

Music Therapy as an Intervention for Pain Perception

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Biography

Rachael completed her BA Psychology at Dalhousie University, in Halifax N.S (1994-1997). She completed one of her semesters in the south of France. Following this, she completed a diploma in Anatomy and Physiology at Henderson College in London England (2000). In September 2000, Rachael began a Post Graduate Music Therapy program at Anglia Ruskin University, Cambridge, England that qualified her as a Music Therapist in July 2001; followed by her thesis work attaining a Masters Music Therapy in 2005. Thesis work is entitled “Music Therapy as an Intervention for Pain Perception”. It was presented at the CAMT 2008 Music Therapy Conference. Rachael completed a MA Social Science with the Open University, London England in May 2004. Rachael instructs music therapy modules for the BA music therapy program and guest lectures Masters Music Therapy classes at Wilfrid Laurier University. Rachael is Director of Music Therapy for Jesse's Foundation for Music and Dance Therapy www.jessesfoundation.com

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ABSTRACT

MASTER OF MUSIC THERAPY

MUSIC THERAPY AS AN INTERVENTION FOR PAIN PERCEPTION

By RACHAEL FINNERTY

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An emphasis on improved pain management for the patients at Sunnybrook Health Sciences Centre motivated this research entitled *Music Therapy As An Intervention For Pain Perception*.

The research proceeds as a naturalistic inquiry using abductive reasoning by the music therapist in the General Medicine Units. The majority of the patients in the General Medicine Units are awaiting placement to a rehabilitation program, long term care centre, nursing home or assisted home care. The research acts as an evaluation study reflecting on the effectiveness of a pre-existing music therapy program. The music therapist leads the music therapy sessions with an eclectic approach under the philosophy that each patient is individual, and how he or she responds to pain and treatment will be unique. The music therapist tailors each session to meet the need of each patient.

Data is collected using triangulation; all observations related to pain perception are recorded after each music therapy session inclusive of patient comments. A survey is added to provide a numerical component to the study reflecting patient pain pre and post each session. Pain is rated on a scale of 1-10; 10 represents the most amount of pain imaginable. The aim of combining these data is to produce predictive generalizations about the use of music therapy as an intervention for pain perception. It is hypothesized that individuals will experience a reduction in pain perception with the exception of those who are symptomatic of depression. It is proposed that pain perception will initially be increased for those symptomatic of depression as a result of self-awareness through the music therapy process.

A literature review about pain management, music and music therapy combined with the data from the research contributed to the evolution of three theories;

1. Music therapy is able to influence biological events such as emotions and memories, which has an impact on the perception of pain.
2. Music therapy can provide a healthy distraction to an individual's pain, including the side effects of pain medication such as nausea, by blocking pain messages.
3. Music therapy is able to decrease anxiety, alleviate symptoms of depression, motivate and provide enjoyment contributing to quality of life. Improved quality of life can lead to a decrease in pain perception.

There is a large emphasis on biological processes in this research project as this is where the parallels between music therapy and pain are most evident.

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Introduction

Music Therapy As An Intervention For Pain Perception

Music therapy addresses the multi-dimensions of pain; discomfort, displeasure, anxiety, insecurity as well as the motivational aspects of pain related to pain management. This research project explores the use of music therapy as an intervention for pain perception. The exploration process is conducted through a literature review of previous studies about *music* and pain, *music therapy* and pain, as well as a review of the biological aspects of pain, music and emotions. This review is used to suggest reasons for *how* music therapy is an intervention for pain perception. There is a descriptive element to the study as the researchers describe their observations of the patients during music therapy sessions. An intervention for the purpose of this study is a tool (music therapy) that is implemented by a trained professional (music therapist), resulting in a positive change for the patients in relation to their perception of pain. The term *pain perception* is used, as pain cannot be quantified as universal between all peoples. It is an individual's perception of his or her pain that is of interest for this research project.

It is hypothesized that individuals will experience a reduction in pain perception with the exception of those who are symptomatic of depression. It is proposed that pain perception will initially be increased for those symptomatic of depression as a result of self-awareness through the music therapy process.

Imagine what it would be like if the standard approach to pain management in hospitals extended beyond a health assessment and the distribution of pain medication. That instead of feeling noxious and unmotivated from the pain medication, there was a

distraction available that eased the nausea and awakened the senses from the haze of anxiety. What if it was standard practise to provide an environment that was void of the sounds of sterile equipment and the discomfort of fellow patients? What if the standard approach to pain management provided the patient with some sense of control over his or her treatment of pain? Control provides a greater sense of self in a strange environment, where anxieties are high, and discomfort is great. Due to the necessity for most hospitals to maintain a regime, patients have minimal control over meals, visiting hours, and meeting with practitioners.

Approaches to pain management need to acknowledge that pain is more than a physiological response to noxious stimuli. Pain is an experience affected by variables that require more than an analgesic to manage it effectively.

The prevalence of pain increases with each decade of life (Davis and Srivastava, 2003). The research performed in this study was predominately with the elderly. Most patients in this study experienced chronic pain, which is defined as *pain that persists the normal course of time associated with a particular type of injury. Poorly controlled pain in the elderly leads to cognitive failure, depression and mood disturbances* (Davis and Srivastava 2003 p.24). Music therapy can be implemented as a rehabilitative tool for cognitive failure, depression and mood disturbances by providing sensory stimulation as well as social experiences that present the elderly with an opportunity to sing, dance, write songs and reminisce (Odell-Miller, 1995). Cognitive failure, depression and mood disturbances all play a role in the perception of pain.

In 2003, Sunnybrook Health Sciences Centre established several teams to improve pain management for its patients. In support of this collaborative the research

project *Music Therapy As An Intervention For Pain Perception* was initiated. Patients in General Medicine and Aging and Veterans Long Term Care were asked to rate their pain on a scale of 1-10 prior and post music therapy sessions (10 reflected the most pain imaginable). Additionally, the music therapists made observations and wrote down patient remarks related to pain perception.

This study concluded that music therapy alleviates patients' perception of pain by affecting variables associated with quality of life. Music therapy is able to impact upon the various elements of pain such as memory, anxiety, nausea, motivation, muscle strength and sense of self worth.

This paper is divided into four chapters as follows;

Chapter I **Pain, Music & Music Therapy**

A brief history and definition of pain, music and music therapy. A review of history allows an understanding of today's definitions and how these topics are interlinked.

Chapter II **The Difference Between Music and Music Therapy**

Clarifies the difference between using *music* as an intervention for pain perception from using *music therapy* as an intervention for pain perception.

Chapter III **Biological Parallels of Music Therapy and Pain**

Highlights the biological parallels of music therapy and pain in order to gain a greater understanding of how music therapy may be influential in the perception of pain.

Chapter IV **Sunnybrook Health Sciences Centre Research;
*Music Therapy as an Intervention for Pain Perception.***

A music therapy study that collects data about pain perception.

Chapter I: Pain, Music & Music Therapy

This section will provide a brief history and definition of pain, music and music therapy. A brief review of history allows a greater understanding of today's definitions and how these topics are interlinked.

1.1 Pain

In order to understand how music therapy can be an effective intervention for pain, a detailed understanding of pain is necessary. For the purpose of this research project, the most relevant aspects of the complex field of pain have been expanded upon.

The study of pain in recent years has diverged into many different fields from pharmacology to psychology and neurobiology. Pain is of interest in the search for the neural correlates of consciousness, as pain has many subjective psychological aspects. Through studying the parallels of the subjective psychological aspects of pain and music therapy, it is hoped that a greater understanding of pain can be achieved contributing to theories of how music therapy is an effective intervention.

The body naturally responds to pain with symptoms of high stress; increased heart rate and blood pressure, quick, shallow breathing, sweaty palms and knotted muscles. The sympathetic nervous system is aroused and stress hormones are released resulting in feelings of anxiety. These physiological responses can result in an increased perception of pain (Mites, 1997 p.137).

The most recent accepted definition of pain from the International Association of Pain Study states;

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of tissue damage. NOTE: Pain is always subjective. Each individual learns the application of the word through experience related to injury. Hence, the experience of pain varies from person to person based on past experience and/or present state of mind (Koestler and Myers, 2002 p.8).

1.2 Models/Theories of Pain

The first model for pain originated in ancient Greece and was codified by Descartes in the 17th century. This model is referred to as the biomedical model (Koestler and Myers, 2002 p.12). This model assumes that there is a direct link between an individual's complaints and symptoms to a specific disease. It is also assumed that the disease can be confirmed by medical evaluation and tests relating to tissue damage and impairment. The mind and body are treated as two separate entities and treatment to pain is directed toward the body. Symptoms of pain are believed to arise as a direct result of a physical impairment. For centuries it was assumed that if a medical treatment did not alleviate the pain or if a physical ailment could not be discovered to explain the pain, that the complaints were psychological in nature. By the end of the 19th century there existed three conflicting theories about pain (Koestler and Myers, 2002 p.12).

- 1 Specificity theory: There are special receptors for each modality of pain that are transmitted to a "pain centre" in the brain.
- 2 Intensive theory: Every sensory stimulus can produce pain if it reaches sufficient intensity.

3 Aristotelian concept: Pain is an affective (emotional) quality.

A major working theory of pain is the Gate Control Theory (GCT) (Skevington, 1995). This theory proposes that the balance of the input between large and small fibres is important in pain sensation. The theory postulates that a predominance of small fibre activity constitutes an 'opening of the gate' allowing the brain to receive and interpret the impulses as pain. Through a preponderance of large fibre activity the gate is 'closed' and pain is not perceived. It is the first theory to acknowledge and integrate known psychological mechanisms that affect individual perception and interpretations of pain. This theory acknowledges that psychological mechanisms such as anxiety, depression and relaxation can effect the "opening of the gate" that allows for the transmission of pain. Music can have a direct affect upon such psychological mechanisms, potentially affecting the transmission of pain postulated by the Gate Control Theory.

In 1989, Melzack and Wall adjusted the Gate Control Theory to *rapidly acting mechanisms that receive and control the transfer of impulses from the input afferent fibres to cells which in turn trigger the various effector systems and which evoke sensation* (Skevington, 1995 p.18). Deficiencies have been found in the anatomical and physiological aspects of this theory but it remains as a milestone in pain research and treatment (Koestler and Myers, 2002 p.27).

The *biopsychosocial* model suggests that the mind and the body are an integrated and dynamic system. This model was initiated by doctors who were treating soldiers during the Second World War (Koestler and Myers, 2002 p.12). Observations were made that questioned the traditional belief that the mind and the body are separate entities when treating pain. Soldiers with serious wounds saw their injuries as a 'ticket out' and

reported less pain than soldiers who had incurred less serious wounds and would have to return to the battlefield (Beecher, 1972 as cited in Koestler and Myers, 2002 p.12). John Bonica, an anesthesiologist who worked in pain control at an army hospital in 1944, observed wounded soldiers and the multifactorial nature of pain. In 1947, he established a Multidisciplinary Pain Center at Tacoma General Hospital in Tacoma, Washington.

Treatment to a disease or recovery from an injury is determined through the interaction of physiological mechanisms, psychological factors, and sociocultural influences. It is these same elements that are interwoven into music therapy sessions. Music inherently affects the body's physiology, state of mind and is found in each culture allowing for social cultural influences to be respected and acknowledged through the patient's choice and use of music. This model acknowledges that physical pathology alone does not always account for an illness or the experience of suffering. The biopsychosocial model is the most influential to clinical pain treatment today.

1.2a Historic Influences to Pain

The following list provides a sample of the diversity of discoveries that have influenced pain theories to date (Jackson, 2002 p.12). The discoveries and declarations below display how premature our understanding of pain still is. The discovery of endorphins in relation to pain was made as recently as 1976. The impact of music therapy upon the release of endorphins in relation to pain is still new to the field of pain research.

1803	Morphine was synthesized from opium
1828	Salicin isolated from Willow bark leading to development of Aspirin
1846	Discovery of anesthesia
1853	Invention of hypodermic needle
1853	Acetylsalicylic acid, predecessor to aspirin
1914	Harrison Act in US sets restrictions of narcotic drugs
1943	<i>Pain Mechanisms</i> published by William Livingston
1946	Henry Beecher's work on the power of the placebo
1965	Gate-control theory of pain published by Melzack and Wall in the journal of <i>Science</i>
1965	First multidisciplinary pain clinic
1966	First hospice, St.Christopher's opens in UK
1973	International Association for the Study of Pain
1975	The McGill Pain Questionnaire (first measurement of pain intensity)
1976	Discovery of endorphins
1986	The World Health Organization publishes <i>The Analgesic Ladder: Guidance to Cancer Pain Relief</i>
1995	The American Pain Society endorses the designation of pain as 'The Fifth Vital Sign'
2000	The U.S congress declares the next 10years the 'Decade of Pain Control and Research'

1.3 Music

For the purpose of this research, music is the tool within music therapy used to alleviate pain perception. Music is a human activity, which involves structured and audible sounds, which is used for artistic or aesthetic, entertainment or ceremonial purposes. Definitions vary in different cultures and social milieus.

Recorded history relates stories of humankind's use of music to soothe the body, mind and spirit. This corresponds with the definition of pain as an emotional quality as recorded by Aristotle. As a movement of research toward specificity began, research found that music alters specific physiologic responses, such as heart rate and respiration rate (Lusk and Lash, 2005). Music has also been found to alter mood and elicit relaxation responses (Magill-Levreault, 1993). Music is able to elicit pleasure, which is assumed to motivate (Stige, 2006). Music as a distraction is able to alter thoughts, emotions, or mood by inducing relaxation (Magill-Levreault, 1993). Music, as is pain, is a subjective sensory and emotional experience. Response to music, as to pain, is based on past experience and/or present state of mind.

1.4 Music Therapy

Music therapy is practiced in 39 different countries (<http://musictherapyworld.com>). This research project collaborates information predominately from Canada, USA and the UK. These countries each have their own professional regulating associations. Below is the definition of music therapy as each association defines it.

Canadian Association for Music Therapy/Association de Musicotherapie du Canada

Music therapy is the skillful use of music and musical elements by an accredited music therapist to promote, maintain, and restore mental, physical, emotional, and spiritual health. Music has nonverbal, creative, structural, and emotional qualities. These are used in the therapeutic relationship to facilitate contact, interaction, self-awareness, learning, self-expression, communication, and personal development.
(<http://musictherapy.ca>)

Association of Professional Music Therapy & British Society of Music Therapy

There are different approaches to the use of music in therapy. Depending on the needs of the client and the orientation of the therapist, different aspects of the work may be emphasized. Fundamental to all approaches, however, is the development of a relationship between the client and the therapist. Music-making forms the basis for communication in the relationship. As a general rule both client and therapist take an active part in the sessions by playing, singing and listening. The therapist does not teach the client to sing or play an instrument. Rather, clients are encouraged to use accessible percussion and other instruments and their own voices to explore the world of sound and to create a musical language of their own. By responding musically, the therapist is able to support and encourage this process.

The music played covers a wide range of styles in order to complement the individual needs of each client. Much of the music is improvised, thus enhancing the individual nature of the relationship. Through whatever form the therapy takes, the therapist aims to facilitate positive changes in behaviour and emotional well-being. He

or she also aims to help the client to develop an increased sense of self-awareness, and thereby to enhance his or her quality of life. The process may take place in individual or group music therapy sessions.

American Music Therapy Association. Founded in 1998 as a merger of the National Association of Music Therapy (1950) and the American Association of Music Therapy (1970)

Music Therapy is an established healthcare profession that uses music to address physical, emotional, cognitive, and social needs of individuals of all ages. Music therapy improves the quality of life for persons who are well and meets the needs of children and adults with disabilities or illnesses. Music therapy interventions can be designed to:

- promote wellness*
- manage stress*
- alleviate pain*
- express feelings*
- enhance memory*
- improve communication*
- promote physical rehabilitation*

American Association of Music Therapy (1970). (<http://musictherapy.org>)

In summary of these definitions, trained professionals use music in a variety of ways as an intervention to reach goals and objectives. In relation to this research project, music therapy is the use of musical interventions by a qualified music therapist to reach the goal of alleviating pain. A qualified music therapist has completed a recognized university program of study at either an under graduate or post graduate level, inclusive of a 1000 hour internship. Entrance to these programs demands that applicants are proficient in guitar, piano, voice, music theory, music history, reading music,

improvisation, as well as varying levels of skill in assessment, documentation, and other counseling and healthcare skills depending on the focus of the particular university's program. Music therapists are found in nearly every area of the helping professions. Some commonly found practices include development work (communication, motor skills, etc.) with individuals with special needs, songwriting and listening in reminisce/orientation work with the elderly, processing and relaxation work, and rhythmic entertainment for physical rehabilitation in stroke victims.

1.4a Primary Researcher's Definition of Music Therapy

The primary researcher defines music therapy as the use of music in all of its forms in a meaningful manner to meet the need of the individual(s). Within this definition, the primary researcher has developed an eclectic approach and a philosophy that is flexible in representing the uniqueness of each individual. In this way, the music therapy sessions vary from predominately providing music at the bedside on the guitar, using the patient's breathing as the music's rhythm indicator; to predominately engaging in conversation, accented with singing songs with the individual that relate to the discussion, evoking memories and further discussion, and song writing.

Chapter II The Difference Between Music and Music Therapy

This section aims to clarify the difference between the use of *music* as an intervention for pain perception and the use of *music therapy* as an intervention for pain perception.

2.1 Music as an Intervention

The studies conducted by a non-music therapist use recorded music only. The researcher often chooses the music as opposed to the patient, there is no relationship between the researcher and the patient, and there is no assessment of the patients' needs outside of alleviating pain perception. In these studies, the findings are a reflection of the act of 'listening to music'. These studies provide useful information about the tool of music and the effects of music on pain perception. Zimmerman et al., (1989) found that music and relaxation significantly decreases the overall pain experience in chronic pain patients. One of music's most documented medical uses is as an audioanalgesic, which has been described as taking aspirin through the ears (Mites, 1997 p.137).

Neurological pathways have been identified supporting music's ability to produce an endorphin response, which is the body's natural response to pain (Baker, 1998). Analyzed data displays significantly elevated pain thresholds with the use of soothing music (Whipple and Glynn, 1992) and that self-selected music can influence chronic pain perception. Testing for the confounding variable of medications revealed that medications do not influence how an individual responds to the intervention of listening to music. These findings are supported by research and clinical experience using music to assist patients with pain management in a variety of medical settings (Presner 2001). A

study by Knight and Rickard (cited in Aldridge, 2003,p.17) supports the *anxiolytic¹ affect of music using a healthy student population.

There are three possible ways that music may modify pain (Magill-Levreault, 1993).

1. **Affective:** Music may alter mood disturbances associated with long term and life threatening illnesses such as anxiety, depression, fear, anger, and sadness. Music can lift depressive symptoms, promote relaxation, and thus diminish tension and anxiety.
2. **Cognitive:** Associative qualities of music provide a means of distracting attention away from pain often creating images and carrying a person's thoughts away from the noxious stimuli. Music provides a mechanism to improve patients' sense of control.
3. **Sensory:** Sensory component of music may have effect on sensory component of pain through counter- stimulation of the afferent fibers.

The act of listening to music may reduce the perception of pain as a distraction as used in a study for procedural pain and anxiety in patients with cancer. This kind of a distraction can change the transmission of pain impulses through activating the limbic system and sensory region of the brain (Kwekkeboom, 2003).

¹ *Anxiolytic: a drug prescribed for the treatment of symptoms of anxiety.

2.2 Music Therapy as an Intervention

Music therapists use the above noted attributes of music as their tools to reach client/patient goals. Research exploring music therapy and pain is undertaken by a qualified music therapist opposed to any other interested professional ie., nurse, doctor, physiotherapist.

As a music therapist, the music is administered in a variety of ways, often as a means of expression. There is a therapeutic relationship between the music therapist and the patient that develops during an assessment period and a treatment plan is created with the patient. The treatment plan covers goals and objectives inclusive of reducing the perception of pain. The tools implemented are fashioned to the individual and may involve a mix of pre-recorded music, live music, improvisation, composing lyrics, vocalization and/or instrumentation.

When patients are asked in Bullington's study (2003) to describe the path from seeking medical help to finding successful rehabilitation the main metaphor that arose was *order out of chaos*. Ordering chaos is regarded as a process moving from diagnosis through to a phase of heightened self-awareness. Related themes in Bullington et al's research concern the role of flexibility and creativity in the healing process and finding new meaning. These are integral elements to music therapy.

Music therapy studies are a reflection of a process involving music in a variety of forms. It is this *process* that patients identify a need for in Bullington's study. The music

therapy process involves flexibility, creativity and meaning underlying the difference between using music in isolation and music therapy.

Surveys on manifestations of pain and suffering have led to the determination that the psychological component of pain is so important that modification of pain through psychological techniques is to be expected (Magill-Levreault, 1993). Music therapists perform comprehensive assessments that include reviews of social, cultural, medical history, current medical status and the ways in which emotions are affecting the pain.

Patients about to undergo surgical procedures are highly stressed; in such situations music therapy helps (Aldridge, 2003, p.17). A study at the Bristol Cancer Help Centre, UK, concludes that music therapy increases well-being and relaxation and decreases tension. The participants in this study had decreased levels of the hormone cortisol (Aldridge, 2003, p.19). High levels of cortisol are linked with stress and depression, which are directly linked to pain perception (Magill-Levreault, 1993). Music therapy can be an effective means to reducing anxiety as indicated in Kerr's study in 2001. This study compared typical reframing techniques as an intervention for reducing anxiety to reframing techniques with the addition of music by a music therapist. The results displayed music therapy as a more efficacious means to reducing anxiety (Kerr et al, 2001) Music therapy has also proven to be helpful as an intervention to those in intensive care (Aldridge, 2003, p.17).

2.3 Musical Interventions

For a better understanding of what kind of musical interventions may be used in music therapy the following is a list of interventions as provided by the CAMT (Canadian Association For Music Therapy). (<http://musictherapy.ca>, 2006)

- 1 *Singing:* Improves articulation, rhythm, and breath control. Improves oxygen saturation rates of individuals with COPD. Encourages reminiscence and discussions of the past, while reducing anxiety and fear.

- 2 *Playing Instruments:* Improves gross and fine motor coordination. Enhances cooperation, attention and provides opportunities for leadership-participant roles. Develops an increase in well-being and self-esteem.

- 3 *Rhythmic Based Activities:* Facilitates and improves upon range of motion, joint mobility/ agility/ strength, balance, coordination, gait consistency and relaxation. Rhythm and beat are important in “priming” the motor areas of the brain, in regulating autonomic processes such as breathing and heart rate, and maintaining motivation or activity level. Assists with receptive and expressive processing difficulties (ie.aphasia, tinnitus) to tolerate and successfully process sensory information.

- 4 *Improvising:* Offers a creative, nonverbal means of expressing thoughts and feelings. It is non-judgmental, easy to approach, and requires no previous musical training. Where words fail or emotions are too hard to express, music can fill the void. Where trust and interaction with others has been compromised due to abuse or neglect, improvisation provides a safe opportunity for restoration of meaningful interpersonal contact.

- 5 *Composing:* Facilitates the sharing of feelings, ideas and experiences. For people with a terminal illness, it is a vehicle for examining feelings about the meaning in life and death. It may also provide an opportunity for creating a legacy or a shared experience with a

caregiver, child or loved one, prior to death. Lyric discussion and song writing can help individuals deal with painful memories, trauma, abuse, and express feelings and thoughts that are normally socially unacceptable, while fostering a sense of identification with a particular group or institution.

- 6 *Listening:* Helps to develop cognitive skills such as attention and memory. For those facing surgical procedures it allows the individual an opportunity to exert a sense of control over an often unpredictable environment. In situations where cognitive perceptions are compromised, such as in early to mid stage dementia, listening can provide a sense of the familiar, and increase orientation to reality. For those with psychological disorders such as Schizophrenia or Bipolar Disorder music listening can facilitate openness to discussion and provide motivation for increased levels of activity.

These music therapy interventions may be used individually in a session or jointly to reflect the needs of the patient. This research project has compiled research from all of the above listed interventions.

2.4 Benefits of Music Therapy As An Intervention For Pain Perception

(Finnerty, 2006)

The following chart was completed by the primary researcher to simplify how these interventions may effect one's perception of pain. All of the noted music therapy interventions result in a benefit of well being, relaxation, catharsis and/or distraction all of which have the potential to lessen pain perception. These benefits have been observed by the primary researcher as well as noted in the above section 2.1, referenced from the Canadian Association of Music Therapy.

MUSIC THERAPY INTERVENTION	BENEFIT	PAIN PERCEPTION
Playing Instruments	Increase well-being, feeling of being a part of something. Self expression	Well-being = Less pain
Rhythmic Based Activities	Regulate Breathing/Heart Rate. Relaxation	Relaxation = Less pain
Improvising	Meaningful Interpersonal Contact/Expression. Possible release of endorphins.	Catharsis = Less Pain Endorphins-body's natural pain killers
Listening	Stimulate Memories, Illicit Emotions, (stimulation of limbic system)	Overrides pain subjective experience = Less pain.
Composing	Sharing Feelings, Experiences, Possible release of endorphins (stimulation of limbic system)	Catharsis= Less pain Endorphins-body's natural pain killers

The aforementioned interventions also result in empowerment, another factor that influences pain perception. A patient can feel completely disempowered while staying at a hospital, finding it too painful to engage in daily activities such as washing, eating and sleeping. Daveson (2001) and Proctor (2002) have written articles in relation to music therapy and empowerment (as cited in Rolvsjord, 2004, p.100). It is suggested that empowerment is intrinsic to music therapy practice due to its participatory process and client ownership. Music making builds upon people's experiences of who they are and what they can do (Rolvsjord, 2004, p.100). Music therapy provides a vehicle of expression, which can be essential to pain relief, particularly for those patients who are inarticulate in the face of strong emotions (Aldridge, 2003). Participation in bedside sessions may begin with the music therapist singing in order to facilitate eye contact. The patient may then be encouraged to sing along, to move to the music (i.e., tap a finger, wiggle toes, wave a hand, nod the head) or to play some other instrument that requires little effort apart from active engagement through a structured, rhythmic response. This participation requires patients to focus on the musical productivity at that moment rather than the pain (<http://healthpropress.com>, 2002).

The benefits of music therapy in pain management are currently recognized at some health institutions such as; the Pain Service to the Neurology Department, New York, USA (Aldridge, 1996, p.75.).

Chapter III Biological Parallels of Music Therapy and Pain

This section will highlight the biological parallels of music therapy and pain in order to gain an understanding of how music therapy may be influential in the perception of pain.

3.1 Subjective Experiences are Biological Events

As neuroscience maps the brain in more detail, the gap between the mind and body begins to narrow and to show itself as a false construct. The body begins to look smarter and more soulful (flesh as ‘spirit thickened’ as surgeon and author Richard Selzer has written) at the same time that the mind incarnates itself as a biochemical event (Jackson, 2002 p.14). Within the definition of pain there is an inherent divide between mind and body; the subjective and physical experience of pain. In recognizing how music therapy can effect pain perception, it is important to recognize that subjective experiences are physical. Subjective experiences are based on memories and emotions which are biological events controlled by the body’s various communication systems.

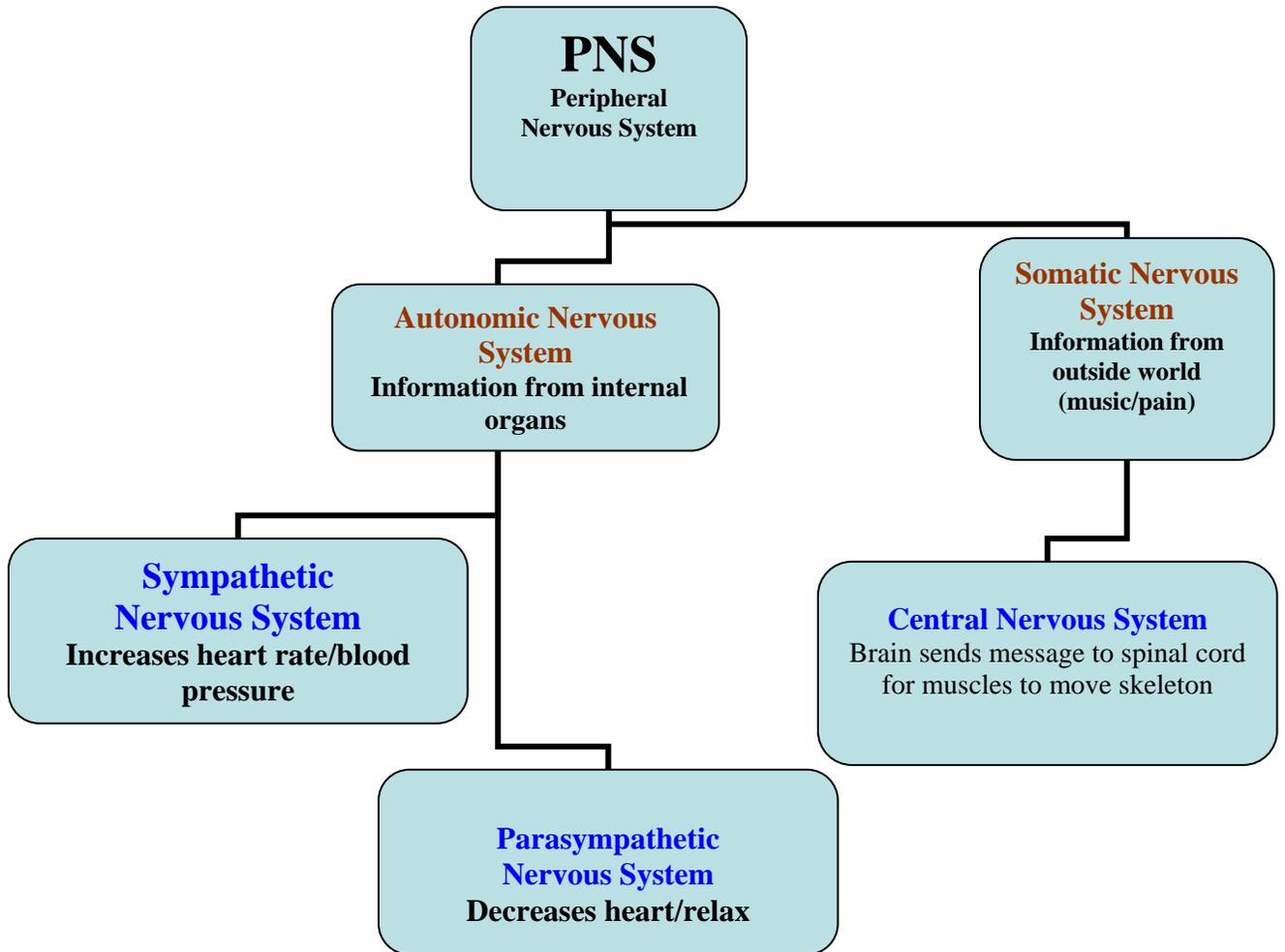
3.2 The Body's Communication Systems

Research to date shows that the ability to perceive, feel, think, know and do is a result of neurons firing and resetting. Signals are generated and carried through networks of neurons. These signals pass through the nervous system; a communication system comprised of the central nervous system (CNS) and the peripheral nervous system (PNS). The CNS consists of the brain and the spinal cord. The somatic nervous system transmits information from the senses (sight, sound, smell, touch and taste) to the CNS, which then triggers neurotransmitters in the brain and muscles to move the skeleton (Koestler and Myers, 2002 p.13). The PNS is composed of the autonomic nervous system (ANS) and the somatic nervous system (SNS). The autonomic nervous system (ANS) causes the adrenal glands to release epinephrine (adrenalin) into the blood system. It is responsible for what is commonly known as 'fight or flight'.

3.2a Communication Systems

(Finnerty, 2006)

The following diagram was formulated by the primary researcher to display how the different communication systems interact.



3.3 Neurotransmitters

Neurotransmitters are chemicals that are used to relay, amplify and modulate electrical signals between a neuron and another cell. The brain learns which nerves are transmitting information from particular areas of the body. Neurotransmitters that mediate pain (and emotions) are norepinephrine, dopamine, melatonin, epinephrine, L-dopa, serotonin, prolactin and enkephalines. A study by Kumar et al (1999) collected blood samples from 20 war veterans with Alzheimer's disease and observed an increase of melatonin, epinephrine and norepinephrine after 4 weeks of regular music therapy. Raised melatonin levels remained for a total of six weeks post sessions. Melatonin is largely known for preventing 'the blues'. The music therapy sessions in this study were inclusive of pre-recorded material only. Serotonin and prolactin levels were not affected in this study. Serotonin (5-HT) is a neurotransmitter that plays a role in regulating mood, sleep, vomiting, appetite and anxiety. Mood, sleep, appetite, and "the blues" are all elements that effect one's perception of pain and can be influenced by music.

Animal studies have shown that when serotonin is added directly to the CNS it accumulates in the periventricular areas and enhances the effectiveness of analgesia and decreases pain perception. When there is an abundance of serotonin being transmitted an individual typically feels a sense of well being and comfort. This is observed when MDMA (street drug Ecstasy) is implemented. MDMA is a drug that inhibits serotonin uptake, which causes a flood in the synapse (the space between neurons). It is also thought to raise levels of norepinephrine and dopamine. Blocking presynaptic reuptake of serotonin in the synaptic cleft raises the threshold for pain. When serotonin is administered as a pharmaceutical it is unable to cross the blood brain barrier preventing it

from directly affecting the CNS, disabling its effectiveness for pain relief unless taken with a synthetic precursor. This is the same for dopamine (DA). Dopamine is commonly associated with the *pleasure system* of the brain, providing feelings of enjoyment, contributing to reinforcement and motivation.

Listening to music can affect the production of dopamine (DA) in the brain by stimulating the production of serum calcium; this was discovered in a study by Sutoo & Akiyama (2004). Previous studies have indicated that calcium increases brain dopamine synthesis, which in turn affects blood pressure. When rats are exposed to music (in this case Mozart's K.205), their systolic blood pressure is reduced and calcium levels are 5-6% higher than non-music control rats (Sutoo & Akiyama, 2004).

As well as neurotransmitters, dopamine and serotonin are hormones. Hormones act as "messengers," and are carried by the bloodstream to different cells in the body, which interpret these messages and act on them.

3.4 Manufactured Pain killers

Manufactured pain killers are made to act on neurotransmitters cutting down the messages passed from cell to cell (Wells and Nown, 1998 p.13). Pain killers are referred to patients by doctors and pharmacists on an analgesic ladder. Over the counter drugs are rung 1, codeine is rung 2, and morphine is rung 3. Rung 2 and 3 are controlled substances. When an injury occurs, the damaged tissue releases the hormone prostaglandin (PG), which stimulates nerve endings to carry pain messages to the brain (Wells and Nown, 1998). Drugs such as acetylsalicylic acid (ASA or Aspirin) inhibit the production of PG resulting in the reduced sensation of pain. Patients who are elderly have a lower toleration for pain medications because aging causes physiological changes that alter the pharmacokinetics and pharmacodynamics of analgesics. This narrows their therapeutic index, and increases the risk of toxicity and drug-drug interactions (Davis and Srivastava 2003). Many manufactured pain killers are addictive, such as morphine, codeine like drugs (if used for more than 6 months) and tranquilizers (benzodiazepine, diazepam, lorazepam) intended to work as a muscle relaxant, addiction can occur after 6 weeks of use (Wells and Nown, 1998).

3.5 Nociception

Nociceptors are the nerve cells that transmit unpleasant impulses to the brain. Nociception is a neurological term that refers to the transmission mechanism of physiological pain. In response to a pain message from a part of the body, the brain can order the release of chemicals that reduce or inhibit pain sensations (Wells and Nown, 1998, p.7). These pain blocking chemicals produced by the body, are called endorphins and are the key to controlling pain. It has been theorized that music might alter pain through affective and cognitive effects that stimulate endorphin production and the other endogenous mechanisms for pain modulation (Wells and Nown, 1998).

3.6 The Gate Control Theory

Gate Control Theory (GCT) proposes that activity in the large afferent nerves may inhibit activity in the smaller fibres resulting in a reduced perception of pain. For example, rubbing a bumped knee seems to relieve pain by preventing its transmission to the brain. It is possible that music can affect the gating mechanism through the suppression of signals descending from the brain to the spinal cord.

One end of each cell has a receiver that picks up a pain message, and the other end has a chemical substance that passes on the pain message to stimulate the next cell. The brain depends on T-cells (central transmission cells) to send messages from the dorsal horns of the spinal cord. Wall and others suggest that the afferent barrage arriving in the spinal cord can be processed at one of three different speeds. The speed of this information processing depends on the context of other information coming in from the periphery and the integration of descending messages from the brain (Skevington, 1995 p.14). Messages are modified at the gates as a result of emotions and what is happening

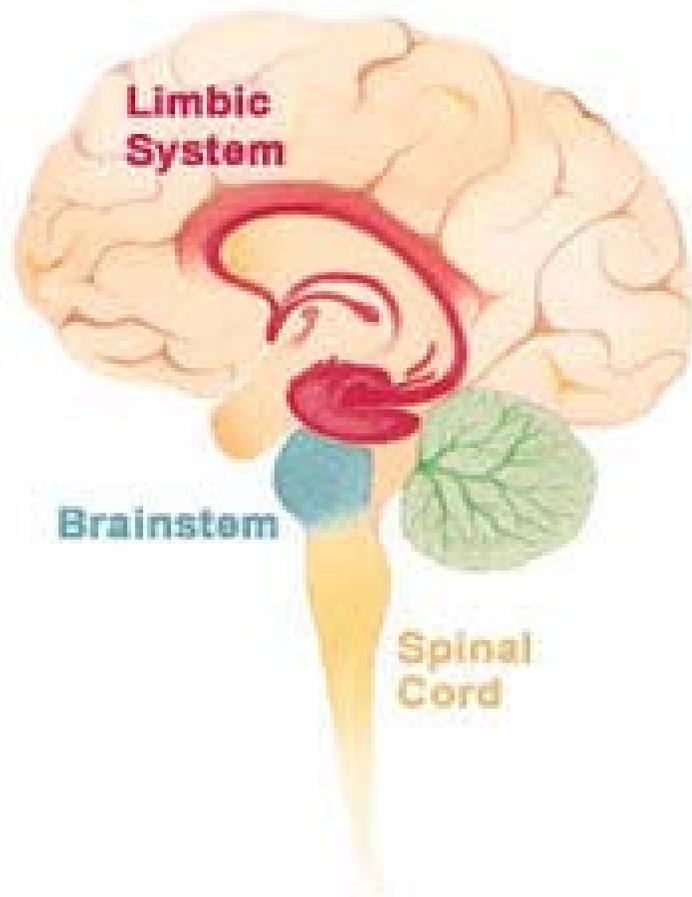
within the body at that given time. Information can be processed either rapidly or assimilated more slowly (minutes or hours rather than seconds) to result in sensitivity control.

Music therapy may be influential in affecting the speed of processing information about pain, modifying the message at the gate by affecting emotions and mental state.

3.7 The Limbic System

The limbic system operates by influencing the endocrine system and the autonomic nervous system (ANS). It is a complex set of structures that lie on both sides and underneath the thalamus and under the cerebrum. These structures are largely responsible for emotional life. They are intensively interconnected and none is solely responsible for any specific emotional state (Rocha do Amaral and Martins de Oliveria). It is believed that connections between centres in the brainstem such as the reticular formation and the limbic system account for strong unpleasant emotions reported by those experiencing pain. The prefrontal and limbic brain structures have been noted to be involved during music therapy sessions (Esch et al, 2004). Particularly the left anterior regions of the brain, which are involved in reward and motivation. Listening to music engages the limbic and paralimbic systems, the same systems involved in pain perception. This is observed in studies using neuroimaging and PET scans (positron emission tomography) while an individual passively listens to music.

3.7a Limbic System



http://en.wikipedia.org/wiki/Limbic_system 2006

3.7b Limbic System-Structures and Relevance to Pain and Music Therapy

(Finnerty, 2006)

There is some controversy over which structures are to be named as part of the limbic system. The structures listed below are the generally accepted structures of the limbic system. The role of each limbic structure is cited from Martins de Oliveria and Rocha do Amaral. For the purpose of this research project, the primary researcher has categorized the relevance of each structure with the relevant research about pain and about music therapy as an intervention to pain.

*In the categories to follow, music therapy is referred to as MT.

Hypothalamus	
	Mainly concerned with homeostasis regulating hunger, thirst, response to pain, pleasure, sexual satisfaction, anger and aggressive behaviour. It also regulates the parasympathetic and sympathetic nervous system, which in turn regulate the pulse, blood pressure, breathing and arousal in response to emotional circumstances.
Relevance to Pain	
	The parasympathetic and sympathetic nervous system are responsible for the “fight or flight” response. Pulse rate, blood pressure and breathing increase as a result of anxiety provoking stimuli such as variable surrounding the experience of pain.
Relevance to MT intervention	
	Music is able to influence the parasympathetic and sympathetic nervous system by decreasing pulse rate, blood pressure and breathing bringing the individual into a relaxed state.
Mammillary body & Hippocampus	
	Important for the formation of memory. Converts short term memory to long term memory. If it is damaged, new memories cannot be stored.
Relevance to Pain	
	Memories provide individuals with their subjective experience of pain.
Relevance to MT intervention	
	Music is able to evoke memories. Evoking pleasurable memories and a pleasurable experience may provide a new subjective experience in relation to pain and override the memories that enhance pain perception.
Nucleus Accumbens	
	Involved in reward, pleasure and addiction.
Relevance to Pain	
	Pain inhibits reward/pleasure systems.
Relevance to MT intervention	
	Music evokes feelings of pleasure that may act as a distraction from the feelings associated with pain.

Orbitofrontal Cortex:	
	Required for decision making.
Relevance to Pain	
	Patients' ability to make appropriate decisions for improved quality of life may be impaired due to loss of motivation as a result of pain.
Relevance to MT intervention	
	Music therapy provides opportunities for the patient to make decisions that will ultimately reduce pain perception through building self-confidence and motivation.
Ventral Tegmental Area	
	Consists of dopamine pathways that are believed to be responsible for pleasure.
Relevance to Pain	
	Pain killers are manufactured to act upon dopamine pathways to decrease pain perception
Relevance to MT intervention	
	Studies have suggested that music therapy increases levels of dopamine (Sutoo and Akiyama 2004). This contributes to the individual's experience of pleasure and motivation, which is essential for an individual to maintain a pain management regime.
Cingulated Gyrus	
	Participates in the emotional reaction to pain and in the regulation of aggressive behaviour. In extreme cases of chronic pain, a patient may undergo an anterior cingulectomy. This procedure disconnects the anterior cingulated gyrus allowing the patient to continue to feel the sensation of pain without the accompanying emotion. This procedure highlights the importance of the emotional aspects of pain to the quality of life.
Relevance to Pain	
	The emotional aspects of pain provoked by a change of lifestyle and daily activities may become overwhelming contributing to diagnosed depression.
Relevance to MT intervention	
	Music therapy is able to influence emotional states and provide an opportunity to process the emotions evoked by pain.

3.8 The Limbic System and Emotions

Emotions are an integral part of the experience of pain. Patients are likely to have an emotional response to the noisy, bustling environment compounded with a newfound lack of independence as expert caregivers, machines, and medications impose their directives and controls (Lusk and Lash, 2005). Each of these emotional factors has an impact on the perception of pain. Music therapy provides patients with a space to express their emotions decreasing the impact of the negative emotional factors.

Music is able to elicit emotional responses and fulfill expectations without the use of rational information processing (Esch et al, 2004). This makes music a particularly powerful tool in eliciting emotions by providing a vessel to enjoying musical moments despite rational information processing that is overwhelmed with the negative emotions associated with pain.

Emotions (affective pain) share the same pathway as the sensation of pain. These pathways (also shared by music therapy) are inclusive of related memory processing, accompanied by endocrinologic and autonomic functions. Through employing a PET scan (positron emission topography), Blood and Zatorre (2001) found that consonant music stimulates parts of the brain associated with pleasure and patients accordingly report positive emotions whilst listening to this type of music. Dissonant music stimulates parts of the limbic system associated with unpleasant emotions. Pleasant and unpleasant emotions are integral to the perception of pain.

Underlying neural mechanisms can be identified for intensely pleasant emotional responses to music. A PET study implemented by Blood and Zatorre (2001) with individuals who chose emotion-provoking music indicates that cerebral blood changes

can be measured. These cerebral blood changes mark a link between music and biologically relevant survival stimuli. There is a common recruitment of activity in the brain known to be involved in the pleasure and reward circuit. Systematic research concerning music and emotions is minimal but there is an intersection with the literature on neuroscience of affective processing which is directly related to the experience of pain (Zatorre, 2003). This intersection highlights the impact that music and emotions (key elements to music therapy) have on pain. Through the use of self-administered scales for stress level and testing systolic blood pressure to measure heart rate, music therapy research has documented the use of music to reduce stress and heart rate. Blood and Zatorre (2001) confirm that the brain is active in the same areas during music therapy as when responding to pain beyond nociception.

Section IV Sunnybrook Health Sciences Centre Research;
Music Therapy as an intervention for pain perception.

In 2003, Sunnybrook Health Sciences Centre established several teams to improve pain management for its patients. In support of this collaborative effort it was felt that a pilot study researching the effects of music therapy as an intervention for pain perception would be a positive means to reinstate the funding for the music therapy program that was coming to a close that year. The pilot study was then to be expanded upon to provide further support for the music therapy program for patients experiencing pain.

4.0 History

The music therapy program was established on the Transition Unit at Sunnybrook Health Sciences Centre in the year 2000. The program was granted private funding for 3 years at which point it would be re-evaluated. The funding allowed a music therapist to work 2 full days a week to meet the needs of the elder, often neglect, frail patients. In 2003, a proposal was presented to both the hospital and the private donor to continue the program. Inclusive with the proposal was a pilot study for the use of music therapy as an intervention for pain perception (Appendix A), along with signed testaments from patients and the medical team (Appendix B). The program was granted an additional 2 years, with 3 full days a week. The proposal highlighted that there is currently a gap in research using music therapy as an intervention for pain.

4.1 Place of Study

The study takes place at Sunnybrook Health Sciences Centre (formerly; Sunnybrook and Women's College Health Science Centre). The staff of Sunnybrook Health Sciences Centre is committed to excellence and has built a stellar international reputation for Sunnybrook and defined the vital role it plays in the Ontario healthcare system. Many of the programs offer highly specialized services, which are unavailable in other communities.

Sunnybrook Health Sciences Centre is an incredible place to work, study, conduct research and receive care. Each year, eleven thousand (11,000) staff, physicians, volunteers and students work to improve the lives of literally hundreds of thousands of people and are committed to transforming healthcare for people across the Greater Toronto Area, throughout Ontario and Canada and around the globe (<http://swhc.ca>)

The study takes place at two areas of Sunnybrook Health Sciences Centre; Transition Unit (General Medicine), and Aging and Veterans Care.

4.1a Transition Unit

Patients who need further care after being admitted to Emergency are transferred to the Transition Unit to be assessed. The medical team, consisting of doctors, nurses, social workers, dieticians, physiotherapists, occupational therapists and music therapists meet to discuss the options for each new patient. The options include being discharged to place of residents, rehabilitation, community living or long term care facility. Hence, these patients are in 'transition'.

4.1b Aging and Veterans Long Term Care

Sunnybrook Health Sciences Centre is one of Canada's foremost veterans' residences and leading programs in aging care and is home to 533 residents, working in close partnership with Veterans Affairs Canada and the Royal Canadian Legion.

Sunnybrook has a distinguished history of excellence in the care of the elderly both in long-term and acute care. Originally founded in 1948 as a war veteran's hospital, it was envisioned as a great hospital in both size and stature, a symbol of the nation's gratitude to its war veterans.

The focus in Aging and Veterans Care is the residents and their families. Patient-focused care is about being listened to, feeling cared about and being treated with dignity and respect (<http://swhc.ca>).

4.2 Purpose of Study

A pilot study to observe and record the effect of using music therapy as an intervention for pain perception on a hospital Transition Unit (General Medicine) and to extend the study to Aging and Veterans Long Term Care facility at the same hospital; Sunnybrook Health Sciences Centre.

4.3 Hypothesis

It is hypothesized that levels of pain perception will be lowered after the music therapy session. Upon repeat sessions; as the therapist and patient begin to build a therapeutic relationship, pain perception will be further reduced. It is also hypothesized that those symptomatic of depression will initially become more aware of their pain after a session as a result of increased self-awareness.

4.4 Research Process

The research is a naturalistic inquiry. There are two reasons for this;

1. The music therapist's caseload did not allow for additional clients for the sole purpose of research.
2. The researcher felt that the results would be more realistic if observed within her own caseload and work setting. The results are a reflection of the researcher's current work.

*Triangulation² is used in the research process to provide a broad spectrum of information to the research question. Qualitative observations and patient quotes were collected using *analytic memos³ from the music therapy sessions (primary data) as well as quantitative data (secondary data) - a number from 1-10, representing the patients' pain pre and post the music therapy session. The research project adopted a positivist approach, using the qualitative and quantitative data to produce predictive generalizations such as "Music therapy can be applied as an effective intervention for pain perception."

The results were analysed using abductive reasoning; meaning that the music therapist had witnessed patients' responses to music as an intervention to pain perception prior to collecting data for this research project. This knowledge provided the framework for the research process. As the material was collected, the data was brought together with the literature review contributing to the development of three theories. The three theories are discussed in Chapter 4.10.

² *Triangulation: The combination of qualitative and quantitative data while remaining anchored in a positivist or non-positivist paradigm.

³ *Analytic Memos: Notes transposed from memory to survey.

4.5 Data Collection

Patients in the pilot study and the extended study who expressed any perception of pain were referred to the music therapist. The referral process is generally verbal from team members such as nurses, doctors and physiotherapists. Additionally, there are written referrals in Long Term Care that are brought to the Creative Arts Team and discussed (Appendix C).

Music therapy sessions take place at the patient's bedside. During the pilot study, the same music therapist (the primary researcher) meets with each referred patient to explain the service she offers and the study being performed. With the patient's consent, the patient is asked to rate his or her own pain on a scale from 1-10 (10 reflects the most pain imaginable). The music therapy session commences in a variety of ways to reflect the need of the patient at the time. The session may be inclusive of any of the following; discussion, recorded music, live instrumental music, writing lyrics, writing melodies, improvising, and/or singing. For example, some patients requested that the music therapist sing specific songs accompanied by the guitar, at other times, the music therapist suggested music that may be relevant to the discussion taking place. Some patients chose to write their own lyrics to music, and others requested poetry and described what the melody should be like using the poem as lyrics to a song.

Sessions ranged in time from 20-60 minutes. Patients (N=20) were asked to rate their pain at the end of each session using the same scale of 1-10. Sessions may happen once or several times over the course of the patients' stay at the hospital. A survey is used with a pain scale inclusive of a section for the music therapist to record relevant observations and comments. The survey also records the patient's pain medications and

when possible, when they were taken. The survey was simplified for the extension of the study as the pilot study proved the original survey to be too difficult to complete. Refer to appendix D for the pilot study survey and Appendix E for the extended study survey. If the patient ingests an analgesic, it is the music therapist's intent to conduct the music therapy session after the analgesic takes effect (one hour after ingestion).

The same method takes place for the extension of the study except that there is more than one music therapist collecting data. There are a total of three music therapists conducting individual music therapy sessions for the extended portion of the study. Two music therapists from General Medicine (which is where the pilot study had been conducted) and one music therapist in Aging and Veterans Long Term Care (the primary researcher, who had collected the data for the pilot study). In all cases, the patients are a part of the music therapists' client caseload as opposed to additional referrals for the purpose of research. It is the intent of the study for the survey to enhance the music therapy service already being provided as opposed to the music therapist compromising her usual caseload for the sake of the study. The methodology of the study reflects the usual course of the music therapists' caseload, and session structure with the sole addition of the survey.

4.5a Data

The following chart represents the patients included in the data for this research.

Gender

	Male	Female	Total
Transition Unit	5	10	15
Aging and Veterans Long Term Care	4	1	5
Total	9	11	20

Age

	Average Age	Age Range
Transition Unit	70.83	23*-89
Aging and Veterans Long Term Care	84.2	80-89

* Patients under 60years of age are exceptional on the Transition Units.

4.5b Data from Transition Unit-Pilot Study

The following chart represents information collected prior to music therapy sessions

Pilot Study- **Primary researcher**

***Patient names represented by numbers**

Transition Unit Patient (General Medicine)	Age	Sex	Primary Diagnosis
1	55	F	Degenerative Disc Disease, Chronic back pain, Depression,
2	72	M	Chronic back pain
3	64	M	Diabetes, leg to be amputated at the knee
4	75	F	Fell with replacement hip incurring fractures to hip
5	23	F	Stiff Person's Syndrome
6	82	F	Degenerative Disc Disease, Chronic shoulder and leg pain (fractured shoulder), Osteoporosis.
7	88	M	Cancer
8	78	F	Unknown
9	83	F	Dementia, complaint of extreme pain all over
10	79	F	Cancer

4.5c Data from Transition Unit-Extended Study

The following chart represents information collected prior to music therapy sessions

Extended Study Sample-**Secondary researcher**

*Patient names represented by numbers

Transition Unit Patient (General Medicine)	Age	Sex	Primary Diagnosis
11	Unknown	F	Generalized pain. Dementia
12	Unknown	M	Pain in right shoulder and legs (Rheumatoid Arthritis)
13	Unknown	M	Pancreatic Cancer
14	89	F	Broken hip (untreatable), Dementia. Awaiting long term care. Delirium due to pain
15	62	F	Undiagnosed neurological disease, complicated by a tumor on the kidney. Pain related to kidney surgery and catheter.

4.5d Data from Aging and Veterans Long Term Care

The following chart represents information collected prior to music therapy sessions

Extended Study Sample-**Primary researcher**

*Patient names represented by numbers

Aging and Veterans Long Term Care	Age	Sex	Primary Diagnosis
16	80	F	Dementia, depression, pain through out her body
17	82	M	Post stroke, early stage dementia
18	86	M	Cancer, palliative care
19	84	M	Post stroke, pain along left side of body
20	89	M	Cancer, right leg amputated at the knee. General pain to lower body.

4.6 Data Analysis

Observations were made by the music therapist during the music therapy sessions and then transposed to the survey after each session. Only observations that were believed to be relevant to the patient's perception of pain were noted.

4.6a Pilot Study, Transition Unit, General Medicine

*Patient names represented by numbers

Patient	Observations (Primary Researcher)
1	Patient engaged in song writing, and on one occasion she sang. Patient was able to relax and find enjoyment.
3	Patients sharing a room began interacting due to their shared enthusiasm for the music. The conversations continued after the music therapy session.
4	Patient moved her legs/feet to the music after reporting hip pain.
5	Patient was able to relax, close her eyes, and engage in singing. Patient was able to refrain from scratching (illness provokes a burning sensation all over the body).
6	Patient began clapping to the music after reporting shoulder pain.
8	Patient sang, after reporting shortness of breath.

4.6b Extended Study, General Medicine

*Patient names represented by numbers

Patient	Observations (Secondary Researcher)
11	Patient ceased moaning from the pain.
12	Patient with pain in the right shoulder and legs became more comfortable and relaxed, requesting further songs and moving his right arm to the music.
13	Patient with pancreatic cancer, in palliative care, sat up in bed and sang along to familiar songs.

4.6c Extended Study, Aging and Veterans Long term Care

*Patient names represented by numbers

Patient	Observations (Primary Researcher)
16	Patient sat up in bed and sang, swinging her arms and moving her feet.
18	Patient sang along to the music, able to vocalize requests after several songs.
19	Patient used right hand to assist left hand to play notes on the piano

4.7 Results

4.7a Quantitative

Only the patients whom were cognitively able to respond to the pain scale of 1-10 are represented here (N=11)

4.7b Chart of Pain Perception Pre and Post Music Therapy Session

	Session 1	Session 2	Session 3	Session 4	Session 5
Pilot Study					
Patient 1	8-10	5-10	9-7	5-5	7-7
Patient 2	7-5	7-5			
Patient 3	9-7				
Patient 4	5-3	3-0			
Patient 5	9-7				
Patient 6	7-5				
Long Term Care, Extended Study					
Patient 17	9-8	9-7	9-7		
Patient 18	10-8	9-7			
Patient 19	9-8	9-7			
Patient 20	8-5				
General Medicine, Extended Study					
Patient 15	9-9				

4.7c Results of Survey

Chart represents patients who were cognitively able to partake in the survey.

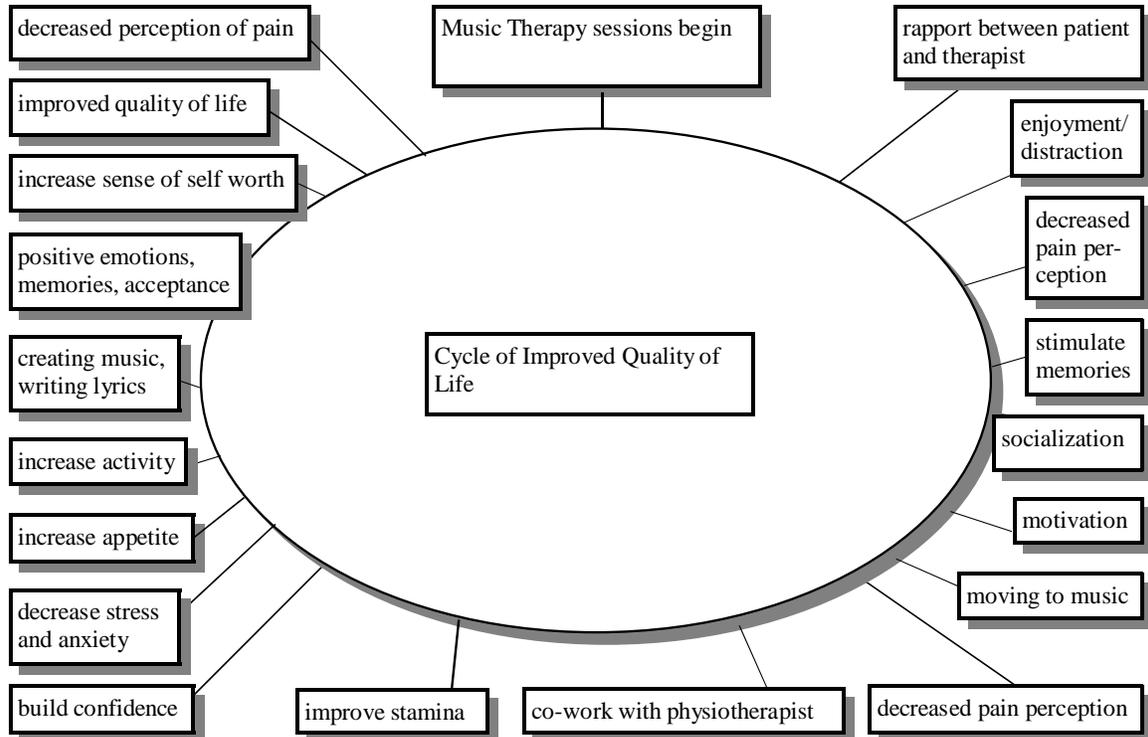
	Pilot Study (Primary Researcher)	Long Term Care (Primary Researcher)	General Medicine (Tertiary Researcher)	Overall
Percent of patients who perceived a decrease in pain	83.3% (5/6)	100% (4/4)	0% (0/1)	81% (9/11)
Average Point Change on Scale (inclusive of increases and decreases)	2	2	0	1.85
Mode Point Change	-2	-2	0	-2
Range Point Change	(+5) – (-2)	(-1)-(-3)	(0)-(0)	(+5)-(-2)

4.7d Qualitative

Prior to the start of this research, the researcher had observed patients to be less focused on their pain during music therapy sessions. Patients became motivated to partake in their daily regime, such as, physiotherapy and recreation, as well as expressing elevated moods after music therapy. The researcher received feedback from the patients' nurses that patients presented less resistance to care after music therapy sessions. Based on these pre-research observations the following diagram was created reflecting how the quality of life (affected by music therapy) impacts pain perception in a cyclic pattern.

4.7e Cycle of Improved Quality of Life Affecting Pain Perception

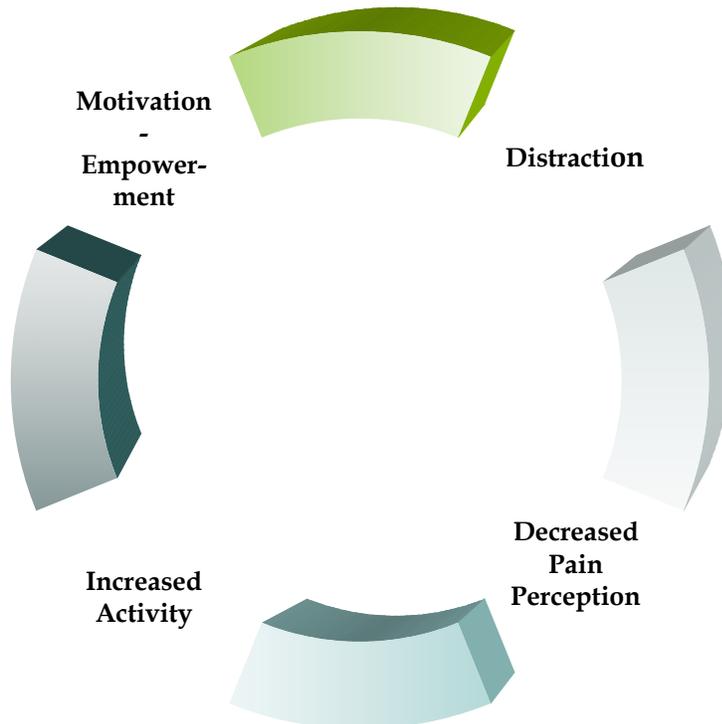
(Finnerty, 2006)



4.8 Observations & Patient Feedback

(Finnerty, 2006)

After completing the data collection, the observations, inclusive of patient feedback, were separated into categories that support the pre-research chart (4.7a). The primary researcher developed four categories based on the cyclic elements of *quality of life*. The categories are; *Distraction, Decreased Pain Perception, Increased Activity and Motivation-Empowerment.*



4.8a Decreased Pain Perception

Key To Diagram

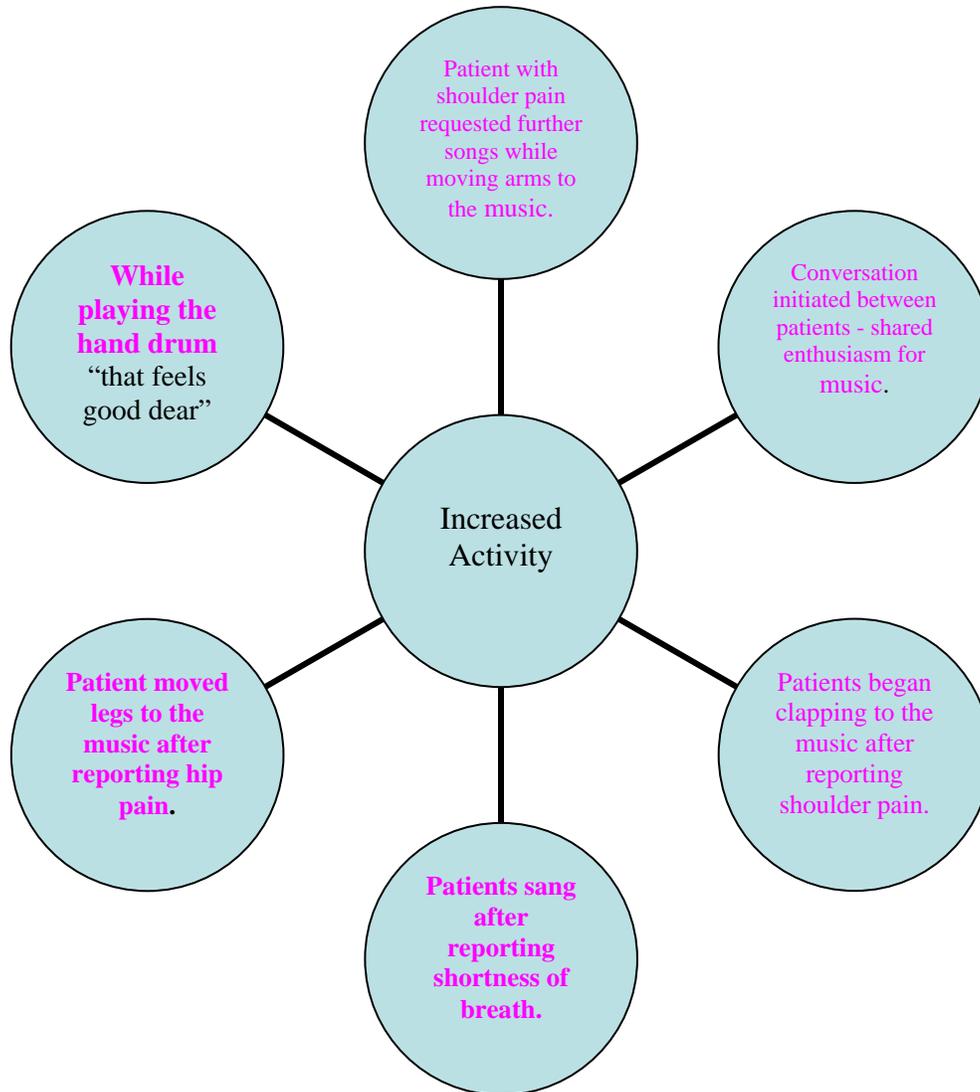
Researcher's Observations	"....." Patient Quotes
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4.8b Increased Activity

Key To Diagram

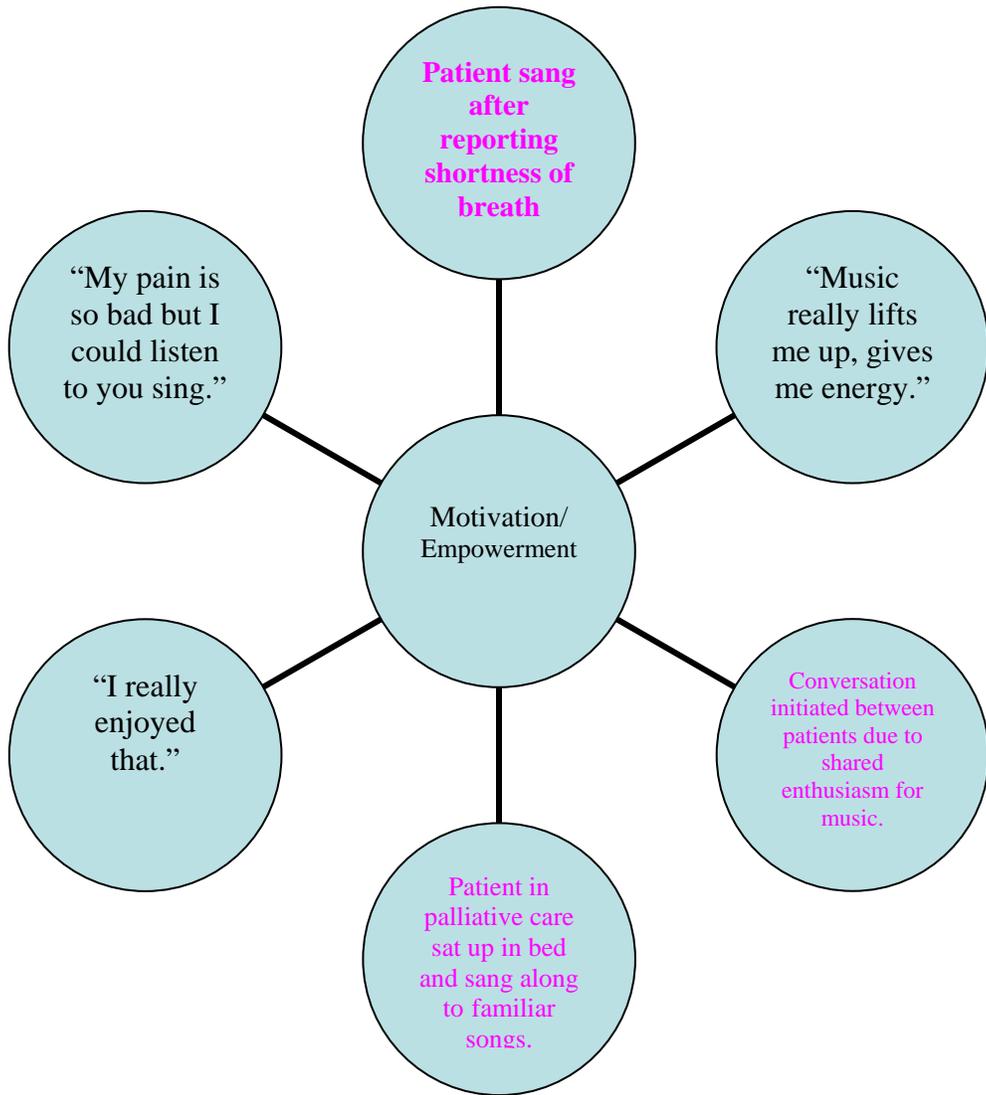
 Researcher's Observations	"....." Patient Quotes
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4.8c Motivation-Empowerment

Key To Diagram

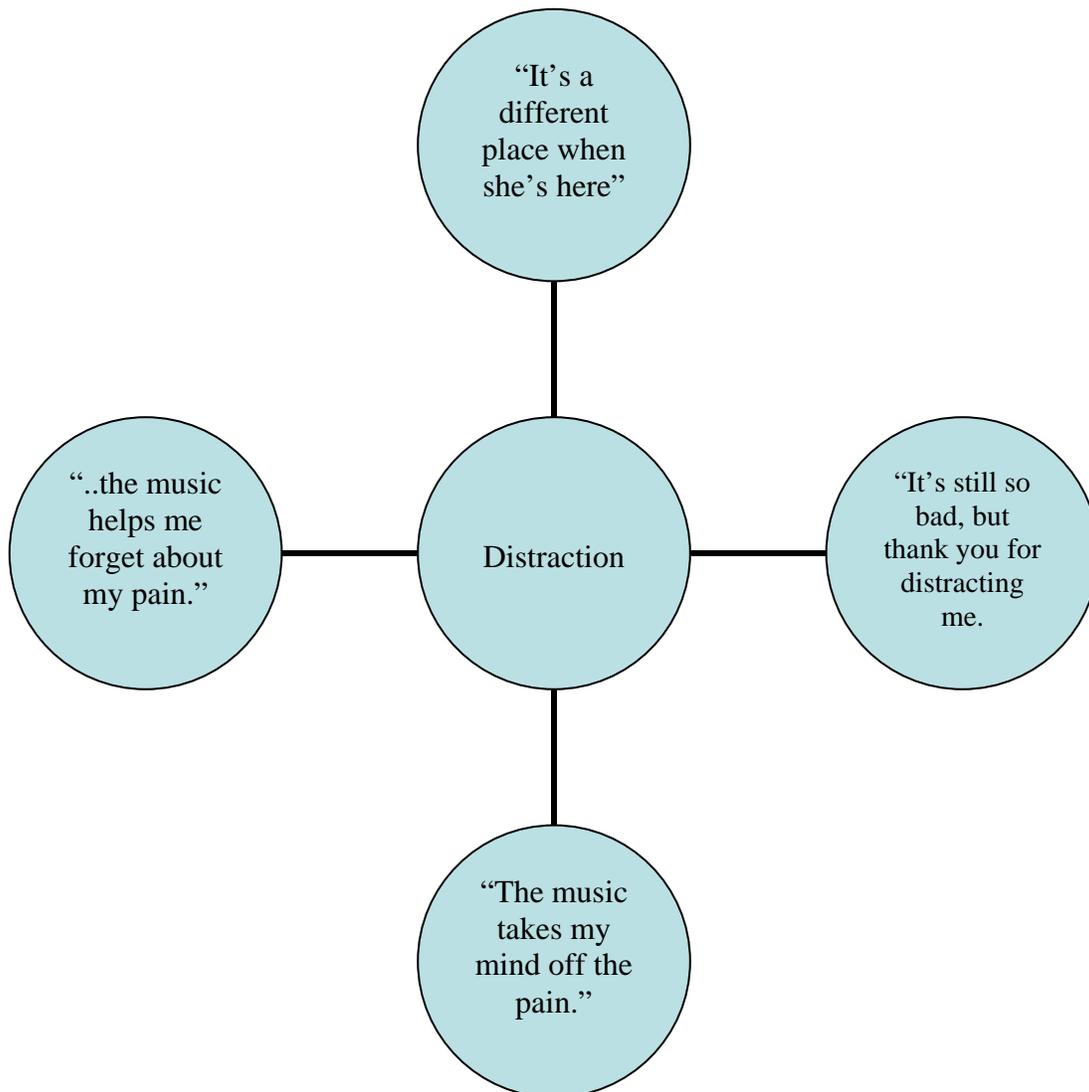
 Researcher's Observations	"....." Patient Quotes
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4.8d Distraction

Key To Diagram

Researcher's Observations	"....." Patient Quotes
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These four diagrams display how the patients responded to the music therapy sessions. The music therapy sessions were able to provide a distraction from the pain, as well as to motivate, empower, and decrease pain perception.

4.8e More of the Story

It is important to comment on the background related to the patients in this research project, particularly those who did not report a decrease on the pain perception scale. The background highlights the significance of the responses that did take place in regards to pain perception that is not otherwise captured. Patient 1 reported an increase in her pain perception during the first two music therapy sessions, and it remained stable for the third and fourth session. This patient was symptomatic of depression after incurring an accident that left her unable to walk without experiencing immense back pain. She had been a teacher, and was known throughout her school for her singing. During the session, she stated *I used to sing all the time, but now there's nothing left, I'm empty*. The sessions initially enhanced the patient's awareness of what she once enjoyed, and she would often refer to her pain. Yet despite this, she wanted the music therapist to stay and continue the music.

The patient taught the music therapist some vocabulary from her native tongue (Hebrew), and a strong rapport was built within the short time period of four weeks. The patient always refused to sing stating that her pain was too much. On the second session, the patient revealed that she would like to hear a particular Yiddish song, and she recounted the reasons. The following week, the music therapist sang this song to the patient, and the patient also sang. The patient could not recall when she had last sung. The patient had lost herself in the music, escaping the pain and allowing herself to sing. However, when the music therapist acknowledged this to the patient, she denied that she had been singing. This was the only session of the four that the patient sang. The patient wrote a song in Hebrew, facilitated by the music therapist expressing her losses, sadness,

and hopes to sing again.

What is relevant to this research project is that music therapy enabled Patient 1 to build a therapeutic relationship, express herself, find enjoyment, and be distracted from her complex pain to the point that she did not realise that she was singing. The music therapy enabled this patient to surpass the barriers of pain, although, this is not reflected by the numeric pain scale. It is of interest to note that this patient was on the highest dose of pain killers available to her, inclusive of weekly needles to the spine.

Patient 5, had been diagnosed with Stiff Person's Disease. As a result, she had the sensation that her skin was burning all over, creating an insatiable need to itch. She commented that her pain was a '9' on the pain scale. This number is not representative to a reader. As an observer, the patient exemplified symptoms of extreme pain; she was moaning, and unable to remain calm in her bed. When reviewing the chart 4.7b, p.47 of this research project, a change for Patient 5 from a 9-7 may not appear overly significant. However, to observe the patient in a state that appeared extremely uncomfortable prior to a music therapy session, and to watch her become calm, and engage in singing during a music therapy session suggests a significant change in pain perception as a result of music therapy.

Patient 14 did not partake in the pain scale survey due to her cognitive ability. Her comments during the music therapy session suggest that she found the music therapy sessions helpful "*that feels good dear.*" The secondary researcher's observations support this too; *patient appeared less agitated, ceased screaming out.* The information that is missing that adds to the significance of music therapy as an intervention to pain perception is that Patient 14 was continually calling out or screaming, was resistant to all

forms of care, and experienced delirium due to her pain. The music therapist had ten sessions with this patient. Each session would begin with the patient responding in a similar fashion, stating; *Oh Deary, my pain is awful; I think I'm dying*. The patient exhibited confusion and agitation. As the music therapist began the music, the patient appeared relaxed and would accept a drum, playing along to the music. After each session, the music therapist left the patient in a calm, quiet state.

Patient 15 recorded no change to her pain pre and post her music therapy session. This information alone suggests that music therapy was not a useful intervention for her pain perception. However, further information suggests otherwise. As a result of Patient 15's pain, she found it difficult to sit comfortably and would pace around the unit. During the music therapy session, Patient 15 was able to sit and engage for twenty minutes. After the session, Patient 15 allowed the music therapist to escort her back to her room where she lay down to relax. This information suggests that a change did occur to Patient 15's pain perception, even if it is not reflected on the pain scale. Her perception of pain was no longer keeping her restless, anxious and wandering. Music therapy was able to provide her with elements of quality of life which are integral to pain perception.

4.9 Evaluation

There are many variables that influence the experience of pain. As previously discussed, pain is emotive as well as physical. Testing in laboratories on pharmacological pain killers can provide the medical world with drugs that are proven to effectively reduce pain. A large gap of research remains around the variables involved in pain perception such as culture, family status, professional background, education, anxiety, stress, emotional state, changes in life style and boredom. Music therapy has the capacity to address all of these variables.

4.9a Variable-Environment

The study was designed to capture an array of results reflective of the reality of a music therapy program on a transition unit within a hospital, and patients in long term care (LTC), at a hospital. The music therapy sessions are not prescriptive but are directed by the patient. This is in adherence with the hospital's philosophy of patient focused care. The study takes into account that a hospital environment is not a controlled laboratory. It is a place where both patient and music therapist adhere to the ever changing pace of hospital life. There are changes in nurse and doctor care, changes to medications, little control over choice of meals, and limitations to when music therapy sessions can take place. Sessions are conducted around the availability of the music therapist and are coordinated with the patient's appointments with other professionals such as the physiotherapist, social worker, Chaplin, dialysis and chemotherapy.

4.9b Variable-Music Therapists

In theory, the results of this study should be comparable to other music therapists dealing with the variables of hospital life. This study allows for the variable of the personal nature of music therapy and the effect of a therapeutic relationship on an individual's well being. The study was initially conducted by one music therapist as a pilot study. The study was extended to include several music therapists. One reason being the practicality of collecting data. Another reason was to not restrict the results to being reflective solely of one music therapist. Music therapy sessions are all molded from the same basis and basic background but each music therapist brings his/her own style of working, and different musical and therapeutic strengths. For example, not all music therapists use the same instruments or have the same knowledge of repertoire. Music therapists who have been in the profession longer are likely to have more tools to draw from within a session and a greater understanding of the illness of the client. Maintaining a consistent music therapist throughout the study would reflect the results of that professional. Compiling information from several music therapists allows for the possibility that the outcome is a result of music therapy opposed to the particular music therapist.

4.9c Variable-Patient Profile

The study includes patients aged 23 – 89 years of age, with a variety of life circumstances. No two patients are alike, even those with the same diagnosis, same age and same sex are different due to outside factors such as family support. This diversity of patients is realistic to all transition units and long term care (LTC). Patients staying on a transition unit will be informed if they are going to be discharged to their home or a

placement. This will impact the patients' anxiety level of which studies reveal influences pain perception (Magill-Levreault, 1993). The medications each patient is taking are also different, and the music therapist may see the same patient at different times of the day therefore interacting with the patient when the medications are having different effects. It is not realistic to meet with a patient at the same time each day or week due to the nature of the unit. Schedules are more stable in a LTC setting, but regular session times are often delayed or interrupted. The experience of a music therapy session is likely to be different in the morning directly after receiving medication than in the afternoon when it has been three hours since the last intake of medication.

4.9d SARS

The research project met with a challenge in May 2003, when patient contact was limited due to SARS. As a result, the data pool is lower than originally intended. Some sessions took place with full protective wear, inhibiting physical contact and covering the music therapist's facial expressions.

4.9e Variable of Medication

The pilot study set out to retain consistency in regards to medication intake. This was proposed by conducting the music therapy session 1 hour after an analgesic to allow it to take effect. This was meant to record the patient's perception of pain before a session with an analgesic in place, meaning that any further pain relief would likely be due to the music therapy session opposed to the analgesic taking effect during the session. This was not the reality of the research. It was often difficult to confirm with the patient's nurse the last time meds had been administered, as the nurse would be with another patient. Rather than waiting to confirm the time that an analgesic was

administered the music therapist would begin the session and add the information about the medication after the fact when possible.

4.9f Transferability/Validity

This research project was implemented in a hospital and long term care setting, primarily with a geriatric population. There were not any discrepancies in the results between these two settings. Research by Standley (1995), confirms that music therapy can be used as an intervention for pain perception for a diversity of diagnoses, settings and age groups. The self appraisal of pain perception captured by the survey cannot be validated by all diagnoses and age groups. It is not applicable to those with cognitive impairment or the inability to communicate.

4.9g Dependability/Reliability

The methodology of this research project is reflective of a typical music therapy session at these particular sites as the *researcher* and the *music therapist* responsible for the caseload is the same person. The extension of the data collection included two additional music therapists who worked within the same framework and approach (allowing the patients to direct the music therapy session using a variety of musical techniques). The observations from all three music therapists are supportive of music therapy as an intervention for pain perception. Replication of the study is recommended to ensure further dependability of the observations and reliability of the quantitative results. The quantitative results have reliability issues for three reasons;

1. There is not a control group for comparison
2. There is a likelihood that the patient desires to please the researcher
3. It is difficult to assess cognitive ability

It is only in conjunction with observing the patient move his arms when suffering with shoulder pain (for example), that dependability can be given to the numerical value of pain pre and post the music therapy session.

4.9h Credibility-Validity

The methodology for this research project does not demand any reconstructions of the natural setting by the researcher. The researcher carries out her regular caseload and after the session she transposes the observations relevant to the research project. There was not a secondary observer meaning that only internal validity was possible. A secondary observer would have provided the opportunity for cross-validation of observations. Comments from the patients who are receiving music therapy are transcribed. Unfortunately, the researcher did not make audio recordings of the sessions. This indicates that the transcription of patient comments is relying on the researcher's memory.

4.9i Confirm-ability

The collection of qualitative and quantitative data had the potential to contribute confirm-ability to the research project. A limited amount of quantitative data was collected overall due to time restraints as well as patients' cognitive abilities. The correlation between the data that was collected indicates that those who claimed a decrease in pain perception did make relevant statements during the music therapy session and also physically moved in a way that was counter to their complaint of pain.

4.9j Cross Validation

The study incorporates both qualitative and quantitative observations. The purpose of this is to gain a broad appreciation for the participants' experiences. To reflect the experience solely as a number from 0-10 jeopardizes the loss of essential information. To state that a patient's pain perception has changed from a 7 to a 5 is much more meaningful in conjunction with the observation that the patient was singing and swaying his arms even though he had been refusing physiotherapy due to the pain in his arms and shoulders as a result of his arthritis. The qualitative observations inclusive of patient remarks allows for documentation of influential pain factors such as change in environment, distraction, mood, emotions, anxiety etc. Due to the variation of cognitive ability of the patients, the qualitative observations provide information where the pain scale is not appropriate. The interventions of music and rhythm, different from verbal language may be able to reach patients when no other access exists, providing further information to the verbal pain scale.

Evolutionary old mechanisms and neuroanatomic structures may fit together in a healthy way and establish contact on a deep, non-cognitive level. Prickett and Moore (1991) demonstrate that musical material stimulates greater recall and learning than spoken material, making music an effective tool for reminiscence and life review which will have a large impact on quality of life and patients' perception of pain. This can be captured in the researcher's observations, but not by the pain scale. Cross validation of the observations and the pain scale scores will help stabilize the variable of patients who have a tendency to want to please the music therapist by stating a lower number on the pain scale after a session. However, a patient is not likely to sing enthusiastically and tap

his feet if it is too painful to do so. The quantitative information is useful when used in conjunction with the qualitative as an overall idea of the change in pain perception.

4.10 Conclusion

This study suggests that music therapy can be an effective intervention for pain perception. These findings do not suggest that music therapy should replace analgesics. It was hypothesized that repeat music therapy sessions will result in building a therapeutic relationship that will further reduce a patient's perception of pain. The pilot study and the extended study confirmed that repeat sessions continue to lessen pain perception. Music therapy used in conjunction with analgesics allows patients to have a greater quality of life. Although analgesics can provide pain relief they cannot motivate an individual to partake in an activity that improves their emotional and physical well being, which in turn affects pain perception. The side effects of pain killers may inhibit an individual's ability to focus on their needs. Music therapy provides individuals with the opportunity to find enjoyment while lessening their pain. As noted in the study by Bullington et al (2003), patients who experience pain emphasize the need to order chaos, a process moving from diagnosis through to a phase of heightened self-awareness. Related themes in Bullington et al's research concern the role of flexibility and creativity in the healing process as well as finding new meaning. Music therapy is able to facilitate this process by providing flexible and creative interventions. Holland (1995, p.432) describes improvisation in music therapy in a similar fashion; *..improvisation can start with a jumble of rhythms, expressing conflicting emotions, (sadness, anger, frustration, fear, isolation) and out of the chaos comes order, a harmony, a beauty of sound, a peace, a feeling of at-oneness, a unity, a wholeness.*

The importance of the factors involved in pain beyond nociception is exemplified by Martins de Oliveria and Rocha do Amaral, whereby an *anterior cingulectomy⁴ is performed to attain chronic pain management. The operation allows for the continuation of nociception while inhibiting the accompanying emotions. Nociception is often manageable with the application of pain killers. It is the contributing emotional factors that are of beyond the reach of medication, yet within the scope of music therapy.

A literature review about pain management, music and music therapy combined with the data from this research contributed to the evolution of three theories;

1. Music therapy is able to influence biological events such as emotions and memories which has an impact on the perception of pain.

This theory is a result of a literature review from the music research and the music therapy research of; Aldridge 2003, Baker 1998, Blackburn-Munro 2003, Blood and Zatorre, 2001, Esch et al, 2004, Grinde 2000, Kumar et al. 1999, Miluk-Kolasa, 1994, Pavlicevic 1995, Sutoo and Akiyama 2004, and, Zattorre 2003. The patients in this study exhibited reduced pain perception while recalling memories associated with the music and expressing their emotions. Patients expressed feelings of joy and self-worth.

4. Music therapy can provide a healthy distraction to an individual's pain, including the side effects of pain medication such as nausea, by blocking pain messages.

This theory is a result of a literature review from the music research and the music therapy research of; Brown et al., 1989, Davis et al 2003, Kenny 2004, Kwekkeboom 2003, Whipple et al 1992, and, Zimmerman 1989. The statements of the patients in this research also contribute to this theory.

⁴*Anterior cingulectomy - a procedure that disconnects the anterior cingulated gyrus from functioning within the limbic system of the brain.

“It’s still so bad, but thank you for distracting me.”

“The music takes my mind off the pain.”

“..the music helps me forget about my pain.”

“It’s a different place when she’s here.”

3. Music therapy is able to decrease anxiety and stress, alleviate symptoms of depression, motivate, empower and provide enjoyment. All of which contribute to quality of life; decreasing pain perception.

This theory is a result of a literature review from the music research and the music therapy research of; Aldridge 2003, Batt-Rawden et al. 2005, Buffum 2003, Hanser 1985 & 1994, Hirsch and Meckes, 2000, Holland 1995, Johnston et al 1996, Kerr 2001, Kenny 2004, Kenealy 1988, Magill-Levreault 1993, Miluk-Kolasa 1994, Mornhinweg 1992, Pavlicevic 1995, Presner et al., 2001, Rolvsjord 2004, Stratton 1992, and, Williams and Dorrow 1983. The statements of the patients in this research also contribute to this theory. The following statements from the patients in this research display an increase in quality of life and a decrease in pain perception.

“If I’d known you were coming I wouldn’t have taken my pain killers.”

“Please keep going! Makes me feels better.”

“I feel much better, I was feeling woozy from the drugs.”

“If they had this every night we’d all be out sooner.”

“Music is great medicine.”

“Music really lifts me up, gives me energy.”

“I really enjoyed that.”

“That feels good dear.”

4.10a Affect of Music Therapy on Confidence, Anxiety and Mood

Research by Magill (2001), captures three patients' experiences of pain with advanced cancer. They each use music therapy as a vehicle to achieve states of relaxation, comfort, mental transportation to a 'better place', and catharsis. Music therapy decreases pain perception to the point that it is no longer interfering with function, mood and communication.

In addition to the above noted benefits, music therapy can also affect one's perception of pain through building self confidence, reducing anxiety and influencing mood.

Self confidence and a sense of control over one's health can play into one's perception of pain. Pain can become all encompassing of one's thoughts and ultimately control day to day activities. This is true of both *in* and *out* patients, both the young and the elderly, and for both chronic and short term pain. Patients with chronic pain in a long term care setting or at a hospital have minimal control over daily activities. Meals and bathing times are planned, permission must be gained before leaving the premises, and both professionals and fellow patients wander in and out of rooms compromising privacy.

Going into a surgery provokes anxieties around the procedure and the outcome, a study by Buffum et al (2003) supports that listening to music is able to reduce the anxiety. After surgery, there are anxieties around the outcome, the discomfort and control over daily activities. A reduction in this anxiety will likely affect one's perception of pain.

The act of listening to music can have the effect of increased pain and anxiety if the patient a) does not want to be distracted and/or b) is not able to choose the music

(Snyder & Chlan, 1999). In a study by Hirsch and Meckes (2000), oncology patients who chose what they wanted to listen to expressed increased feelings of control, decreased pain and diminished anxiety. Self-confidence and control are imperative in minimizing feelings of anxiety a documented attributing factor to increased pain perception.

During a music therapy session, a patient is provided with the opportunity to be in control and build self-confidence by deciding how the sessions are going to take place. The patient decides if pre-composed music will be used, and if so, what songs and how they will be heard. The patient can choose to sing along, to play along or to listen. The patient can choose to share lyrics and partake in the writing of a song. The patient may decide not to choose or not to partake at all. It is having choices again that provide a sense of control. The outcome of the choices is what improves one's self-confidence. Patients with Alzheimer's or Dementia often express great joy and surprise in their accomplishment. It is this joy, confidence and control that affect a patient's perception of pain.

4.10b Affects of Music Therapy on Pain Perception

(Finnerty, 2006)

The following chart was constructed to summarize a variety of key elements that affect pain perception displaying how music therapy can affect these elements in the reduction of pain perception.

Elements Affecting Pain	Benefit of Music Therapy	Results
Fear/Anxiety	A safe way to express fears	Relaxation. Feeling of relief. Decreased pain perception. Greater ability to benefit from other professionals within the team.
Lack of Control	Opportunity for control	Improved Confidence. Decreased pain perception. Greater ability to benefit from other professionals within the team.
Loss of Self Worth	Opportunity for self affirmation	Improved sense of well being and optimism. Decreased pain perception. Greater ability to benefit from other professionals within the team.
Hospital Environment	Escape from noise and stress	Reduced anxiety and stress. Improved sleep. Decreased pain perception. Greater ability to benefit from other professionals within the team.
Medication (Nausea/lack of motivations)	Distraction from the side effects of the medication, possible increase in DA, increase in motivation	Ability to partake in something meaningful. Dopamine (DA) is related to pleasure. Decreased pain perception. Greater ability to benefit from other professionals within the team activity.
Physiological Impact	Possible stimulation of shared pathways between music and pain Possible stimulation of endorphins (body's natural pain killers)	Reduces the transmission of pain. Decreased pain perception. Greater ability to benefit from other professionals within the team.
Isolation	Therapeutic relationship.	Being a part of a process. Positive feelings. Decreased pain perception. Greater ability to benefit from other professionals within the team.
Difficulty Moving	Motivates movement through playing instruments, singing and/or moving to music	Increased muscle strength. Increased ability and motivation. Decreased pain perception. Greater ability to benefit from other professionals within the team.

In summary, the chart 4.10b highlights the multiple facets of pain and how music therapy can be an intervention to each facet. It is particularly important to note how these facets of pain can hinder an individual's quality of life and recovery process. Each of these elements of pain have a 'knock-on' effect disabling the patient from receiving the maximum benefit from the care the hospital has to offer. Music therapy has the ability to affect these elements, improving one's quality of life, enabling the patient to be more receptive to the hospital care being provided.

4.10c Cost Effectiveness of Music Therapy

In addition to improving quality of life for patients suffering with pain, music therapy is able to reduce hospital costs related to pain intervention. Pharmaceuticals are Canada's second largest cost to the health care system at 15 billion dollars per year (Morgan, 2000 p.1). In Ottawa (Canada) alone, the average cost of pain killers per year was 8.5 million dollars in 1993 (Hawkes et al, 1994, p.896). The data from this research project provides evidence that patients are willing to forego their pain killers for music therapy. Although it is not the intent for music therapy to replace pain killers; reducing the amount of pain killers that patients require on a daily basis will decrease overall hospital costs. Implementing music therapy fifteen minutes prior to when a patient is due for his or her analgesic may help to increase the interval time of medication intake. Over the course of the day, this would decrease the overall daily intake of pain killers. In addition to the reduction in the need for pain killers, music therapy can contribute to the rehabilitation process resulting in a speedier discharge. Music is a means to generating physical strength, stimulating muscular action and inducing bodily action (Alvin, 1976, p.92). This is integral to the rehabilitation process. Music therapy has been put forth as a cost-

effective and accessible intervention for older adults experiencing contributing factors to pain such as; symptoms of depression, distress and anxiety (Hanser, 1994).

Even one day less in the hospital will have a significant financial impact. It is difficult to determine an average daily cost per patient, as the data is not available for each hospital across Canada in that format. However, a study conducted in Washington (USA) provides an idea of cost variations. The study focuses on inpatients who have experienced a stroke and reveals that the average cost ranges from 1,124 – 18,740 US dollars, per day (Reed et al, 2001). The economic impact in terms of lost work, clinic and hospital visits and out of pocket medication costs is estimated to be 9,723 – 14,744 US dollars per person each year (Stewart et al, 2003, as cited in Henry, 2005).

In addition to lengthy hospital stays and pharmaceutical costs, the side effects of drugs lead to further costs to the health system. A study by the University of Toronto reveals that 40% of patients using pain killers exhibit drug dependence as defined by the DSM-IV criteria (Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition TM) and 67% sought help for mental health problems, most commonly depression (Romach et al., 1999). This alert to the connection between pain and depression is further exhibited in the study by Blackburn-Munro G., and Blackburn-Munro R (2003) that states that over 50% of chronic pain patients express clinically diagnosable symptoms of depression.

Music decreases the necessity for patient medications by 30% (Brown et al., 1989). These patients are likely to have a faster discharge time, cutting hospital costs further. Due to the nature of music, fellow patients and staff are likely to benefit from the improved atmosphere resulting in an enhanced positive mood. This was noted by the primary researcher of the pilot study who observed other patients tapping their toes,

making conversation with room mates about the music, and staff members humming. The cost of a music therapy program is comparably minimal to the benefits of music therapy to the patients, staff and hospital.

Considering that seven million Canadians are taking medication for pain at any one time (Henry and Panju, 2005) and 80% of nursing home residents suffer with pain, the need for pain interventions that affect the multi-factorial issues surrounding pain needs more attention.

The observations of this study in conjunction with the feedback of the patients implies that further research is needed to understand the mechanisms behind the effectiveness of music therapy as an intervention for pain perception. Manufactured pain killers act upon neurotransmitters cutting down the messages to the brain. Perhaps, elements involved in music therapy effect neurotransmitters in a similar manner.

4.10d Relevance of *Music Therapy as an Intervention to Pain* to the Field of Music Therapy

This research highlights the intimacy between what has traditionally been recognized as the *medical model* and *allied health*. As well as the importance of acknowledging *the mind* and *the body* as a single entity. Historically, *the body* has taken precedence in the medical model and *the mind* has taken precedence in allied health. This research recognizes the *mind* as a collaboration of biological events. Memories, emotions, motivation, anxiety; are all biological events that constitute the *mind*. This is a unique approach in the field of music therapy. Research in the field of music therapy is predominately documented as case studies based on observations. These observations provide little information about how the biology of the body is interacting to result in the effects of music therapy interventions. If not case studies, music therapy research is

found in experimental studies that are genuinely about music, opposed to the diverse aspects of music therapy. For example; recording physiological responses such as heart rate and blood pressure when listening to music. This is partially due to the belief that it is not possible to scientifically measure the emotional effects of music, and that research on the physiological responses to musical vibrations could add to measurable music therapy studies (Alvin, 1975 p.89). As noted in the chart 1.2a, p.8, there are many discoveries since 1975 that have changed the types of research methods available to music therapy in relation to pain. This research project has collaborated these studies to reflect the diversity of music therapy.

A rich tradition of literature exists in allied fields, such as psychiatry, psychology, psychotherapy, neurology, musical aesthetics, and musical analysis (Pavlicevic, 1995 p.63). The profession of music therapy like all health professionals has a responsibility to tell the whole story, *filling in* the gaps with research, in order to progress. It is not enough to document the observations of the effects of music therapy. These observations need an explanation. Such explanations will benefit music therapists as practitioners by enabling better use of music therapy interventions. This type of research will benefit the field of music therapy by providing other health disciplines (particularly medicine) with a better understanding of the efficacy of music therapy. Chapter 1 (p.4) notes that in recent years pain has diverged into many different fields from pharmacology to psychology and neurobiology. The shared elements between pain and music therapy highlight the potential for music therapy to diverge in a similar manner. For example, in the search for neural correlates of consciousness. The study by Zatorre (2003), intends to demonstrate the value of music as a window onto complex brain functions, simultaneously illustrating

how a scientific understanding of music can yield deep insights into the nature of human thought and experience. These types of studies will lend support to the use of music therapy in many fields inclusive of pain.

The most recent model of pain is the *biopsychomedical* model mentioned in Chapter 1.2 (p.6). Music therapists could benefit from adopting this model and moving away from separating the biological, psychological and medical aspects of music therapy research. By collecting data about the hormones that are affected during a music therapy session (for example, using saliva swabs) data can be collected to determine what the body is internally communicating. For example, hormone levels may indicate that the body is communicating a relaxation response. This information, in conjunction with observations allows a better understanding of how the music therapy sessions are affecting the patient.

There is a gap in the understanding of *how* music therapy alleviates pain perception and symptoms related to pain such as depression and anxiety. There is also a gap in the biological research surrounding the use of music therapy in evoking memories. Memories are an influential party to the perception of pain, and music therapy is a powerful vessel to accessing memories. The primary researcher has witnessed this phenomenon on a daily basis in Long Term Care with Dementia patients who were unable to recall any songs when asked to, yet once the music began, they were able to sing all the lyrics by memory and recall memories associated with the music. The tool of evoking memories provides a distraction to pain, as well as improved self-esteem, well being and a further means of communication.

This research study starts to lessen the gap of research by exploring the biological

mechanisms behind the observations of the effects of music therapy. The music therapy field needs this information. As cited in Jackson (2002, p.14), *As neuroscience maps the brain in more detail, the gap between the mind and body begins to narrow and to show itself as a false construct. The body begins to look smarter and more soulful, at the same time that the mind incarnates itself as a biochemical event.* Research collected using this quote as a philosophical framework has the potential to strengthen music therapy's liaison with medicine. This type of recognition is essential in regards to funding music therapy programs, which in turn makes music therapy a more accessible service.

The following three theories are a product of this research process. To highlight the importance of these theories to the field of music therapy they have been repeated from Chapter 4.10. The theories not only attribute pain management potentials to music therapy, but also the importance of music therapy as part of the rehabilitation process and quality of life.

1. Music therapy is able to influence biological events such as emotions and memories, which has an impact on the perception of pain.
2. Music therapy can provide a healthy distraction to an individual's pain, including the side effects of pain medication such as nausea, by blocking pain messages.
3. Music therapy is able to decrease anxiety and stress, alleviate symptoms of depression, motivate, empower and provide enjoyment. All of which contribute to quality of life; decreasing pain perception.

The elements within each of these theories are not unique. What is unique however is how these elements have been collaborated as interventions for pain perception. For example, there are documentations about both the effects of music and music therapy in relation to anxiety, pain distraction, evoking memories, depression, and

emotions in individual studies (refer to 4.10 p.66.) providing pieces of the story. This research project has enveloped and evolved these pieces of the story resulting in the aforementioned three theories. These three theories are based predominately on research focusing on the elderly population. Pain is a universal phenomenon across the diversity of age and diagnosis of each person. For this reason, this research suggests that the three theories of how music therapy is an effective intervention for pain perception will also apply to populations other than the elderly. Further research is needed to support this suggestion.

4.10e Researcher's Reflection

Prior to conducting this research, the researcher was of the opinion that a study concerning pain perception would need to follow a quantitative, bio-medical model. This opinion was confirmed when reviewing previous research concerning pain perception. Almost all of the research consisted of a numerical pain scale and little information was provided about the individuals involved in the data outside of their medical condition. Elements of pain such as anxiety and depression were recognized in pain studies, but once again recorded on a numerical scale with little data about the participants as people.

As a music therapist, the data about the person is integral to the make up of the sessions. Each session is individualized to the patient to facilitate goals and objectives. Collecting data about pain perception on a scale of 1-10 appeared necessary, yet superficial to the researcher. However, the process of conducting this research exposed the truth to the researcher about such presumptions. Pain is not a numerical number to be studied quantitatively. Pain is a subjective, emotional experience that involves the whole

person. The quantifiable element of a numerical pain scale provides a tangible element to the study whilst the literature review revealed an exciting parallel between pain intervention and music therapy to the researcher. The observations of this research project support the parallels. All of the patients, regardless of how they reported their pain on the pain scale, presented evidence of a reduction in pain. The patients were engaged, some attempting to sit up, others agreeing to sit down opposed to wandering the hospital unit due to their discomfort, and everyone moved some part of their body to the music without referring to any discomfort.

4.10 f Summary;

Music therapy acts as an intervention for pain perception by affecting pain in all of its facets, impacting one's quality of life in the moment.

The Gate Control Theory (GCT) remains a questioned yet respected theory regarding pain perception. It is postulated that psychosocial factors such as anxiety, depression and relaxation affect a gating mechanism that can control pain messages to the brain. It is known that emotions, thoughts and feelings (concepts often defined as "mind" separate from "body") are a result of neurons firing, as is nociception (pain). Perhaps the messages instigated by the "mind" are able to over power the message of nociception. PET scans (positron emission topography) reveal that the endocrine system and the limbic system are stimulated by music releasing endorphins (body's natural pain killers) and dopamine (pleasure) into the body. Low levels of dopamine results in feelings of anxiety, worthlessness and fatigue, all factors likely to contribute to an increase in pain perception. Serotonin is also controlled by the limbic system; it is responsible for regulating mood and enhancing the affects of analgesics. Research measuring serotonin

pre and post music therapy sessions would be useful in determining serotonin's role in the effects of music therapy as an intervention for pain perception.

The parallels between music therapy and pain are evident in this research. Pain is a subjective experience and the perception of that pain can be influenced in a music therapy session. Patients are able to benefit from interventions, such as music therapy, that offer flexibility within routine yet unpredictable venues, such as hospitals. The treatment, unlike pharmaceuticals, does not have any time restrictions or *contraindications.⁵ This flexibility provides an opportunity for patients to regain some control over their pain management by not being restricted from when they can or cannot partake in the therapy. Music therapy as an intervention for pain perception is able to affect the multiple variables involved in pain while providing a more pleasant environment for fellow patients and staff. It is cost effective, without side effects, and improves one's overall sense of well being, contributing to quality of life. The number of participants, and the early evolution of theories around pain perception and music therapy limit this study. However, the literature review in conjunction with patient remarks suggests a strong correlation between the multiple variables of pain perception and the use of music therapy as an intervention for pain perception.

^{5*} Contraindications-a condition or factor that increases the risk involved in using a particular drug, carrying out a medical procedure or engaging in a particular activity.

5.0 Appendix A



Patients' Perception of Pain and Music Therapy Intervention Pilot Study D4

Research by Rachael Finnerty, (BPsych, PG Music Therapy), Music Therapist
Sunnybrook and Women's College Health Sciences Centre and University of Toronto, Toronto, Ontario, Canada



Abstract

Patients' Perception of Pain and Music Therapy Intervention

According to Han (1998), pain and music appear to be processed in the same part of the brain. This indicates that the stimulus of music may potentially be employed to override the stimulus of pain. Live music might refocus attention and distract individuals from their pain. Song writing used as a means of self-expression may also reduce levels of anxiety. Music therapy promotes, maintains and restores mental, physical, and emotional health.

This study aims to evaluate the potential of Music therapy as an option for pain intervention.

Participants are asked to rate their level of pain both preceding and following music therapy intervention (0=no pain, 10= extreme pain). Medication times are considered by initiating sessions approximately one hour following an analgesic.

Hypothesis

It is hypothesized that levels of pain perception will be lowered after the music therapy session; and upon repeat sessions, as the therapist and patient begin to build a therapeutic relationship, pain perception will be further reduced.

It is also hypothesized that those displaying symptoms of depression will initially become more aware of their pain after a session as a result of increased awareness.

Purpose

To observe the effects of music therapy as an intervention for pain.

Participants

10 elderly patients who had expressed they are experiencing pain.

Example of Survey

Patients' Perception of Pain and Music Therapy Intervention

Date: _____ Time of Music: _____ Visit #: _____

Medication and Time:

Primary Diagnosis: _____

Rachael Finnerty Music Therapist, D4

Nurse rating of Patient's level of agitation prior to music therapy intervention

0 1 2 3 4 5 6 7 8 9 10

Questions to Patient Prior to Music Therapy Intervention:

What number best describes your pain right now? (0 =no pain, 10 =extreme pain)

0 1 2 3 4 5 6 7 8 9 10

(If >1, RN provides analgesic and Music Therapy session commences 1hr later)

Do you like music? Tell me about the role that music plays in your life or

Why is music (not) important to you?

Comments:

Benefits of Music Therapy that Influence Pain Perception

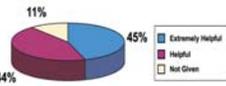
Music is a universal form of communication and means of expression.

Music can change and evoke moods, rouse memory, influence physiological processes and stimulate specific brain areas. It provides structure and a safe context for verbal and non-verbal communication as well as immediate feedback. Music is motivational, easily accessible, and enjoyable.

- Build Self-Confidence
- Alleviate Pain
- Self-Satisfaction
- Sense of Accomplishment
- Effect Mood
- Increase Self-Awareness
- Evoke Memories
- Act As A Distraction
- Provide a Pleasurable Experience
- Increase Motivation
- Increases Socialization/Interaction
- Induce Relaxation

Previous Study on Music Therapy and Pain Perception

- Agenda: official newsletter of the cancer and young adult inc. Aug/Sept 1999 Issue No.69, Cancer Patients Say Music Reduces Pain.
- Oncology and palliative care subjects in a hospital pilot program at Royal Melbourne Hospital.
- 45% patients found music therapy "extremely helpful" in reducing pain perception
- 44% patients found music therapy "helpful" in reducing pain perception
- 11% not given



- Music has been found to decrease the necessity for patient medication by 30% (Brown, Chen and Dworin, 1989)

References

Brown, C.J., Chen, A.N. & Dworin, S.F. (1989) Music in the Control of Human Pain. *Music Therapy*, 8, 47-60
Han, P. (1998) The use of music in managing pain for hospitalised children. *The Australian Journal of Music Therapy*, 9 45-56

Results

Music therapy intervention took place after medication would have already taken effect, or when pain medication had not yet been taken.

Quantitative

- Only 6 of the 10 patients in this study were cognitively able to use the pain perception scale.
- Scale ratings were as follows:
10 = Most amount of pain imaginable
0 = No pain

	Patient A	Patient B	Patient C	Patient D	Patient E	Patient F
Visit 1	8-10	7-9	9-7	5-1	8-7	7-5
Visit 2	5-10	7-5		3-3		
Visit 3	5-5					
Visit 4	7-7					

- 5/6 (83.3%) patients perceived a decrease in pain
- Pain perception decreased on average by 2 points on the scale.

Qualitative

All patients in this study were able to provide verbal feedback

Examples of Patient Feedback

- "If I'd known you were coming I wouldn't have taken my painkillers"
- "Music is a great medicine"
- "Hospitals have changed so much, the music helps me forget about my pain"
- "I used to sing all the time, but now there's nothing left, I'm empty"
- "Music really lifts me up, gives me energy"
- "I feel much better, I was feeling woozy from the drugs"
- "I really enjoyed that"
- "Please keep going! Makes me feel better"
- "If they had this every night we'd all be out sooner"
- "It's a different place when she's here"

Observations

Patients began clapping to the music after reporting shoulder pain.

Patients moved their legs/feet to the music after reporting hip pain.

Patients sung, after reporting shortness of breath.

Patients sharing a room began interacting due to their shared enthusiasm for the music, and the conversations continued after the music therapy session.

Limitations of Study

- Participants inconsistent in age and diagnosis
- Participants on 'Transition Unit' therefore repeat sessions are inconsistent
- Interruptions due to sharing of space with other patients and health care workers
- Different medications received by patients
- Patients wanting to 'satisfy' therapist by giving 'right answer'
- Cognition level of patients effected gathering quantitative results
- Study interrupted by SARS limiting patient accessibility
- Setting made it too difficult to consistently acquire observations from nursing staff as set out on survey.

Discussion

This pilot study presents supportive findings for the use of music therapy as an intervention for pain. Verbal feedback was positive from all patients, including the one patient who noted an increase in pain perception on the scale. This patient was symptomatic of depression, and the music therapy sessions included writing songs that reflected her emotional state. As stated in the hypothesis, it is possible that this process made her more aware of herself and her pain (both emotionally and physically). It is interesting to note her pain level remained the same as the sessions continued week 3 and 4.

Music therapy decreased levels of pain in most cases in addition to their pain medication, and in some cases, when the patient had not yet taken any pain medication for various reasons.

Music therapy may be able to provide additional relief for those who experience adverse effects to medication and to those who refuse to take medication. As well as providing relief to those who are taking pain medication and still experiencing pain.

The results of this pilot project have given reason to further research the use of music therapy as an intervention for pain.

5.1 Appendix B

During the collection of data, the music therapist asked staff members to write down their comments about the music therapy program with their signature.

The following are some of the comments that are relevant to this research paper. Each comment is from a different professional in General Medicine.
(April 2003)

- *Distraction necessary, especially with confused and agitated patients.* (Nurse)
- *Patients seem to get calm with songs of the past.* (Nurse)
- *Patients always respond positively to music therapy* (Nurse)
- *...her golden voice touches the patients. Her singing is being enjoyed by the staff.*
- *Music therapy is able to aid a difficult transition in a patient's life...* (Social Worker)
- *.....her music allows them (patients) to improve and advance their mobility* (Physiotherapist)
- *Encourages socialization* (Dietician)
- *Good for patients well being* (Nurse)
- *Pain level decreases with increased therapeutic intervention* (Nurse)
- *.....adds to quality of life, especially long term patients* (Social Worker)
- *Increased relaxation, increased control and comfort measures.* (Nurse)
- *I believe that music therapy brings an important element of healing to an individual in a hospital setting.....* (Physiotherapist)
- *....patients look forward to seeing the music therapist, they become less anxious, and value their time with her.* (Social worker)

5.2 Appendix C

Welcome to Creative Arts

“Creative Arts provides you with opportunities for creative expression through meaningful self-directed experiences. A relationship is formed between yourself, the therapist and the creative mediums of art, music and horticulture.”

Creative Arts Therapies are offered Monday to Saturday mornings, afternoons and evenings.

Name: _____ Unit: _____ Rm# _____

What benefits do you, the resident, hope to gain by being involved with Creative Arts?

1. Art Therapy



Group Individual Other

- Woodworking Pottery/Ceramics Storytelling/Poetry/Creative Writing
- Photography/Video Enameling Women's Group
- Painting & Drawing Unit Program Stroke Support Group
- Individual Art Therapy Multimedia Group Art on the Computer
- Sewing/Weaving

2. Music Therapy



Group Individual Other

- Tonechimes Music Library Cart Jewish Music & Culture
- “Hooked on Classics” Music & Spirituality Assorted Music Groups
- East Coast/Country Music Jazz Appreciation Music Therapy with Computers
- Music & Sensory Stimulation Unit Program Singing
- Instrument Playing Music Listening

3. Horticulture Therapy



Group Individual Other

- Outdoor gardening & workspace (April - Oct.)
- Indoor winter greenhouse programs using our own dried plant materials, garden craft activities (Nov. - March)
- Unit Programs

Your Schedule

Times

Nursing Care _____	_____
Physiotherapy _____	_____
Occupational Therapy _____	_____
Recreation Therapy _____	_____
Creative Arts _____	_____
Special Considerations _____	_____
Other _____	_____

Compiled by: _____ Family Staff Self Other
 Contact Number: _____ Today's date: _____

Please return completed request to the Creative Arts mailbox on your unit or mailbox L1108.

Thank you for your interest and we are looking forward to sharing Creative Arts with you!

Sunnybrook and Women's College Health Sciences Centre
 If you have any questions please call 416 480 6100 ext. 6712.

5.3 Appendix D

Patients' Perception of Pain and Music Therapy Intervention

Date: _____ Session Time _____ Visit # _____

Medication and Time _____

Primary Diagnosis: _____

Rachael Finnerty Music Therapist, D4

Nurse rating of Patient's level of agitation prior to music therapy intervention

0 1 2 3 4 5 6 7 8 9 10

Questions to Patient prior to music therapy Intervention:

What number best describes your pain right now?(0 =no pain, 10 =extreme pain)

0 1 2 3 4 5 6 7 8 9 10 (If >5, RN provides analgesic and Music Therapy session commences 1hr later)

Do you like music? Tell me about the role that music plays in your life or Why is music (not) important to you?

Comments:

Questions to Patient Following Intervention:

What number best describes your pain right now?

0 1 2 3 4 5 6 7 8 9 10

Patient Comments:

Music Therapist's Comments/Observations

Nurse rating of Patient's agitation following music therapy intervention

0 1 2 3 4 5 6 7 8 9 10

5.4 Appendix E

Music Therapy as an intervention for Pain Perception

Date: _____ **Time of Session** _____ **Visit #** _____

Medication and Time _____

Primary Diagnosis: _____

Music Therapist: _____

Prior to music therapy Intervention:

What number best describes your pain right now?(0 =no pain, 10 =extreme pain)

0 1 2 3 4 5 6 7 8 9 10

Following Music Therapy Intervention:

What number best describes your pain right now?

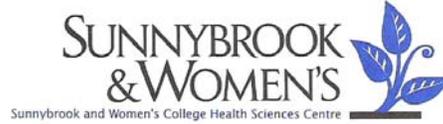
0 1 2 3 4 5 6 7 8 9 10

Patient Comments:

Music Therapist's Comments/Observations

5.5 Appendix F

MEMORANDUM



To: Rachael Finnerty
Music Therapist
Room D609

From: Philip Hébert MD

Date: April 29, 2003

Subject: Patient's Perception of Pain and Music Therapy Intervention

Research Ethics Board
Sunnybrook Campus

The Research Building
2075 Bayview Avenue,
Room S1 33,
Toronto, ON,
Canada M4N 3M5
Tel 416.480.4276
Fax 416.480.5814

The Research Ethics Board
of Sunnybrook and Women's
College Health Sciences
Centre operates in compliance
with the Tri-Council Policy
Statement, the ICH/GCP
Guidelines and Division 5 of
the Food and Drug Regulations.

The Research Ethics Board conducted an expedited review of the above referenced study on March 31, 2003.

The Board feels that this study is best treated as a Quality Assurance study and as such does not require Research Ethics Board approval to proceed.

The Board suggests that this could be developed as a formal study for submission at a later date.

Best wishes in your endeavours.


Philip Hébert MD PhD FCFPC
Chair, Research Ethics Board
/cap



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