THE EFFECTS OF ATTENTION ENHANCEMENT DURING MUSIC LISTENING ON CHRONIC PAIN ATTENUATION

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A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF MUSIC THERAPY

School of Music

1996

ABSTRACT

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Chronic pain accounts for an estimated 700 million lost work days and $65 billion in the United States each year. Pain attenuating effects of music indicate the importance of cognitive involvement. This study tested the effects of utilizing a music-based Attention Enhancement Strategy (AES) of verbalization during music listening on perceptions of chronic pain.

A within-subject repeated-measures design was used to compare two experimental conditions of (a) music listening alone, and (b) music listening combined with use of the AES. A significant decrease in chronic pain perception resulted after listening to 20 minutes of investigator-selected music under both experimental conditions. No statistically significant difference was found in the amount of change in the chronic pain perceptions comparing the two experimental conditions. Correlations were run on selected intervening variables.

Dedicted to my loving parents,

Chan and Daesook C. Hong

ACKNOWLEDGEMENTS

The author would like to express her sincere appreciation to Professor Dale Bartlett for his invaluable guidance throughout the completion of this thesis, and his personal dedication to assuring academic excellence. Furthermore, the author would like to thank her other committee members, Professor Roger Smeltekop and Professor Michael Largey, for their expert advise, generous support and interest throughout the study.

The author would also like to express her heartfelt appreciation to the subjects of this study because without their support and interest this study would not have been possible. Also, a special note of gratitude is offered to the dedicated staff at St. Lawrence Health Pavilion Pain Clinic, and especially to Dr. Mary Stelma and Dr. John Jerome whose generosity, interest and dedication to their patients allowed this study to become a reality.

A special note of appreciation is extended to Mr. Youngchang Jin for his expert assistance in statistical analysis of data.

TABLE OF CONTENTS

LIST OF TABLES

BACKGROUND

Chronic pain is described as unnecessary persistent pain of at least a three-month duration, for which all diagnostic and treatment modalities have been shown to be ineffective in relieving the pain (Michigan State University, 1994). Some known causes of chronic pain include injury, arthritis, back and neck problems, migraine headaches, ulcers and other diseases, as well as other unknown reasons.

Chronic pain is reported to account for an estimated 700 million lost work days and $65 billion in health care costs, compensation, and litigation in the United States each year (Bonica, 1981). As the cost of medical treatment sky-rockets and the awareness of the mind-body connection in health and disease heightens, a search for an alternative treatment method which is less costly, more holistic, and effective, has been invigorated.

Theories of Pain

There exist several theories regarding pain. Review of the theories of pain is imperative as the ways in which pain is viewed appears to determine the strategies used to alleviate the pain.

A. Direct Transmission Line Model

According to this 19th-century model of pain, pain perception is seen as a direct result of the quality and intensity of tissue damage (Kongstvedt, 1987). Through the pain receptors located along nerve fibers in the spinal cord, the pain information is transmitted to the brain where it can be processed. Cognitive and affective factors are considered as mere reactions to the pain and they are often treated as secondary in importance during pain treatment.

B. Psychological Model of Pain

The psychological model of pain emphasizes the role of cognitive information processing, memory schemata and the affective qualities of pain (Morley, 1986). According to this model, the perception of pain is recognized as a "multi-dimensional perceptual experience" which refers to the experience of pain in the following ways: (a) the person's sensory perception of pain stimulus, (b) the person's emotional state, as well as (c) the person's cognitive appraisal of experience with pain. The sensory-evaluative, cognitive-evaluative, and affective-motivational dimension of pain, also collectively referred to as the psychological dimension of pain, are believed to influence the subjective pain perception (Melzack, Weisz & Sprague, 1963). According to the psychological model, manipulation of any one or all of the psychological dimensions influences the quality and intensity of the pain perceived by the individual experiencing pain.

C. Gate Control Theory

"Gate Control Theory" has been referred to as the most influential theoretical model for understanding the mechanism of pain perception (Melzack & Wall, 1965). Melzack and Wall proposed that there is a mechanism located in the dorsal horn of the spinal column which acts as a "gate" that can enhance or inhibit the somatic neurological input before its transmission to the thalamus and cerebral cortex in the brain. The gate mechanism is influenced by activities in the myelinated and fast-conducting large-diameter nerve fibers that transmit the descending, efferent information from the brain. It has been theorized that when there is an increase in the presence of efferent neural activity from the brain, the gate mechanism may block the conduction of a less eminent neural impulse such as the pain neural signals from reaching the Central Nervous System (Brown, Chen & Dworkin, 1989).

The gate control theory recognizes pain perception as a result of a complex multi-dimensional phenomenon involving interactions between the sensory, motivational, and cognitive-evaluative components. The theory suggests that the modulation in pain perception may result from modifying (a) emotional arousal, (b) interpretation of the pain, or (c) the ability to control the sensations, in the individual suffering from pain (Kongstvedt, 1987).

Management of Chronic Pain

Currently, there are a number of standard management approaches available for the chronic pain condition which include: (a) long term dependency on the use of pharmacological agents, mild (narcotic or non-narcotic) to strong narcotics such as morphine or methadone; (b) surgical intervention; and (c) chronic pain clinics in which treatment approach varies from intraspinal drug delivery to behavior modification and psychological therapy.

Aside from the high cost of medication itself, most medication carries a certain amount of undesirable side effects. The pain clinics, on the other hand, provide a multidisciplinary, "pyramidal" strategy of relieving pain with (a) medication, (b) controlling the pain inducing condition, (c) minimizing the undesirable side effects of medication, and (d) maintaining the muscle and joint functions via education and physical therapy (McCraken, 1991).

In light of the current recognition of the psychological and behavioral factors involved in individual pain perception, cognitive-behavioral treatment approaches which focus on behavioral changes have received an increased attention from the chronic-pain community (McCraken, 1991). According to McCraken, cognitive-behavioral approaches involve a coping-skills training regimen which entails teaching the effective management of tension, arousal, and mood. Skills typically taught include relaxation, self-reinforcement, communication skills, and/or training in cognitive pain-coping skills such as distraction, attention diversion, or re-labeling.

Positive outcomes of the cognitive-behavioral treatment approaches have been reported in the quality and intensity of the self-reported pain, functional impact, pain behavior, number of involved pain areas, and sleep (McCraken, 1991).

MUSIC IN PAIN MANAGEMENT

With its more broadly recognized effects of relaxation, distraction, and mood induction, music has been investigated for its efficacy in treating human pain. Music Therapy as a distinctive therapy discipline and its various techniques (ie. entrainment/imagery, music-enhanced relaxation) have also been reported to produce positive outcomes in treating pain patients in medical settings. The basic premise of using music to manage pain stems from the notion that music possesses the potential to decrease the total perception of the pain through influencing both physiological and psychological components of the total pain experience (Magill-Levreault, 1993). Distraction, alteration of mood, enhancement of sense of control, use of prior skills, and promotion of relaxation have been listed as functions of music within the context of pain management (Magill-Levreault, 1993).

Theories of Music's Function in the Modulation of Pain Perception

The Gate Control Theory provides a theoretical basis on which the distraction mechanism involved in music and pain is explained (Melzack and Wall, 1965). Melzack and Wall (1963) proposed that a strong auditory stratagem, such as music listening, may exert direct effect on the sensory perception of pain via counter-stimulation (or distraction) in the nociceptive pathways. According to the Gate Control Theory, processing of the music stimulus triggers large fiber efferent neural activity in the brain which overrides the neurologically less eminent stimuli, such as the pain stimulus, at the spinal level.

Music, as a multidimensional stimulus that facilitates the multi-faceted therapeutic processes during pain treatment, has been postulated (Beck, 1991). The multi-faceted therapeutic process refers to the various ways in which music can address therapeutic aims of its users. According to Beck (1991), music not only distracts its listeners' from the pain stimulus, but also provides cognitive and affective changes which ultimately promote pain relief. Beck proposed that on a cognitive level, music promotes a sense of control over pain by providing opportunities to utilize skills acquired previous to the chronic pain condition. On an affective level, music meets the current affective state of an individual with pain, and effectively promotes a more desirable affective state (Beck, 1991).

On a physiological and biochemical level, it has been contended that music stimulus may trigger activation of the endocrine system as well as other endogenous mechanisms which will result in modulation of pain perception in the brain (Scartelli, 1988; Beck, 1991). Scartelli (1988) proposed that, processing of music signals are distinct from all other auditory stimuli due to virtue of music's rhythmic formation of information. According to Scartelli, a music signal is sent to the upper brain regions throughout the brain stem, reticular formation, and limbic system in a hypercharged manner. The heightening of activities in the limbic-hypothalamic areas is believed to trigger activation of the pituitary gland which subsequently commands chemical and hormonal secretion into the body with the ultimate outcome of a modulation of pain perception (Scartelli, 1988).

Current Studies in Music for Pain

Music's efficacy in treating human pain has been investigated in both clinical and laboratory settings. Various types of human pain examined include acute pain (i.e., injection pain, post-surgical pain, painful medical procedures, labor), chronic pain (i.e. rheumatoid arthritis pain, cancer pain), and experimental pain (i.e., ice water pain, finger pressure pain).

Music was found to be effective in increasing pain threshold (Schorr, 1993), pain tolerance, and tactile threshold (Whipple & Glynn, 1992) in adult experimental pain subjects. In a clinical setting, music effectively distracted adult female patients from painful gynecological procedures (Davis, 1992), and distracted children from injection pain (Fowler-Kerry & Lander, 1987). Music prompted relaxation responses among women undergoing labor pain (Hanser, 1993; Davis. 1992); helped produce and guide imagery processes (Godley, 1987; Rider, 1987); altered affective response to pain (Magill-Levreault, 1993); and helped increase the pain subjects' overall sense of control over pain (Beck, 1991).

A review of the existing literature on the effects of music on pain attenuation revealed a number of interesting factors. It appeared that the (a) characteristics of music (i.e., stimulative vs. soothing), (b) presentation methods (i.e., live music vs. recorded music), (c) reflection of subjective musical preference for the music, and (d) amount of listener's cognitive involvement to the task of music listening contribute to music's efficacy in modulating individual pain perception. While both stimulating and soothing music were effective in significantly elevating pain and tolerance thresholds, only stimulating music significantly elevated the tactile thresholds of pain (Whipple & Glynn, 1992). The mode of presentation of the music also appears to make a difference in the music listeners' affective response to the stimulus. Live music was found much more effective in inducing a positive mood than taped music among hospitalized cancer patients (Bailey, 1983). Subject tolerance of cold-pressor pain was significantly greater when the music was subject-preferred as opposed to investigator selected (Hakmat & Hertel, 1993).

Cognitive Involvement Factor

The cognitive appraisal of the pain situation, including past experience with the pain as well as the pain sufferer's coping ability and resources for help, appears to contribute to music's effectiveness for pain attenuation. Using cold-pressor pain on adult subjects, Melzack, Weisz and Sprague (1963) found that a significant amount of pain tolerance resulted only when the music listening was combined with a strong suggestion for its effectiveness in pain abolishment. Intense auditory stimulation, such as music without the explicit suggestion or the strong suggestion accompanied by a placebo stimulus, on the other hand, did not increase the pain tolerance (Melzack, Weisz & Sprague, 1963). From these findings, it can be postulated that the sensory perception of pain is highly involved with the cognitive assessment of resources available for a person to aid in his/her pain. It can also be asserted that upon cognitive acknowledgement of the available help, adult pain subjects are more inclined to make attempts to control pain by utilizing the resource. This was apparent when subjects made deliberate attempts to control pain or to divert their attention away from pain by actively tracking the music with the noise-volume knob, keeping time by tapping their feet, singing out loud and so forth (Melzack, Weisz & Sprague, 1963).

In children, individual level of cognitive functioning, such as the subject's chronological age, seems to play an important role in predicting music's success as a strategy for pain attenuation, rather than the cognitive appraisal of the pain situation. Children in injection pain situations reported less pain while listening to music (Folwer-Kerry & Lander, 1987). It is interesting to note, however, that a single experimental condition of music as a distractor was as effective as the music combined with suggestion. That is, unlike Melzack, Weisz and Sprague's observation (1963), Fowler, Kerry and Lander did not find it necessary to combine suggestion and distraction (music) to further enhance pain relief compared to the use of distraction (music) alone. Furthermore, the age was found to be an important predictor for success of the distraction strategy. Among all subjects who received the distraction either alone or in combination with suggestion, the youngest group of subjects reported the greatest mean pain.

An interesting observation on the importance of cognitive involvement during music listening has been made by Geden, Lower, Beattie and Beck (1989) who initially compared the effects of listening to various types of music on pain perception. Referring to the results of their study, Geden et. al. discussed that listening to music in-and-of-itself may not demand sufficient cognitive involvement of the listeners to facilitate pain attenuating effects. They, in turn, tested the hypothesis by comparing the effect of listening to music in-and-of-itself to combining imagery with music listening. Some clinically meaningful differences between a treatment condition of self-generated imagery with music and control groups of no music or imagery were found in subjective mean pain ratings. The researchers also found significant pairwise comparisons obtained on heart rate, diastolic blood pressure and systolic blood pressure.

Strategic Use Factor

In his description of music's function in the psychoneuroimmune process, Scartelli (1988) asserted that music, arbitrarily heard, will not produce desired effects on immunological and endocrine activities. Rather, Scartelli emphasized that music needs to be specifically prescribed to each individual patient in order to assist efficacy building and enhance self-management methods to increase a sense of strength and control among its listeners. Along with use of the "right music" which will create an emotionally arousing "thrill" response in the listeners (Goldstein, 1980), Scartelli stressed the importance of learning and practicing the newly learned strategy in order to create habits and re-conceptualize the patients' thinking with regard to his or her own health maintenance and rehabilitation (Scartelli, 1988).

Findings of another study yielded evidence that use of a cognitive strategy to increase understanding of the structural elements of the music may significantly influence the subjective preference for the music. Bartlett (1973) tested whether repeated music listening and recognition of the structural elements of the music will influence affective response to a particular piece of music. The results indicated that the subjects who listened discriminately for novel structural elements through repeated listening displayed a significant increase in their preference rating for the music of the classical era which had been initially rated as not preferred.

Bartlett wrote,

> .... Based on writings from psychology and neurology, music should have some interest for the listener as long as he can discriminate certain novelties that arise out of variations on the familiar and as long as these discriminations make music listening rewarding. (1973)

Considering the role of affective response to music in increasing the amount of pain amelioration as seen in Hakmat and Hertel's study (1993), findings from Bartlett's study seem to offer an important venue through which future application of music listening for pain attenuation may benefit.

The above findings indicate that a strategic application of music is essential to effective use of music for pain attenuation. In strategic planning there are several factors which need to be taken into consideration. Such factors include (a) musical preference; (b) structural characteristics of the music; (c) mode of presentation; (d) amount of cognitive involvement determined both by structure and the listener's cognitive ability; as well as (e) finding the right music and practicing the techniques learned.

PURPOSE OF THE STUDY

The purpose of this study was to evaluate the pain attenuating effect of music listening when combined with an investigator-devised strategy for enhanced attention to the music stimulus.

The Problem and Research Questions

The study was designed to evaluate whether or not the cognitive strategy designed to enhance attention to a music stimulus will reinforce the pain attenuating effects of music. The results of music listening with a combined use of the cognitive strategy on chronic pain perception was compared to the results of music listening without the cognitive strategy.

Research Questions

1. To what extent will chronic pain perception change after 20 minutes of music listening? The pain change will be determined by comparing subjects' pre-music pain scores with post-music pain scores, as reported in the Short Form-McGill Pain Questionnaire (SF-MPQ).

2. To what extent will chronic pain perception change after 20 minutes of music listening combined with an Attention Enhancement Strategy (AES)?
3. To what extent will any change in chronic pain perception resulting from music listening when combined with the AES differ from that of the music listening without the use of the strategy?
4. To what extent will perceived level of attention to the music during music listening with the AES differ from perceived level of attention during music listening without the AES? Self-reports on perceived level of attention to music will be measured after each listening session using an investigator-devised questionnaire.
5. To what extent will subjects' perceived level of relaxation change when the AES is used during music listening when compared to the relaxation level during the music listening without the use of the AES? Self-reports on the perceived level of relaxation will be measured after each listening using an investigator-devised questionnaire.
6. To what extent will subjects' preference of the musical selections change with the use of the AES during music listening? The change in preference will be measured by comparing the daily preference ratings of the musical selections heard in each experimental condition.
7. To what extent will subjects' perceived sense of control over pain change when the AES is used during music listening? The perceived sense of control over pain will be measured after each listening session using a self-report form devised by the investigator.

8. To what extent will subjects' overall enjoyment during each experimental session change with the use of the AES during music listening when compared to that of the music listening session without the use of the AES? An investigator-devised self-report form will be used to measure the perceived enjoyment level.
9. To what extent will perceived changes in (a) chronic pain perception, (b) attention, (c) relaxation, (d) selection preference, (e) sense of control and (f) enjoyment of session intercorrelate throughout the experimental conditions?
10. To what extent will subjects' number of verbal responses during music listening combined with AES correlate with their perceived amount of the following: (a) gain score in pain change, (b) attention, (c) relaxation, (d) selection preference, (e) control, and (f) enjoyment of the session? The subjects' verbal responses will be recorded on the AES form and will be tallied for the total number of verbal responses, according to their descriptive content.
11. To what extent will subjects' musical training make a difference in the amount of perceived pain change throughout the experiment?
12. To what extent will subjects perceive music listening as a useful modality for chronic pain treatment, with or without the use of the AES?

DEFINITIONS

Attention Enhancement Strategy

Attention Enhancement Strategy (AES) refers to a strategy developed with the purpose to increase the music listener's attention to the properties of the music stimulus being used. The strategy entails guided exploration of various aspects of self-generated thoughts and images during the course of music listening. A participant will verbally report his/her responses using descriptive words chosen either (a) on their own, or (b) from a list provided by the investigator. Although there is no correct or incorrect response, as music perception is a subjective experience, participants will be asked to provide background information indicating what led him/her to choose the particular descriptive words in response to the music.

Chronic pain

Chronic pain is a type of pain characterized as the constant or recurrent experience of unrelenting pain of at least a 3 month duration. The condition does not accompany or result from a concurrent progressive tissue damage, or if objective evidence is present, there is no effective treatment or cure (Stanton, 1993).

Structural Elements of Music

Structural Elements of Music refers to various characteristic discriminations about the musical piece including melodic material, melodic material in repeated or altered form, metronomic rhythm, specific rhythm patterns or rhythmic play, meter, tempo, dynamic levels and their nuances, families of instruments or voices, specific instruments or voices, instrumental or vocal techniques, mode, harmonic structure, form and tessitura (Bartlett, 1973).

ASSUMPTIONS

a. Subjects in the study will represent a random sample of the pain population in that their background in music, such as a formal training in music, performance experience, and general interest in music will not bear any significance or influence on the research outcome.

b. The influence of individual preference for the music selected for the study will not confound the research outcome through the use of the Within-Subject Repeated Measure experimental design.

c. The 20-minute exposure to music is an adequate amount of time to produce change in the cognitive, affective, and sensory state of the music listeners with pain conditions.

LIMITATIONS

a. Musical content of the study will be limited to Western art and popular music.

b. All mention of pain will refer to pain experienced by the chronic pain population, as compared to acute pain and laboratory-induced pain.

c. The cognitive strategy requires that all subjects will have an adequate cognitive capacity to perform abstract cognitive tasks.

d. Subjects who utilize this strategy must be free of any hearing impairment that would otherwise impair their ability to listen and process the music stimulus.

e. The music selection used in the study may carry special meaning or conjure up particular associations for the subjects participating in the study.

NEED FOR THE STUDY

In response to increasing calls for alternative, less costly, and effective treatment interventions for pain, various clinical and empirical investigations of the pain attenuating effects of music have emerged. Traditionally, researchers investigated the basic assumption that music might be an effective treatment alterative for pain. Despite the increased interest, as well as the number of studies available on the topic, only a few existing studies have focused on developing the specific strategies to augment music's pain attenuation effects. Therefore, this researcher has identified a need to develop a music application strategy specific to chronic pain management. Acknowledging the important role of cognitive involvement and attention to the music during listening, this study will attempt to validate the importance of attention focused on the music stimulus, by developing and testing a music-based, directed cognitive activity strategy to augment the pain attenuating effects of music as its ultimate aim.

METHODS

Description of the Sample

The sample consists of 14 subjects, 5 males and 9 females, who completed the study by attending four forty- minute sessions (see Table 1). All of the subjects were Caucasian chronic pain patients currently attending one or more pain treatment programs at the pain clinic where the research experimentation was conducted. The mean age was 51.8, with the age ranging from 22 to 77 years. A survey of their educational levels indicated that one person held a Master's degree, seven subjects (50%) had college degrees, and six had high school diplomas. Although most of them did not hold a job (3 retired, 6 on a leave, 1 homemaker, and 1 unemployed), two were working in clerical positions and one is a college student.

The etiology of their pain condition varied widely including physical injury, to rheumatoid arthritis, to medical surgery, to complication during pregnancy to Fibromyalgia (see Table 2). Existence of the chronic pain experience varied from subject to subject. The longest duration of pain condition was 37 years and the shortest duration of pain experience was a little under one year. With an except of one patient who reported scheduled use of pain medications, all subjects reported scheduled use of medications. Of the thirteen subjects who reported taking scheduled pain medications, eleven reported daily intake of a pain medication and the other two reported taking medications when their pain become unbearable. Five subjects reported taking Prozac, an antidepressant medication, to treat pain and pain-related symptoms of depression.

Table 1. Demographic Characteristics

Characteristic	Frequency (N = 14)	Percent
Gender		
Male	5	35.7
Female	9	64.3
Race		
Caucasian	14	100.0
Education		
High school graduate	1	7.1
Some college	5	35.7
Bachelor's degree	7	50.0
Graduate degree	1	7.1
Age		
Range - 22-77	-	-
Mean - 51.8	-	-
SD - 12.07	-	-
Occupation		
Home Maker	1	7.1
Clerical Position	2	14.3
Student	1	7.1
Retired	3	21.4
On Disability Leave	6	42.8
Unemployed	1	7.1

Table 2. Chronic Pain Characteristics

Characteristics	Frequency (N = 14)	Percent
Etiology of Chronic Pain*		
Arthritis	2	14.3
Fibromyalgia	7	50.0
Work-related injury	6	42.8
Automobile accident	1	7.1
Migraine Headache	2	14.3
Vulvodynia	1	7.1
Surgery complication	3	21.4
Length of Pain Condition		
1 to 5 years	7	50.0
6 to 10 years	2	14.3
11 to 20 years	2	14.3
21 years or longer	3	21.4
Medication Information**		
Daily Analgesics	10	71.4
Analgesics as needed	3	35.7
Antidepressant	5	35.7
No medication	1	7.1

* Many subjects have multiple etiology for chronic pain condition.
** Many are on more than one medication schedule.

Nine subjects reported background in some type of musical training, and seven of those reported an ability to read musical notation (see Table 3). Eight subjects reported prior experience in employing music as a pain-coping strategy. While the majority (eleven out of the fourteen subjects) reported using music as a background or atmospheric sound, ten reported having used music for relaxation.

Table 3. Musical Background Characteristics

Characteristics	Frequency (N = 14)	Percent
Music Training		
Yes	9	64.3
No	5	35.7
Music as a pain coping strategy		
Yes	8	57.1
No	6	42.9

Setting

The experiment took place at an outpatient pain clinic where each subject attended a chronic pain support group lead by a staff psychologist. Subjects were solicited by contacting the pain clinic and by talking to the members of the support group during one of their weekly meetings. Subjects were informed that the thesis of the study is to investigate the effect of using music for attenuation of chronic pain. Individuals who expressed an interest in participating in the study were contacted on an individual basis to arrange individual experimental sessions with the researcher.

All sessions took place in a small, 5x7 square foot room within the pain clinic, furnished with two comfortable reclining chairs, a dimable light fixture, a Cassette/Compact Disc player, and cassette tapes containing musical selections for listening. The room was not equipped with sound proof walls and doors and, therefore, noise from the hallway and the adjacent rooms easily penetrated into the room during the experimental sessions. Earphones were not used because a number of subjects indicated a concern that using earphones might induce a pressure headache.

Design

An within-subject repeated-measures design was used. This design provided a means for matching the scores, or the experimental outcome, of each subject with oneself, thus controlling many confounding variables (Beck, 1991). In this study, examples of such confounding variables included the subject's individual musical preference, particular association with the music, and/or variation in the amount of pain experienced from one day to the next.

Intervention

There were two experimental conditions. During Experimental Condition One, the subjects were asked to relax while listening to music provided by the therapist. During Experimental Condition Two, in addition to the music listening, subjects were asked to verbalize any images, thoughts, and emotions they experienced while listening to the music. Each subject met with the researcher on a one-to-one basis, in a total of four, forty-minute experimental sessions. Two sessions were conducted under each experimental condition.

Measurement

Independent Variables

There were two independent variables: (a) music listening with the therapeutic aim of relieving chronic pain, and (b) enhancement of listener's attention to music during music listening. Subjects listened to music throughout both experimental conditions one and two. An investigator devised Attention Enhancement Strategy (AES), designed to increase the listeners's attention to the music itself during a listening session, was administered during the second Experimental condition only.

The AES is characterized as verbalization of semi-structured, self-generated images, thoughts, and affective responses to the music. The subjects were first introduced to a list of objectives that they could incorporate during their verbalization process while listening to music (see Appendix F). This researcher-devised list was based upon some of the typical comments participants of music and imagery sessions mentioned from the researcher's clinical practice as a music therapist. Subjects were also encouraged to freely verbalize any thoughts, images, or emotional responses to music at any point during music listening.

Dependent Variable

The subjective report of perceived pain intensity as a dependent variable was measured by using the Short Form-McGill Pain Questionnaire or SF-MPQ (Melzack, 1987). The SF-MPQ is composed of three components including (a) 15 Pain Descriptors, or PD, (b) the Present Pain Intensity, or PPI, index, and (c) a Visual Analogue Scale, or VAS (see Appendix B). The 15 pain descriptors (11 sensory; 4

affective) use an intensity scale of 0 = none, 1 = mild, 2 = moderate and 3 = severe. On the SF-MPQ, the PPI scale contains verbal descriptors corresponding to numbers ranging from zero (no pain) to five (excruciating pain). The VAS is a 100-mm line, the length of which represents a continuum of pain experience, with one end marked as no pain and the other end marked as the worst possible pain. A high and consistently significant correlation was reported between the SF-MPQ and the standard McGill Pain Questionnaire, a reliable and valid multidimensional instrument for measurement of pain (Melzack, 1987, Beck 1991). The SF-MPQ has been described as an adequate and useful tool when used in place of the lengthy MPQ in providing qualitative as well as quantitative pain information.

Perceived intensity of pain was measured twice during a single session, once before music listening and once after the music listening. The degree and the direction of pain change was determined by measuring and comparing the degrees of perceived pain intensity before and after the music listening.

Intervening Variables: Using an investigator-devised Daily Experimental Survey (DES), self reports of the subject's perceived level of (a) attention focused on the music stimulus, (b) preference for the music heard in the session, (c) relaxation, (d) sense of control over pain, and (e) overall enjoyment of session were assessed (see Appendix D). The subjects' verbal responses were recorded on blank paper by the investigator, using a continuous recording format. The total number of the comments and the type of the comments (i.e., color, physical activity, person, places, etc.) were later analyzed from the continuous recording of the subjects' verbal responses. The subject's perception of the value and usefulness of the music intervention as a treatment option, as well as his/her prediction for future use, were assessed during an exit interview upon completion of the study (see Appendix G).

Pre-existing and extraneous variables: Subjects' demographic information, including their age, sex, education, occupation prior to onset of the pain condition, nature of the subject's prior musical experience, and current patterns of music listening were assessed using an investigator-devised initial interview form (see Appendix C). The subject's current pain management regimen, such as use of analgesics and other nonpharmacologic interventions, was also monitored throughout the subject's participation in the study to determine if there were any significant changes unrelated to the experimental treatment conditions which might influence the subject's daily report of pain perception.

PROCEDURE

Each subject met with the investigator a total of four times in individual experimental sessions. Sessions were scheduled according to (a) clinic space availability and (b) subject availability. Therefore, the exact length of time it took to complete all four sessions varied from subject to subject. Each experimental condition consisted of two individual sessions, each session lasted forty minutes. All subjects experienced both experimental conditions, presented in the same order, with at least one day or 24 hour break between the Experimental Condition One and the Experimental Condition Two.

In the first session, each subject was asked to fill out an Initial Interview Form (see Appendix A) to assess demographic information, musical background, musical interests, and pain information. Subjects were then asked to listen to a series of eight musical excerpts, each excerpt 20-30 seconds long, and asked to give a preference score on each excerpt, using a seven-point Likert scale. Four of the eight excerpts were selections from the classical art music genre, and the other four excerpts were from the popular, contemporary, easy listening musical genre (see Appendix B). All of the selections used in the experimental sessions were instrumental pieces. Following completion of the preference test, each subject evaluated his/her prelistening pain level, using the Short-Form McGill Pain Questionnaire or SF-MPQ (see Appendix G).

Music listening was done using one of the several cassette tapes prepared by the researcher. Each cassette tape contained four or five different musical selections from one of the two musical genres, classical or popular, from recordings of various artists' performances. The musical selections used in the study can be found in appendix D. Each listening session was approximately twenty minutes long. All subjects listened to the same tape on the first and the third experimental sessions and another tape on the second and the fourth experimental sessions. During Experimental Condition One -- first two experimental sessions-- subjects were asked to listen to the music and relax as much as possible. During Experimental Condition Two --third and fourth session-- subjects were asked to verbalize, with selected guidance (see Appendix E), any images, feelings, and/or thoughts related to the musical selections to which they were listening.

Upon completion of listening to the musical selections each day, the subjects were asked to evaluate post-listening pain levels using the SF-MPQ form. A Daily Experimental Survey (DES) (see Appendix D) was completed to evaluate perceived attention, relaxation, sense of control, preference for the musical selections heard and the overall enjoyment of the session. Upon conclusion of the study at the end of the fourth experimental session, an exit interview was conducted to assess the subjects' perception of usefulness of the music for pain, as well as the overall evaluation of the experimental procedures (see Appendix F).

RESULTS

Following are the findings of the study that investigated the effects of listening to 20 minutes of investigator-selected music on the listeners' perception of chronic pain. An investigator-devised verbalization task to accompany music listening was used only in Experimental Condition Two, as a mean of enhancing the listeners' attention to the music stimulus. The results are presented in response to the list of research questions found on pages 14 through 16.

Effects of Music Listening Alone on Chronic Pain Perception

Question 1: To what extent will chronic pain perception change after twenty minutes of music listening?

Perceived degree of chronic pain was measured during both the pretest and post-test in Experimental Condition One. Chronic pain was measured using the Short Form of the McGill Pain Questionnaire which is comprised of three different measures: Pain Descriptors (PD), Present Pain Intensity (PPI), and Visual Analogue Scale (VAS). These pain measures, expressed as mean scores and found in table 4, were compared for a possible decrease in pain as the result of listening to selected music for 20 minutes. Mean difference scores of -.3104 (PD), -.625 (PPI), and -1.243 (VAS) were obtained. Applying a paired-sample t test (SPSS) on these difference scores produced t values of 3.857 ($p < .002$), 3.565 ($p < .003$), and 3.596 ($p <. 003$), respectively.

Table 4. Mean Pain Scores Measured Before (Pretest) and After (Posttest) Music Listening during Experimental Condition One

	PD		PPI		VAS	
Subject	Pretest	Post-test	Pretest	Post-test	Pretest	Post-test
1	0.93	0.63	2.75	2.50	3.45	2.15
2	1.60	0.67	2.50	2.00	6.40	5.20
3	0.28	0.07	1.50	0.50	2.38	0.63
4	0.70	0.53	2.25	1.50	5.70	5.25
5	0.23	0.10	1.50	0.50	3.50	0.90
6	0.97	0.43	2.25	1.00	6.55	4.35
7	0.70	0.93	2.00	3.00	3.80	5.21
8	0.43	0.10	1.75	1.00	3.80	1.45
9	0.63	0.27	2.50	1.00	4.10	1.65
10	0.17	0.03	1.00	0.50	0.80	0.20
11	0.67	0.27	1.75	0.75	3.95	1.85
12	1.07	0.80	2.75	2.75	3.05	9.45
13	1.50	0.70	3.25	2.00	8.70	6.10
14	0.20	0.20	2.00	2.00	6.75	7.15
Mean	0.72	0.41	2.13	1.50	4.92	3.68

Note: (PD): 2-tail t- $p <.002$; (PPI) 2-tail t- $p <.003$; (VAS) 2-tail t- $p <.003$.

Effects of Music Listening Combined With AES on Chronic Pain Perception

Question 2: To what extent will chronic pain perception change after 20 minutes of music listening combined with an Attention Enhancement Strategy (AES)?

Perceived degree of chronic pain was measured during both the pretest and post-test in Experimental Condition Two, as well. Chronic pain was again measured using the Short Form of the McGill Pain Questionnaire which is comprised of three different measures: Pain Descriptors (PD), Present Pain Intensity (PPI), and Visual Analogue Scale (VAS). These pain measures, expressed as mean scores and found in table 5, were compared for a possible decrease in pain as the result of using AES while listening to 20 minutes of

Table 5. Mean Pain Scores Measured Before (Pretest) and After (Posttest) Music Listening during Experimental Condition Two

	PD		PPI		VAS	
Subject	Pretest	Post-test	Pretest	Post-test	Pretest	Post-test
1	0.77	0.37	2.75	1.25	6.65	2.80
2	1.23	0.50	2.50	1.50	5.70	4.30
3	0.37	0.07	2.50	0.25	4.00	0.25
4	0.50	0.23	2.50	1.00	5.38	3.25
5	0.43	0.22	2.50	1.50	4.53	2.70
6	0.47	0.37	2.00	1.25	6.15	3.80
7	1.00	0.90	2.50	2.50	3.20	3.30
8	0.63	0.14	2.50	1.00	4.68	2.55
9	0.43	0.37	2.00	2.00	2.98	1.60
10	0.20	0.13	1.00	0.75	0.38	0.28
11	0.50	0.43	1.50	0.75	3.63	2.53
12	0.63	0.67	3.00	2.00	7.63	6.65
13	1.07	0.90	2.75	2.00	7.20	6.08
14	0.47	0.73	2.50	2.50	7.68	8.45
Mean	0.62	0.43	2.32	1.45	4.98	3.47

Note: (PD): 2-tail t-p<.012; (PPI) 2-tail t-p <.000; (VAS) 2-tail t-p <.001.

selected music. Mean difference scores of -.1910 (PD), -.8750 (PPI), and -1.5161 (VAS) were obtained. Applying a paired-sample t test (SPSS) on these difference scores produced *t* values of -2.938 ($p<.012$), -4.883 ($p<.000$), and -4.313 ($p<.001$), respectively.

Effects of the Attention Enhancement Strategy (AES)

Question 3: To what extent will any change in chronic pain perception resulting from music listening when combined with the AES differ from that of the music listening without use of the strategy?

The pretest and posttest music listening pain scores measured in all three sub-measures of the SF-MPQ, including the Pain Descriptors (PD), Present Pain Intensity (PPI) and Visual Analogue Scale (VAS), were compared according to the experimental condition under which they were measured. Expressed as a gain score, the computed difference between the pretest and posttest pain scores were computed by subtracting the pretest pain scores from the posttest pain scores of the same day. The mean gain scores for each experimental condition were computed and a paired sample 2-tailed t test was used to investigate the statistical differences between the two means, using the Statistical Package for Social Science (SPSS), 7.0 version for Windows. The results are illustrated in Table 6.

Pain Descriptor

Results of the paired sample 2-tailed t test revealed that the amount of positive pain change, or pain relief, experienced by the subjects during Experimental Condition One was larger than that of Experimental Condition Two. Expressed as a gain score, the mean difference in the post-test and pretest pain scores during Experimental Condition One (0.31) was compared to that of Experimental Condition Two (0.19). Using a paired sample 2-tailed t test, the difference of -0.12 (t = -1.64, $p < 0.125$) was found to be statistically nonsignificant ($p > 0.05$).

Present Pain Intensity (PPI)

There was an increase of 0.25 in the PPI gain score during the Experimental Condition Two compared to the Experimental Condition One. This result indicates that the amount of pain relief experienced by the subjects under the Experimental Condition Two was larger than that of the Experimental Condition One. However, the difference of 0.25 (t = 1.157, $p < .268$) was not found statistically significant using a table for the Paired Sample 2-tailed t test at 0.05 level.

Visual Analogue Scale (VAS)

Again, the gain in VAS pain score after the music listening was greater during the Experimental Condition Two (1.51) compared to the Experimental Condition One (1.24). The results indicate that the average amount of pain relief experienced by the subjects under Experimental Condition Two was greater than that of the Experimental Condition One. However, the difference of 0.27 (t = .80, $p < .438$), was not found statistically significant at 0.05 alpha level (see Table 6).

Table 6. Mean Pain Gain Scores (Post-pain minus Pre-pain) during each Experimental Condition

	Experimental Condition One				Experimental Condition Two		
	Gain score				Gain score		
Subject	PD	PPI	VAS	Subject	PD	PPI	VAS
1	0.30	0.25	1.30	1	0.40	1.50	3.85
2	0.93	0.50	1.20	2	0.73	1.00	1.40
3	0.22	1.00	1.75	3	0.30	2.25	3.75
4	0.17	0.75	0.45	4	0.27	1.50	2.13
5	0.13	1.00	2.60	5	0.22	1.00	1.83
6	0.53	1.25	2.20	6	0.10	0.75	2.35
7	-0.23	-1.00	-1.41	7	0.10	0.00	-0.10
8	0.33	0.75	2.35	8	0.49	1.50	2.13
9	0.37	1.50	2.45	9	0.07	0.00	1.38
10	0.13	0.50	0.60	10	0.07	0.25	0.10
11	0.40	1.00	2.10	11	0.07	0.75	1.10
12	0.27	0.00	-0.40	12	-0.03	1.00	0.97
13	0.80	1.25	2.60	13	0.17	0.75	1.13
14	0.00	0.00	-0.40	14	-0.27	0.00	-0.77
Mean	0.31	0.63	1.24	Mean	0.19	0.88	1.51

Note: Paired sample t test on Experimental Condition One and Two (PD): 2-tail t-$p < .125$; (PPI): 2-tail t-$p < .268$; (VAS): 2-tail t-$p < .438$.

Effects of AES on the Intervening Variables: Attention, Relaxation, Preference, Sense of Control, and Enjoyment

Attention

Question 4: To what extent will perceived amount of attention to the music stimulus during music listening with the AES differ from perceived attention during music without the AES?

Comparing the subjects' reports on perceived attention to music during each experimental condition, a significantly higher level of perceived attention to the music during listening was noted during Experimental Condition Two in which the music listening was combined with use of the AES. A mean increase of 6.25 ($t = 2.127$, $p < 0.053$) resulted when the mean attention during the Experimental Condition Two (91.785) and the mean attention during the Experimental Condition One (85.535) were compared. The paired-sample t test results are displayed in Table 7. The significant difference value of $p < 0.05$ was found when the two mean values were compared.

Attention level during the third experimental session compared to the first session (8.571, 2-tailed $t = 2.673$, $p < 0.019$) was much more significant, when compared to that of the fourth session as compared to the second session (3.928, 2-tailed $t = 1.154$, $p < 0.269$).

Table 7. Perceived Level of Attention to Music from the Daily Experimental Survey

	Experimental Condition One		Experimental Condition Two	
	Day 1	Day 2	Day 3	Day 4
N	14	14	14	14
Mean	85.36	85.71	93.93	89.64
SD	14.07	10.89	9.24	12.4
	Experimental Condition One		Experimental Condition Two	
Mean	85.54		91.79	
SD	10.43		8.96	

Note: Experimental Condition One and Experimental Condition 2: Mean difference = -6.25, 2-tailed t = -2.13, $p < .05$.

Relaxation During Music

Question 5: To what extent will subjects' perceived level of relaxation change when the AES is used during music listening when compared to the relaxation level during the music listening without the use of the AES?

The results of a paired-sample t test are illustrated in Table 8. Although there was an increase in the level of relaxation during Experimental Condition Two (2.32), the increase did not reach a statistically significant level (t = .543, P = .592). It was noted, however, that the level of relaxation a subject experienced within an experimental condition, regardless of the experimental condition, increased significantly on the second day of the same experimental condition. The group mean relaxation score for the first day was 71.79 on a scale of zero to 100. Scores on the second day through the last day of the experiment were 83.57, 77.14, and 82.86, respectively. Also, the standard deviation in the row scores during the first and the third days were much larger (27.50, 22.59) than the second and the fourth days (12.16, 10.69).

Table 8. Perceived Level of Relaxation from the Daily Experimental Survey

	Experimental Condition One		Experimental Condition Two	
	Day 1	Day 2	Day 3	Day 4
N	14	14	14	14
Mean	71.79	83.57	77.14	82.86
SD	27.50	12.16	22.59	10.69
	Experimental Condition One		Experimental Condition Two	
Mean	77.68		80.00	
SD	18.59		14.74	

Note: Experimental Condition One and Experimental Condition Two: Mean difference = -2.23, 2-tailed t = - .549, $p < .592$.

Preference for the Musical Selections

Question 6: To what extent will subjects' preference for the musical selections change with the use of the AES during music listening?

Results from a paired-sample t test on preference are illustrated in Table 9. The group mean preference scores for the musical selections heard during each session, as reflected on the Daily Experimental Survey, indicated a slight decrease in the subjects' preference level during the sessions in Experimental Condition Two. The preference scores during the Experimental Condition One was 6.25 on a seven-point Likert scale, compared to 6.16 of Experimental Condition Two. However, the difference of

-.09 (2-tailed $t = .358$, $p < .726$) was found not to be statistically significant.

Table 9. Preference for the Musical Selections Heard in Each Session from the Daily Experimental Survey

	Experimental Condition One		Experimental Condition Two	
	Day 1	Day 2	Day 3	Day 4
N	14	14	14	14
Mean	6.07	6.43	6.43	5.89
SD	1.49	.68	.23	.32
	Experimental Condition One		Experimental Condition Two	
Mean	6.25		6.16	
SD	.89		.72	

Note: Experimental Condition One and Experimental Condition Two: Mean difference = .09, 2-tailed $t = .358$, $p < .726$.

Sense of Control Over Pain

Question 7: To what extent will subjects' perceived sense of control over pain change when the AES is used during music listening?

Results of the report on perceived sense of control over pain are illustrated in the Table 10.

Table 10. Perceived Level of Attention to Music from the Daily Experimental Survey

	Experimental Condition One		Experimental Condition Two	
	Day 1	Day 2	Day 3	Day 4
N	14	14	14	14
Mean	71.79	73.86	74.64	80.71
SD	28.80	26.10	26.64	27.66
	Experimental Condition One		Experimental Condition Two	
Mean	72.82		77.68	
SD	26.16		24.99	

Note: Experimental Condition One and Experimental Condition Two: Mean difference = 6.25, 2-tailed $t = 2.13$, $p < .053$.

The mean sense of control increased during the second experimental condition by 4.86 percentage points. Using a paired-sample t test, the corresponding t value of -1.143 and t-table significance value of 0.27 resulted. Additionally, a positive relationship with the number of experimental sessions and the amount of perceived sense of control over pain was noted. That is, an increase in the number of experimental sessions to which the subjects were exposed, resulted in a report of greater sense of control over pain. The percentage scores from day one to day four were as follows: 71.79, 73.86, 74.64, and 80.71, respectively. A paired-sample correlation indicated positive, significant correlations between day one and day three ($r = .69$, $p = .007$) and between day two and day four ($r = .873$, $p = .000$).

Enjoyment of the Session

Question 8: To what extent will subjects' overall enjoyment during each experimental session change with the use of the AES during music listening when compared to that of the music listening session without the use of the AES?

The enjoyment of the overall content of the session, as reported in the Daily Experimental Survey, slightly decreased during Experimental Condition Two (see Table 11). However, both the t test results and the correlation score indicate that the difference was minimal (0.07 on a seven point likert scale). Enjoyment of the session was largest on the first day (6.57). A gradual decrease in the enjoyment scores was noted through the second (6.36) and the third sessions (6.32). The last session showed a slight increase (6.45).

Table 11. Perceived Level of Overall Enjoyment of the Session

	Experimental Condition One		Experimental Condition Two	
	Day 1	Day 2	Day 3	Day 4
N	14	14	14	14
Mean	6.57	6.36	6.32	6.45
SD	1.16	.74	1.64	.26
	Experimental Condition One		Experimental Condition Two	
Mean	6.46		6.39	
SD	.75		.99	

Note: Experimental Condition One and Experimental Condition Two: Mean difference = .08, 2-tailed t = .544, $p < .60$.

Relationship Between Perceived Change in Chronic Pain and Intervening Variables

Question 9: To what extent will perceived changes in (a) chronic pain perception, (b) attention, (c) relaxation, (d) preference, (e) sense of control and (f) enjoyment of session show correlation with each other throughout the experimental conditions?

Results from a Pearson product moment correlation among pain (PD, PPI, VAS), attention, relaxation, preference, sense of control, and enjoyment are provided in Table 12.

Attention

During Experimental Condition One of music listening only, predominantly inverse relationships were found between the amount of attention to music with such variables as (a) perceived pain relief ($r = -.40$ (PD); -.17 (PPI); -.12 (VAS)), (b) relaxation ($r = -.26$), and (c) sense of control during music listening ($r = -.20$) (see Table 12). These relationships indicate that the more attentive to the music the subjects were, the less pain relief, relaxation, and sense of control they experienced during the music listening only condition. Interestingly, however, during Experimental Condition Two of music listening plus AES of verbalization, these relationships changed to a weak but positive relationship. For example, the correlation coefficient with pain measures were .32 (PD), .02 (PPI), and .02 (VAS). The correlation coefficient reflecting the relationship between relaxation and sense of control during Experimental Condition Two also changed to .32 and .10, respectively.

Relaxation

A strong positive relationship existed throughout both experimental conditions between the amount of relaxation the subject experienced and the followings: (a) the amount of pain change reported in Condition One: r = .50 (PD), .74 (PPI), and .64 (VAS); Experimental Condition Two: r = .64 (PD), .55 (PPI), and .54 (VAS), (b) preference for the musical selections used in the session reported in Experimental Condition One: r = .75; Experimental Condition Two: r = .50, (c) sense of control over pain reported in Experimental Condition One: r = .90; Experimental Condition Two: r = .85, and (d) overall enjoyment of the session reported in Experimental Condition One: r = .55; Experimental Condition Two: r = .76 (see Table 12). A weak negative correlation between relaxation and attention to music during Experimental Condition One (r = -.26) changed to another weak but a positive correlation (r = .32) during Experimental Condition Two.

Preference for the Musical Selections

During Experimental Condition One, a strong positive relationship existed between the subjects' preference score for the musical selection they listened to and the subjects' (a) change in pain perception: r= .55 (PD), .73 (PPI), .68 (VAS), (b) sense of control over pain: r = .66, (c) relaxation: r = .75 and (d) an overall enjoyment of the session: r = .84. Interestingly, however, during Experimental Condition Two, the positive relationship between preference and the pain changes became a weak (PD: *r* = .25; VAS: *r* = .05) or negative (PPI: *r* = -.01). Also the weak and positive correlation between preference and attention during Experimental Condition One (*r* = .07) became slightly stronger during the Experimental Condition Two (*r* = .28).

Table 12. Correlation Matrix: Mean gain pain scores (Pain Descriptors, PPI, VAS); Attention; Relaxation; Preference; Sense of Control; Enjoyment of Session

		PD		PPI		VAS		Attention		Relaxation		Preference		Control		Enjoyment	
		E1	E2	E1	E2	E1	E2	E1	E2	E1	E2	E1	E2	E1	E2	E1	E2
PD	E1	1.00	.52	.57*	.21	.59*	.27	-.40	.01	.50	.43	.55*	.11	.32	.25	.45	.31
	E2	.52	1.00	.15	.59*	.35	.58*	-.30	.32	.40	.64*	.44	.25	.45	.62*	.34	.51
PPI	E1	.57*	.15	1.00	.26	.91**	.43	-.17	.12	.74**	.46	.73**	-.01	.63*	.39	.48	.25
	E2	.21	.59*	.26	1.00	.32	.84**	-.38	.02	.44	.55*	.29	-.01	.62*	.54*	.20	.15
VAS	E1	.59*	.35	.91**	.32	1.00	.52	-.12	.26	.64*	.52	.68**	.12	.55*	.38	.48	.41
	E2	.27	.58*	.43	.84**	.52	1.00	-.49	.02	.40	.54*	.27	.05	.60	.57*	.21	.28
Attn	E1	-.40	-.30	-.17	-.38	-.12	-.50	1.00	.37	-.26	-.05	.07	.44	-.20	-.20	.20	.23
	E2	.01	.32	.12	.02	.26	.02	.37	1.00	.05	.32	.21	.28	-.08	.10	-.02	.23
Relx	E1	.50	.40	.74**	.44	.64*	.40	-.26	.05	1.00	.57*	.75**	-.09	.89**	.70**	.55*	.30
	E2	.43	.64*	.46	.55*	.52	.54*	-.05	.32	.57*	1.00	.77**	.50	.65*	.85**	.79**	.76**
Pref	E1	.55*	.44	.73**	.29	.68**	.27	.07	.21	.75**	.77**	1.00	.34	.66*	.67**	.84**	.65*
	E2	.11	.25	-.01	-.01	.12	.05	.44	.28	-.09	.50	.34	1.00	.02	.40	.62*	.70**
Ctrl	E1	.32	.45	.63*	.62*	.55*	.60*	-.20	-.08	.90**	.65*	.66*	.02	1.00	.81**	.60*	.37
	E2	.25	.62*	.39	.54*	.38	.57*	-.20	.10	.70**	.85**	.67*	.40	.81**	1.00	.71**	.66**
Enjoy	E1	.45	.34	.48	.20	.48	.21	.20	-.02	.55*	.79**	.84**	.62*	.59*	.71**	1.00	.85**
	E2	.31	.51	.25	.15	.41	.28	.23	.23	.30	.76**	.65*	.70**	.37	.66**	.85**	1.00

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 (2-tailed).
Note: All numbers represent mean scores between the two days in each experimental condition. All pain scores (PD, PPI, VAS) represent the mean pain gain score on each day averaged by experiment condition. Attention, Relaxation, Preference, Sense of Control and Enjoyment of session are mean row scores of the two days during each experimental condition.

Sense of Control

Strong positive and statistically significant correlations were found throughout both experimental conditions between the subjects' perceived sense of control over their pain and the following list of variables: (a) change in PPI scores reported in Experimental Condition One (r = .63) and Experimental Condition Two (r = .54), (b) change in VAS scores reported in Experimental Condition One (r = .55) and Experimental Condition two (r = .57), (c) enjoyment of session reported in Experimental Condition One (r = .59) and Experimental Condition Two (r = .66), and (d) relaxation reported in Experimental Condition One (r = .89) and Experimental Condition Two (r = .85). Using the Pain Descriptor section of the SF-MPQ, the pain change and the sense of control reached a significantly positive correlation level only during Experimental Condition Two (r = .62). A weak but negative correlation between the sense of control and the attention to music during Experimental Condition One (r = -.20) changed to another weak but a positive correlation during Experimental Condition Two (r = .10).

Enjoyment of Session

Strong positive correlations were found between the subjects' enjoyment of session and the following variables, throughout both experimental conditions: (a) Preference for the musical selections heard in each session, reported in Experimental Condition 1 (r = .84) and Experimental Condition Two (r = .70), (b) Relaxation level reported in Experimental Condition One (r = .55) and Experimental Condition Two (r = .76), and (c) Sense of Control reported in Experimental Condition One (r = .60) and

Experimental Condition Two (*r* = .66).

Effects of AES Facilitated Verbalization During Music on Pain, and Other Intervening Variables

Question 10: To what extent will subjects' number of verbal responses during music listening combined with AES, correlate with the following: (a) pain, (b) attention, (c) relaxation, (d) preference, (e) sense of control over pain, and (f) enjoyment of the session?

The subjects' verbal responses during music listening were recorded on the AES form. According to their descriptive content, the verbal responses were later tallied for the purpose of a statistical analysis. For example: " This music reminds me of **a place** in northern Michigan... It is a lazy **summer afternoon**" received a numeric score of two since it included a verbal association for "Place" and one for "time".

The results of Pearson product moment correlation between the number of verbal responses, pain gain scores, attention, relaxation, preference and sense of control over pain and enjoyment are provided in table 13. Generally, weak correlations were found between the number of verbalizations and gain scores in the three pain measures, PD (Day 3: *r* = -.054; Day 4: *r* = -.145), PPI (Day 3: *r* = .048; Day 4: *r* = .023), VAS (Day 3: *r* = -.426; Day 4: *r* = .075). Similarly, weak correlations were found between the number of verbalizations and the following intervening variables: (a) relaxation (Day 3: *r* = -.004; Day 4: *r* = .193), (b) preference (Day 3: *r* = .081; Day 4: *r* = .248), (c) sense of control over pain (Day 3: *r* = -.241; Day 4: *r* = .333), and (d) enjoyment of session (Day 3: *r* = .018; Day 4: *r* = .236).

Table 13. Correlation (1-tailed): Verbal response on Day 3 and Day 4 (Experimental Condition Two) with Pain (PD, PPI, VAS), Attention, Relaxation, Preference, Sense of Control, and Enjoyment of Session

		Total number of Verbalizations	
Variables		**Day 3**	**Day 4**
PD	Day 3	-.054	-.310
	Day 4	.213	-.145
PPI	Day 3	.048	.054
	Day 4	.018	.023
VAS	Day 3	-.426	-.353
	Day 4	-.020	.075
Attention	Day 3	-.160	-.216
	Day 4	-.286	* -.514
Relaxation	Day 3	-.004	.071
	Day 4	.073	.193
Preference	Day 3	.081	.138
	Day 4	-.173	.248
Control	Day 3	-.241	.029
	Day 4	.042	.333
Enjoyment	Day 3	.018	.062
	Day 4	.126	.236

*. Correlation is significant at the 0.05 level (2-tailed).

It is interesting to note that the Pearson product moment correlation between the number of verbal responses measured during Experimental Condition Two, and the amount of perceived attention on music listening, also displayed a negative relationship (Day 3: $r = -.160$; Day 4: $r = -.514$). These negative correlations indicate that the higher the number of verbalizations about the music, the less the amount of perceived attention on the music listening task as reported by the subjects. On day 4, the negative correlation between the number of verbal responses and the attention to music listening reached a correlation coefficient of $r = -.514$ (1-tailed $p < .030$), which is statistically significant at 0.05 alpha level.

Effect of Musical Training as an Extraneous Variable on the Pain Perception Outcome of Music Listening

Question 11: To what extent will subjects' musical training background make a difference in the amount of perceived pain change throughout the experiment?

An independent sample t test for Equality of Means on the mean pain change scores (PD, PPI, VAS) of the two groups of subjects, divided according to whether they had previous musical training, indicated no significant difference (PD: $t = -.081$, $p = .937$; PPI: $t = .127$, $p = .901$; VAS: .590, $p = .566$) under assumption of equal variances.

Perceived Efficacy of Using Music Listening as a Chronic Pain Treatment Modality

Question 12: To what extent will subjects perceive music listening as a useful modality for chronic pain treatment, with or without the use of the AES?

All but one subject out of the fourteen subjects who participated in the study indicated that music listening is a useful modality for chronic pain treatment, with or without the use of the AES. The one subject who answered negatively to the efficacy of music listening for the chronic pain attenuation, however, indicated the music's efficacy to improve the listener's mood. This subject acknowledged that, although music listening might not be a sufficient medium to alleviate persistent and aggravating chronic pain, the change of mood resulting from the music listening is very important for chronic pain patients who often suffer from severe depressive mood.

The reasons stated by the subjects who found music listening to be useful for pain treatment include the following functions: relaxation (n=11), distraction (n=11) and change of mood (n=6).

DISCUSSION

The purpose of this study was to investigate the usefulness of enhanced cognitive involvement during music listening on amelioration of chronic pain perception. As a strategy to promote the listener's cognitive involvement during music listening, subjects were asked to verbalize, with selected guidance, any thoughts and images relating to the music being heard. The subjects' responses to either of two listening conditions were compared, as demonstrated in their reports on the perceived levels of (a) pain during pretest and posttest music listening, (b) attention to music, (c) preference for musical selections heard during each session, (d) relaxation during listening, (e) control over pain, and (e) general enjoyment during each session.

The Effects of Music Listening on Pain

Twenty minutes of music listening, with or without use of the attention (cognitive) enhancement strategy, seemed sufficient to induce a significant amount of pain amelioration among the chronic pain subjects. The pain attenuation effect of music listening was consistently significant throughout all four experimental sessions.

Effects of Musical Properties

In addition to reporting their responses to the music listening on the designated forms, subjects often verbally reported their responses to each individual musical selection heard during each session. Usually voluntary in its context, the significance of these subjective responses to music on perceived pain levels was often emphasized by the subjects. The comments usually pertained to such structural music elements as pitch, timbre, rhythm, melody, harmony, and form. In addition, many references were made with regard to the general mood of the music.

These largely subjective reports often exhibited a certain degree of resemblance in content from one subject's report to another. Following is a summary of these subjective verbal reports as they pertain to chronic pain therapy, identified as either helpful or detrimental.

1. Mood of the Music

Six subjects mentioned the general mood of the music as a significant factor in deciding whether the music will be helpful for their pain conditions. Apparently music with a "happy," "uplifting," and "positive" mood, rather than "sad" or "depressive" one, is much more desirable. The chronic pain condition, usually accompanies a depressive mood. The chronic-pain subjects reported that the use of music with a happy and uplifting mood is helpful in easing the psychological, as well as the physical, pain level. One subject described solo instrumental pieces as "lonely" and "depressing", as opposed to an ensemble or orchestral piece. She explained that the solo instrumental piece reminded her of the solitary or socially isolated state of being disabled and depressed due to her chronic pain condition.

2. Pitch and Timbre of the Musical Instruments

The pitch range and the general timbre of the musical instruments are other major factors which seemed to draw attention from pain subjects. Generally, high pitch range and "shrill" timbre were described as pain inducing. Instruments with generally high pitch range such as the piccolos, flutes, and first violins, were mentioned as undesirable for pain relief. Middle to low ranges were reported as preferable because they, along with the more general "smooth" and "blending" instrumental timbre, are more "soothing" and "comforting" in quality. Piano, as a percussion instrument, along with the violin, is the most frequently reported musical instrument not conducive to relaxation. The heavy or "banging" notes on the piano and the "shrill" sound of violin are two of the most frequently mentioned instruments as "intensifiers" of pain.

3. Melodies and Structure

As far as the melody and chordal progressions are concerned, there seems to be a general preference among the pain subjects for flowing musical passages, without much sense of a development or a climax, as suitable for pain management. Sudden changes in the tone, pitch or dynamics in a musical passage seemed to cause a startling response, an opposite response from that of the desired relaxation. A development and anticipation into a climax was also reported as causing the listeners with chronic pain to become anxious and, consequently, unable to relax.

One subject who was a trained musician as well as a seasoned listener, mentioned her need to hear changes and resolutions through chordal progressions and various other musical events in the music that she hears. She reported that certain music without much change, such as the "New Age" or sounds of ocean tides, bothers her as they are too "stagnating" and do not bring the peaceful contentment a musical resolution can provide to listeners.

4. Rhythm, Beat or Sense of Pulsation

Musical selections with a heavy or intense sense of pulsation are reported as pain inducing for chronic-pain subjects. The pulsation was associated with the pounding and throbbing pain sensation at its worst. More smooth and blending beat patterns, typically found in most New Age music, was referred to as more conducive to eliciting relaxation responses in the listeners with chronic pain.

The Effects of Verbalization During Music as an Attention Enhancement Strategy on Chronic Pain Perception

The attention enhancement strategy, or AES, of music listening, when combined with verbalization of the thoughts and/or feelings elicited while engaged in the process, resulted in the following outcomes: (a) an increase in mean pain change, although not statistically significant, after music listening using PPI and VAS of the SF-MPQ, (b) a slight decrease in mean pain after the music listening using the Pain Descriptive section of the SF-MPQ, and (c) a statistically significant (at 0.05 level) increase in attention to the task; namely, music listening and processing of the auditory stimulus.

Measurement of Chronic Pain Using the SF-MPQ

The mean gain scores within each experimental condition reported in the PD, PPI and VAS on the SF-MPQ, were compared as a measure of examining consistency in the pain measurement tool. In order to evaluate how well the pain gain scores, measured by the three different sub-measurements of SF-MPQ, namely PD, PPI and VAS, related to one another, the Pearson product moment correlation test was used.

The Inter-Measurement Correlation between Gain Scores of Pain Descriptors (PD), Present Pain Intensity (PPI) and Visual Analogue Scale (VAS)

The results indicate that there exists a strong positive correlation between all three measurement scales of the SF-MPQ (see Table 14). For example, during Experimental Condition One, statistical significance of $p < .033$ ($r = 0.527$) and $p < .026$ ($r = 0.591$) was found between the gain scores measured in Pain Descriptors (PD), Present Pain Intensity (PPI) and Visual Analogue Scale (VAS).

Table 14. The Inter-Measurement Correlation Matrix: Gain Scores for Pain Descriptors (PD), Present Pain Intensity (PPI) and Visual Analogue Scale (VAS) for Mean Pain Change Using the Pain Descriptors, PPI and VAS Scores

	PD		PPI		VAS	
	Exp 1	Exp 2	Exp 1	Exp 2	Exp 1	Exp 2
PD						
Exp 1	1.00 (14) p = .	.517 (14) p = .058	.572 (14) p = .033	.210 (14) p = .470	.591 (14) p = .026	.270 (14) p = .350
Exp 2	.517 (14) p = .058	1.00 (14) p = .	.151 (14) p = .606	.592 (14) p = .026	.346 (14) p = .255	.577 (14) p =.031
PPI						
Exp 1	.527 (14) p = .033	.151 (14) p = .606	1.00 (14) p = .	.257 (14) p = .375	.905 (14) p = .000	.429 (14) p = .126
Exp 2	.210 (14) p = .470	.592 (14) p = .026	.257 (14) p = .375	1.00 (14) p = .	.319 (14) p = .267	.844 (14) p = .000
VAS						
Exp 1	.591 (14) p = .026	.346 (14) p = .225	.905 (14) P = .000	.319 (14) P = .267	1.00 (14) p = .	.519 (14) p = .057
Exp 2	.270 (14) p = .350	.577 (14) p = .031	.429 (14) p = .126	.844 (14) p = .000	.519 (14) p = .057	1.00 (14) p = .

PD = Pain Desriptors; PPI = Present Pain Intensity; VAS = Visual Analogue Scale; Exp 1 = Experimental Condition One; Exp 2 = Experimental Condition Two

During Experimental Condition Two, pain gain scores measured in the three measurement scales of the SF-MPQ, again displayed statistically significant positive correlations ($p < .026$ at $r = .592$; and $p < .031$ at $r = .577$). This result seems to indicate that the direction and the degree of pain change expressed as gain scores using Pain Descriptors (PD) correlated significantly with those of the PPI and VAS.

It is interesting to note that while the pain measurement (Short Form-McGill Pain

Questionnaire) itself displayed a high positive correlation in pain scores among all three of its three sub-measurements including the PPI, VAS and Pain Descriptors, only the PPI and VAS displayed a decrease in mean pain perception during Experimental Condition Two, whereas the Pain Desriptors gain score increased slightly during Experimental Condition Two.

It is speculated that this discrepancy may be due to the possibility that the overall pain perception measured by the 6 point scale (PPI) and the Visual Analogue Scale (VAS) are more subjective in nature than the Pain Descriptors which classify and address a rather extensive list of specific physical and psychological pain responses. The use of PPI and VAS may reflect, to a larger degree, the pain subject's overall mood, relaxation level, and attention as well as the emotional and cognitive appraisal of the environmental or external stimuli (ie., like or dislike, etc.). The Pain Descriptors, on the other hand, may reflect, to a larger degree, more objective and specific areas of pain responses while prompting the subjects to recall and/or re-evaluate the pain symptoms.

The high inter-measurement correlation outcome may be due, at least partially, to the fact that the perception and the evaluation of pain continues to be a highly subjective experience, based on an intricate interplay between physiologically-based pain sensations and psychologically-based coping mechanisms.

The Influence of Enhanced Cognitive Involvement and the Subsequent Increase in Attention During Music Listening on Treatment of Chronic Pain

Measured in terms of the subjects' perception of the level of attention to the music stimulus, the cognitive strategy significantly increased the perceived attention to the music itself when compared to the no strategy condition of passive music listening without verbalization. This increase in attention to music did not, however, bear any significant relationship to the amount of pain change, preference on the musical selections heard, level of relaxation, sense of control over pain, or overall enjoyment of the session. In fact, during Experimental Condition One of music listening only, attention displayed weak negative correlations with pain change, relaxation, and sense of control over pain. This relationship, however, changed to weak but positive relationships during the Experimental Condition Two.

It is apparent that a significant increase in attention to task did not positively correlate with a significant increase in the amount of pain relief, nor did it display any significant correlation with intervening variables such as relaxation, preference, sense of control, or overall enjoyment of the listening sessions. Contrary to the widely accepted view of distraction as the key explanation for music's efficacy in pain relief, the distraction potential of music may actually have little influence on the actual amount of pain relief a pain subject experiences during music listening. That is, the music as a form of distraction is not necessarily a satisfactory explanation for the pain relief the listeners experience as a result of music listening.

Why was the verbalization task beneficial to some but detrimental to others seeking to use music to cope with pain?

The reports from subjects are conflicting in terms of perceived usefulness of verbalization during music listening. Five subjects reported the verbalization to be helpful during music listening while another four subjects reported verbalization to be unhelpful. The five subjects who found verbalization helpful, stated the following:

(a) "Verbalization helped me focus more on music and less on my pain."

(b) "Verbalization helped me get deeper into the music and what I was listening to."

(c) "Listening to questions asked by the researcher helped me feel safe to explore the music and the images I get from listening."

(d) "Talking always helps me process my thoughts especially when it is in free format."

The most frequent complaint about the verbalization task during music listening was that the subjects felt a distraction from the music itself due to the felt obligation to verbalize about the music.

It appears that the verbalization task was a helpful strategy for those listeners who have difficulty focusing on the music, possibly due to distracting thoughts or unfamiliarity with the setting, the procedure or with listening to music itself. For those subjects who readily engaged in the music listening, verbalization seemed more as a distractor rather than an aid in focusing on the music itself. These "ready engagers" in music listening were usually ones with either (a) background in music through training or appreciation experiences, or (b) generally good ability to focus on tasks. Attention to a nonpain stimulus, acting as a distraction from the pain source and sensation, does seem, however, important in subjective interpretation of why music is useful as a pain coping strategy. Of the thirteen subjects who reported music to be a helpful coping strategy for chronic pain, twelve indicated the distraction potential of music as one of the reasons why music is useful for pain. Even the one subject who did not find music to be immediately helpful for pain reported that one of the most important functions of a pain coping strategy is to "get my mind off my pain."

Relaxation Factor

The level of relaxation during music listening was highly related to the perception of (a) the amount of pain relief, (b) sense of control over pain, (c) preference for the music heard, and (d) overall enjoyment of the experience. While a causal relationship between relaxation and other variables can not be determined from correlation, it is clear that relaxation is an important factor in the effect of music on chronic pain therapy. During the exit interview, twelve of the thirteen subjects who reported music as helpful to their pain condition, attributed the relaxation effect of music as one of the primary reasons for their perceived pain relief.

It is interesting to note that the level of relaxation displayed a weak negative correlation with attention during the Experimental Condition One. With an equal number of subjects indicating both relaxation and distraction potential of music as a key influence on music's efficacy in pain treatment, the relationship between the level of relaxation and the amount of attention to a nonpain stimulus such as music seems to be a key issue of investigation before further refinement of the music therapy technique for chronic pain relief can be accomplished.

It appears that familiarity with the setting and the procedure contribute to the level of relaxation a person experiences when listening to a piece of music. Between the two experimental conditions, subjects experienced a significantly higher relaxation level during the second day of the same experimental condition. This finding appears to warrant the importance of repeating certain experimental procedures, such as the ones used in this study, in order to provide the subjects with an even greater familiarity with the testing environment. As the perceived level of relaxation was highly correlated with the perceived changes in pain perception, an increased number of trials in both experimental conditions might have yielded some interesting results in the study.

Upon analysis of the relationship among variables and reports from the subjects, several factors were identified as helpful in eliciting the relaxation responses in the listener. In addition to the general characteristics of the musical properties mentioned earlier in the discussion of the music effect, the following two factors were identified as important for promoting relaxation responses in the listeners: (a) refraining from imposing an additional cognitive demand during music listening, and (b) the provision of safety and familiarity in the listening environment.

Preference Factor

Overall, preference for the musical selections displayed an inconsistent relationship with the amount of pain relief reported. A strong positive correlation with pain relief during the first experimental condition of passive music listening changed to a weak negative correlation during the second experimental condition in which listening was accompanied by verbalization. Musical selection initially rated as high on the preference scale, on one hand, seemed to lose the preferred status during the subsequent listening session in which verbalization was required. Music initially not rated as high on the seven-point Likert scale, on the other hand, gained in preference rating, when repeated in a subsequent session. One possible explanation for this phenomenon could be the role of novelty elements in music found during subsequent listening of the same music. These findings are confirmed by those of Bartlett (1973). The music that is initially not favored due to unfamiliarity might gain a higher preference rating as the result of an increased attention to structural details of the musical selection, and discovery of other novel elements during the subsequent listening condition of verbalization. Similarly, music, initially preferred due to familiarity, might lose its preference due to the lack of comparable number of novelty factors that are available to the listeners during subsequent listenings.

This finding appears to imply that reflecting the listener's preference is more important when selecting music to accompany passive listening rather than music listening accompanied by attention enhancement strategy. Reflecting the listener's preference would enhance the initial positive response to music, but it may not be as important when the music listening will be (a) accompanied by cognitive strategies that are likely to enhance the listener's attention to the music itself, and (b) repeated in several subsequent sessions which will likely result in an increase in the listener's ability to recognize variations and difference factors in the music itself.

Sense of Control Over Pain

It is not surprising that strong positive correlations were observed between the sense of control over chronic pain and the reported perception in the amount of (a) pain relief, (b) enjoyment of session, and (c) relaxation. As the number of the experimental sessions progressed, a gradual daily increase in the sense of control over the pain condition was observed. This result seems somewhat similar to the tendency found in the level of relaxation. Just as in the case of relaxation, subjects may have experienced a better sense of control due to an increase in the familiarity of the environment and the procedure. It is interesting to note that most of the subjects reported the term "sense of control over pain" as an unfamiliar term, requesting a clarification. Many verbalized that, "I have never thought about it in terms of control."

Overall Enjoyment of Session

Enjoyment of the session seemed most highly related to preference for the music heard during the sessions (0.91, 0.36, 0.86, 0.77) when compared to other variables. Relaxation and a sense of control during the session also related strongly and positively with enjoyment of the session, but this relationship did not show as much consistency or significance as did the relationship between enjoyment of the session and preference of the music selections heard during the session. It can be inferred from the findings that the single most important factor in overall enjoyment is the listener's preference for the musical selections heard. Displaying a positive, but weak, relationship with enjoyment, attention during music listening seems to play a relatively minor role in overall satisfaction or enjoyment of the listening session.

The Role of Psychological Response to Chronic Pain

It appears that the majority of the chronic pain patients not only struggle with physical pain but also with psychological issues relating to the pain condition. Five subjects were taking anti-depressant medications on a regular basis. Seven subjects were diagnosed with Fibromyalgia and, although it is difficult to confirm, many of these Fibromyalgia patients are reported as having "Type-A personality," having difficulty relaxing and lacking leisure skills or interests. Social isolation, withdrawal, and, generally, anxious mood appear common among patients suffering from chronic pain conditions.

Music and music therapy may assist in the psychological issues of the chronic pain sufferers. Music, as reported by several subjects, is useful in (a) changing and promoting a desirable mood state, (b) providing relaxation, (c) bringing back pleasant memories, and (d) redirecting their attention to a nonpain stimulus. One subject reported that he tends to experience an increase in insight and awareness of himself through music listening, and suggested that psychologists should use music to "open up" and "soften" the patients before the psychological consultation.

Research Questions and Suggestions for the Future Study of Music in Chronic Pain Therapy

Several questions and suggestions for the future study of music for chronic pain emerged from this study. First, there was a wide range in the subjects' verbalization responses in terms of descriptive quality (ie., images, thoughts, musical analysis, etc.) and the total number of verbalizations. From this observation, it is apparent that there is a need to devise a standard measurement and classification system for such verbalization responses. Developing such a system will yield a more accurate and useful analysis of the verbalization responses which might, in turn, help provide some pertinent clinical and research questions relating to the use of music in pain therapy. The question of whether any relationship exists between the number and the descriptive quality of verbalization response with the amount and direction of pain change would be an interesting topic of investigation likely to be encouraged by such a development. This investigation might, in turn, encourage identification of verbalization processes and musical selections specific to enhancing the efficacy of using music in pain management.

Secondly, with the significant amount of pain amelioration experienced by subjects after 20 minutes of music listening, a need was recognized for a control condition of no music listening to be compared with the music listening conditions. This addition of the third experimental condition will help provide an answer to whether the twenty minutes of relaxing in a calm atmosphere was not the reason for such a perceived reduction of pain sensation.

Thirdly, as mentioned earlier in the discussion, a thorough investigation of the subjects' (a) musical preference for specific musical genre, (b) responses to instrumental timbre, and (c) comfortable pitch range of the music, appears essential to successful design and investigation of music's effect on chronic pain perception. For many participants, regardless of their musical background and training, the investigation and reflection of personal musical preference and taste seemed to be importance. Therefore, it would be essential for any investigators interested in using music for chronic pain to realize its importance and take careful measures to satisfy this criterion before expecting an accurate and successful outcome in using the music medium.

Finally, the subject's orientation and familiarity with the surroundings and procedures seemed to have influenced their perception of sense of control over pain and level of relaxation during the experimental sessions. Therefore, it appears that repeating the same experimental condition for more than two times, or having the sessions at a more familiar and comfortable setting, such as the subjects' own homes, might significantly influence the research outcome by familiarizing or stabilizing the participants in relation to the surroundings, experimental procedures, and the music medium itself.

APPENDICES

APPENDIX A

APPENDIX A

MUSIC AND PAIN STUDY INITIAL INTERVIEW QUESTIONNAIRE

Name:____________________ **Date:**____________
Date of Birth:___/___/___ **Sex:** Male Female

Education
Junior High School
High School Diploma
Junior College
Four year College/University
Bachelor, Master, Doctorate, Post Doctorate
Other ________________________________

Occupation Current: ____________________ Previous: ____________________

Musical Background

1. Have you ever had any music training? Yes, No
   If Yes, what was the nature of the training (ie. musical instrument) and for how long?
2. Can you read music? Yes, No
3. How often do you listen to music?
   * Daily (less than 15 minutes, less than 30 minutes, less than 1 hour, longer ________)
   * 1-3 times per week, 4-7 times per week
   * Other ____________________

4. Do you ever use music to help cope with pain?
5. What is your favorite music?
6. How do you use music in your life? Circle ones that apply.
   (Relaxation, Dance, Background Music, Therapeutically, and Other________________)

Pain Background Information

1. What causes you to experience current pain? (eg. arthritis, cancer, injuries)
   Please specify: ____________________

2. How often and what type of analgesics do you use for your pain?

3. How long have you had your pain for which you are currently being treated?

4. What is your goal in attending this pain program?

5. What is your most immediate objective in participating in this program/ study?

APPENDIX B

APPENDIX B

MUSICAL EXCERPTS USED TO DETERMINE PREFERENCE BETWEEN CLASSICAL AND CONTEMPORARY MUSICAL GENRES

1. Mozart: Horn Concerto No. 3, 2nd Movement
2. Schumann: Traumerei
3. Bach: Oboe Concerto in D minor, Adagio
4. Brahms: Intermezzo in A major, Op.118, No. 2, Andante teneramente
5. Enya: "Watermark" from the album Watermark
6. Kenny G: "Forever in Love" from the album Breathless
7. Eric Tingstad and Nancy Rumbel: "Shannandoah" from the album Legends
8. David Lanz: Piano solo "Leaves on the Seine" from the album Nightfall

APPENDIX C

APPENDIX C

MUSIC SELECTIONS USED FOR THE MUSIC AND CHRONIC PAIN STUDY

Tape 1: Category - Classical (Instrumental)

1. Mozart: Horn Concerto No. 3, 2nd Movement [4'18]
   Sebastia Weigle, horn; Dresden Philharmonic; Jorg-Peter Weigle, conductor
2. Schumann: Traumerei [3'05]
   Budafest Strings
3. Bach: Oboe Concerto in D minor, Adagio [3'03]
   Burkhard Graetzner, oboe; New Back Collegium Musicum; Max Pommer, conductor
4. Brahms: Intermezzo in A major, Op.118, No. 2, Andante teneramente [8'49]
   Ivo Pogorelich, piano

Tape 2: Category - Classical (Instrumental)

1. Mozart: Clarinet Concerto KV 622: Adagio [6'56]
   Bela Kovacs, clarinet; Franz Listzt Chamber Orchestra; Janos Rolla, conductor
2. Handel: Largo, from "Xerxes" [3'01]
   Budapest Strings
3. Dvorak: Symphony No. 9. "From the New World", 2nd movement [the first 5'03 of the movement]
   Prague Festival Orchestra; Pavel Urbanek, conductor
4. Beethoven: "Moonlight" Sonata; Adagio sostenuto [5'22]
   Evelyne Dubourg, piano

Tape 3: Category - Classical (Instrumental)

1. Mozart: Clarinet Concerto KV 622: Adagio [6'56]
   Bela Kovacs, clarinet; Franz Listzt Chamber Orchestra; Janos Rolla, conductor
2. Handel: Largo, from "Xerxes" [3'01]
   Budapest Strings
3. Dvorak: Symphony No. 9. "From the New World", 2nd movement [the first 5'03" of the movement]
   Prague Festival Orchestra; Pavel Urbanek, conductor
4. Bach: Minuet in D minor, BWV Anh, 132 [1'10]
   Karl-Heinz Passin, flute; Walter Heinz Bernstein, harpsichord
5. Schubert: Entr'acte No. 2 from "Rosamunde" [8'16]
   Budapest Philharmonic; Janos Kovacs, Conductor

Tape 4: Category - Classical (Instrumental)

1. Bach: Chorale "Jesus always is my gladness", BWV 992 [3'31]
   Wolfgng Basch, trumpet; Wolfgang Rubsam, organ
2. Gluck: Orfeo ed Euridice [2'30]
   Southwest German Chamber Orchestra; Wilhelm Keitel, conductor
3. Mozart: Piano Concerto No. 21 in C major, K. 467 "Elvira Madigan", Andante [5'34]
   Svetlana Stanceva, Piano; Mozart Festival Orchestra; Alberto Lizzio, conductor
4. Mozart: Concerto for flute, harp and Orchestra in C major, K. 299, Andantino [8'34']
   Akiko Miyazashi, flute; Taki Ozawa, harp; Orchestre du Festival Belgique; Pierre Narrato, conductor

APPENDIX C:
MUSIC SELECTIONS USED FOR THE MUSIC AND CHRONIC PAIN STUDY (CONT'D)

Tape 5: Category - Contemporary (Instrumental)
1. Enya: "Watermark" from the album Watermark [2'24]
2. Kenny G: "Forever in Love" from the album Breathless [4'58]
   Kenny G, Soprano Saxophone; Paulinho Da Costa, Percussion; Dean Parks, Guitar
3. Kenny G: "The Wedding Song" from the album Breathless [3'21]
   Kenny G, Soprano Saxophone; Walter Afanasieff, Piano; William Ross, String Arrangements & Conductor
4. Eric Tingstad and Nancy Rumbel: "Shannandoah" from the album Legends [5'37]
5. David Lanz: Piano solo "Leaves on the Seine" from the album Nightfall [5'37]

Tape 6: Category - Contemporary (Instrumental)
1. David Lanz: Piano solo "Nightfall" from the album Nightfall [7'11]
2. Soo-Chul Kim: Taekuem title from the sountrack of movie "Sopyonje" [4'43]
3. Eric Tingstad and Nancy Rumbel: "The Eyes of Amelia" from the album Legends [5'50]
4. Howard White: "Ocean Song" with waves, [2'00 exerpt]

Tape 7: Category - New Age and Contemporary (Instrumental)
1. Eric Tingstad: "A sense of place" from the album A Sense of Place [4'32]
2. Eric Tingstad: "Soveriegn of the Sea" from the album A Sense of Place [5'05]
3. Shadowfax: "Angel's Flight" [5'05]
4. Howard White: "Ocean Song" with waves [5'00 excerpt]

Tape 8: Category - A subject's choice, Popular Orchestral Arrangements
Henry Mancini, conductor [20'00 exerpts of the cassette recording furnished by the subject]

APPENDIX D

APPENDIX D

DAILY EXPERIMENTAL SURVEY

Name: ____________________
Date: ____________________ Experimental Session Number: ___________

1. How much attention did you focus on music listening today?

0	10	20	30	40	50	60	70	80	90	100
No Attention										Full Attention

2. How much did you enjoy the music you heard today?

Dislike	1	2	3	4	5	6	7	Like
	Very Much	Moderately	Mildly	Neither	Mildly	Moderately	Very Much	

3. How would you rate your level of relaxation while you were listening to music?

0	10	20	30	40	50	60	70	80	90	100
No Relaxation										Full Relaxation

4. How much control did you feel you had over your pain while you were engaged in listening to the music?

0	10	20	30	40	50	60	70	80	90	100
No Control										Full Control

5. Please rate how much you enjoyed participating in today's Music experiment?

Dislike	1	2	3	4	5	6	7	Like
	Very Much	Moderately	Mildly	Neither	Mildly	Moderately	Very Much	

APPENDIX E

APPENDIX E

MUSIC LISTENING AND ATTENTION ENHANCEMENT STRATEGY

During next portion of the study, you are asked to listen to music carefully and verbally report your subjective response to the music, using the list provided in the following page. First, you will choose one of the descriptors from each of the categories that seem most appropriate to describing your subjective response to the music listening experience. Along with your choice of descriptor, you are asked to give a detailed explanation about the reason behind your choice in the descriptive you chose. In other words, you are asked to give your rationale for the descriptive you chose. For example, upon listening to a music selection, one may choose the color "blue" to describe his/her music listening experience, and a statement such as the following will be verbalized by the subject: "I'd say this music is Blue, because it has some parts that made me think of a water fall". Your subjective response to any music you will hear is clearly personal and will be considered valid as long as you can give a clear rationale for the descriptive you chose to describe your music listening experience.

Attention Enhancement Strategy: Verbalization (Imagery) Guideline

I. Color (eg. White/ Black/ Red/ Blue/ Yellow...etc.)

II. Configuration (eg. Triangle/ Square/ Circle/ Hexagon...etc.)

III. Physical Activity (eg. Walk/ Jump/ Hop/ Skip/ Run/ Dance/ Swim/ Boxing...etc.)

IV. Season (eg. Spring/ Summer/ Fall/ Winter/ Christmas/ Easter/ Thanksgiving...etc.)

V. Place (eg. Caribbean/ Europe/ South America/ Bay City...etc.)

VI. Food (eg. Steak, Salad, Beans, Soup, Bread..etc.)

VII. Person (ie. anyone you music allows you to think of)

APPENDIX F

APPENDIX F

EXIT INTERVIEW

Name: ____________________ Date: ______________

1. Did music seem to help you deal with your pain?
   Yes/ No
2. If answer to #1 is "yes", describe how it did that in your own words or by choosing from following list of words.
   (a) Relaxation
   (b) Distraction away from the pain sensation
   (c) Mood changing to a positive direction
   (d) Don't know why
   (e) Other ______________________________
3. If answer to #1 is "no", what did you experience?
   (a) Annoyance
   (b) Difficulty concentrating on the task
   (c) Anxiety
   (d) Increased pain sensation
   (e) Other ______________________________
4. Would you use music to help with your pain?
   Yes/ No
5. Is there anything you would have liked done differently? If so, please describe.

Thank you very much for your participation in the study. Your contribution helped us with furthering our knowledge in how we might use music to help those who are suffering from chronic pain conditions.

APPENDIX G

APPENDIX G

SHORT FORM McGILL PAIN QUESTIONNAIRE

SHORT-FORM McGILL PAIN QUESTIONNAIRE (SF-MPQ)

RONALD MELZACK

PATIENT'S NAME ____________________ DATE __________

	NONE	MILD	MODERATE	SEVERE
THROBBING	0) ______	1) ______	2) ______	3) ______
SHOOTING	0) ______	1) ______	2) ______	3) ______
STABBING	0) ______	1) ______	2) ______	3) ______
SHARP	0) ______	1) ______	2) ______	3) ______
CRAMPING	0) ______	1) ______	2) ______	3) ______
GNAWING	0) ______	1) ______	2) ______	3) ______
HOT-BURNING	0) ______	1) ______	2) ______	3) ______
ACHING	0) ______	1) ______	2) ______	3) ______
HEAVY	0) ______	1) ______	2) ______	3) ______
TENDER	0) ______	1) ______	2) ______	3) ______
SPLITTING	0) ______	1) ______	2) ______	3) ______
TIRING-EXHAUSTING	0) ______	1) ______	2) ______	3) ______
SICKENING	0) ______	1) ______	2) ______	3) ______
FEARFUL	0) ______	1) ______	2) ______	3) ______
PUNISHING-CRUEL	0) ______	1) ______	2) ______	3) ______

PPI

0 NO PAIN ____

1 MILD ____

2 DISCOMFORTING ____

3 DISTRESSING ____

4 HORRIBLE ____

5 EXCRUCIATING ____

NO PAIN |———————————————| WORST POSSIBLE PAIN

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