THE EFFECT OF MUSIC THERAPY ON MOOD, PERCEIVED EXERTION, AND EXERCISE ADHERENCE OF PATIENTS PARTICIPATING IN A REHABILITATIVE UPPER EXTREMITY EXERCISE PROGRAM

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ABSTRACT

The purpose of this study was to investigate the effects of music therapy on perceived exertion, mood and exercise adherence of patients participating in a group upper extremity exercise program. Twenty two patients ranging in age from 22 to 86 participated in a occupational therapy upper extremity exercise (OT-UEE) program and a music therapy upper extremity exercise (MT-UEE) program for two consecutive days. Rating of Perceived Exertion (RPE) and Feeling Scale (FS) were used for participants to rate their perceived exertion levels and mood change respectively. Each session was videotaped for data collection. Analysis of data revealed that the use of music during exercises significantly reduced perceived exertion (p=0.0011) and enhanced mood (p=0.0401), although patients' exercise adherence between the two groups was not significantly different. The physiological and psychological benefits of music on rehab patients which were shown through examination of patients' perceived exertion and mood changes suggest potential benefits for exercise performances.

DEDICATION

This thesis is dedicated to my father, who has taught me through his obedience to God's Word, and my mother who brought me up with ceaseless prayers.

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It was a somewhat long journey with God. It was He who led me to begin studying in music therapy and opened a way to complete this piece of work when I had no ability to do it. And it was He who led me to confess all that I am and all that I have to Him for Him to use. I am grateful to my Lord God that He has been with me during this journey and led me through hardships which were blessings in disguise.

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CHAPTER I

INTRODUCTION

Physical Rehabilitation

Rehabilitation is the process of restoring or improving an individual's ability to perform the normal activities of daily living as independently as possible following a disabling disease or injury (Blue Cross Blue Shield of Nebraska, 2006; Miller & Keane, 1978). Accordingly, physical rehabilitation programs involve various medical and clinical interventions to help patients achieve the maximum degree of independence possible by addressing each patient's physical, psychological, and social/emotional needs (Peters, 2000). Currently, it is reported that fifty percent of persons over age 65 in the United States (or 31 million people) have some level of disability. Also, nine million people across all ages have severe disabilities requiring personal support for activities of daily life (ADL), and one in eight children ages 6 to 14 has some kind of disability. In addition, a high percentage of people in the United States suffer from back pain, chronic pain, stroke, and traumatic brain injury and spinal cord injury (University of Utah Health Sciences Center, 2003).

According to the Bureau of Labor Statistics of the United States (2006), the demand for rehabilitation will continue to increase as a result of: (a) growth in the elderly population who may have high incidences of disabling conditions and need therapeutic services, (b) baby-boomers' movement into middle age, a period when the incidence of heart attack and stroke increases, (c) advances in medical technology which helps save both a higher percentage of newborns with severe birth defects and trauma victims who may need extensive rehabilitative care. Therefore, it is anticipated for the rehabilitation population to continue to increase and for their needs to become more demanding and challenging.

Interdisciplinary Team Approach

Patients treated in medical rehabilitation programs are often a very heterogeneous group consisting of patients with amputations, arthritis, cancer, cardiac disease, neurological problems, orthopedic injuries, spinal cord injuries, stroke, traumatic brain injury, and multiple sclerosis. Each patient has different types of illnesses or disabilities, severity of the impairments, physical conditions and ages. In addition, a patient's deficits resulting from any physical illness or injury are diverse and complicated by medical, physical, functional, communicative, behavioral, cognitive and/or social deficits (Kennelly & Brien-Elliott, 2001). As a result, each patient's needs and required support services vary greatly (Peters, 2000).

Working with these patients necessitates interdisciplinary team work consisting of a variety of health care professionals including physiotherapy, occupational therapy, speech and language therapy, psychology, nursing and medical care, dietetics, dental care and social work (Magee, 1999). The interdisciplinary team works together in assessing a patient, selecting two to three focus areas based on the assessment, and sets interdisciplinary goals for the patient's rehabilitation program from the selected focus areas. Then, each discipline formulates discipline specific goals in order to address interdisciplinary goals (Lee & Baker, 1997). Team members often plan and coordinate each patient's treatment, and if necessary, therapists of two or three different disciplines may implement treatment programs together (Kennelly & Brien-Elliott, 2001; Magee, 1999).

Music Therapy in Physical Rehabilitation Program

Music therapy services, as a part of an interdisciplinary team, have also been used to assist in the physical recovery and health maintenance of patients (Paul & Ramsey, 2000) due to its distinctive characteristics. Firstly, since music processes in the brain in unique ways, namely, activates both sides of the brain simultaneously, it has great potential to create additional neurological pathways utilizing a patient's unimpaired abilities. Patients with brain injury or stroke may be able to relearn or acquire necessary skills through these new pathways (Peters, 2000). Secondly, because music can create both motor and emotional responses through auditory, visual, and tactile sensory stimulation, it can not only facilitate physical movements and/or create a diversion from a painful workout, but can improve emotional states as well (Karageorghis & Terry, 1997; MacRae, 1992). Thirdly, since music is not only a pleasurable and intrinsically motivating activity and is easily adjustable to each individual's needs and functioning levels (Dissick, 2005), it can facilitate patients' consistent participation during serious and strenuous physical rehabilitation programs. Lastly, since music can relax the body, it may alleviate the discomfort and difficulties related with exercise and therapy activities and decrease pain perception (Paul & Ramsey, 2000).

Clinical and research literature demonstrates that music therapy in conjunction with other therapies has improved physical and social/emotional functioning of patients in rehabilitation programs. This includes motor function such as motor coordination, motor planning and range of motion (Brunk, 1992; Clair, 1996; Cofrancesco, 1985; Sandness, 1995; Staum, 1983, Thaut, 1999), various cognitive functions such as alerting and orienting responses, reality orientation, attention span, memory (Boyle & Greer, 1983; Brunk, 1992; Claeys, Miller, Dalloul-Rampersad, & Kollar, 1989; Sandness, 1995; Thaut, 1999), communication skills (Cohen, 1988; Cohen, 1992; Kennelly & Brien-Elliott, 2001), pain control (Rider, 1985; Wolfe, 1978), and social/emotional skills (Amir, 1990; Barker & Brunk, 1991; Claeys et al, 1989; Magee, 1999; Nagler & Lee, 1989).

Music Therapy and Upper Extremity Exercise Program

Upper extremity exercise programs designed to address the independent use of arms and hands are often considered the most essential part of the rehabilitation program (Blackburn, 1987). This is because limited upper extremity movements cannot only prevent patients from performing activities of daily life at home and work environments, but also may result in physical imbalance and inefficient movements of overall physical activities (Kim & Koh, 2005). The upper extremity exercises in rehabilitation programs are designed and implemented by occupational therapists and commonly occur in a form of group treatment. Utilizing group treatment is getting more attention, since it has not only decreased labor costs, but increased the speed of patients' recovery (Duncombe & Howe, 1995; Trahey, 1991).

Patients in physical exercise programs often do not participate to their full potential due to physical pain and discomfort, emotional distress, feeling of loss, and/or worries for the future, although they understand the importance of the exercise programs. As one approach to facilitating patients' participation in an exercise program, music therapy can address their physical and emotional/psychological needs and difficulties. Studies of music in exercise have demonstrated that music cannot only facilitate physical activity and rhythmic participation (Alvin, 1966; Morris, 1986), but also motivate participants psychologically (Beckett, 1990; MacNay, 1995) and improve their emotional states (Hanser & Thompson, 1994; MacRae, 1992). In addition, music can decrease exercisers' perceived pain and exertion and alleviate discomfort (MacNay, 1995; Thornby, Haas & Axen, 1995) since music may provide exercisers a means to dissociate from perceptions of pain and fatigue (Copeland & Franks, 1991).

A large body of research regarding the therapeutic use of music in exercise programs has shown positive effects in patients' physical and psychological/ emotional conditions. However, there are few studies which examined the effects of music on psychological perception and emotional states of patients participating in upper extremity exercise programs. It is possible that music can positively influence patients' psychological perception and mood during exercises, and this improved psychological and mood states, in turn, may improve performance (Hohler, 1989; Lucaccini & Kreit, 1972). Therefore, there is a need to examine the effects of music on psychological perception and mood of patients participating in group exercise programs.

Purpose of Study

The purpose of this study was to determine the effect of music therapy on psychological perception of exertion and mood of patients participating in a group upper extremity exercise program. More specifically, this study examined if patients who participated in a group music therapy upper extremity exercise (MT-UEE) program reported lower perceived exertion in comparison to a group occupational therapy upper extremity exercise (OT-UEE) program. Also, this study examined if patients who participated in a group MT-UEE program reported improved mood states when compared to a group OT-UEE program. Lastly, this study examined if patients participating in a group MT-UEE program had greater adherence to the exercises when compared to a group OT-UEE program.

CHAPTER II

REVIEW OF LITERATURE

Rehabilitative Upper Extremity Exercise

Patients with physical impairment often experience decreased joint range of motion, decreased coordination, decreased strength and increased pain and discomfort upon movement (Paul & Ramsey, 2000). Consequently, patients are more likely to be inactive and spend much time on bed rest and, over time, this prolonged inactivity can worsen the patient's physical and psychological conditions (James, 1987).

Upper extremity exercise in physical rehabilitation is designed to improve upper extremity strength, coordination, endurance and range of motion. Based on assessment by an interdisciplinary team, patients with physical impairment may be assigned to an upper extremity exercise group where individual patients work together with other patients to accomplish individual goals. Kim and Koh (2005) emphasized the importance of upper extremity exercise in the rehabilitation process of stroke patients. They pointed out that limited upper extremity movements can result in inefficient movements of other body parts including lower extremity movements such as gait (Nashner & Forssberg, 1986), reduced ability of body turning, and decreased ability to control body postures (Hwang, 1998). They concluded from these studies that upper extremity exercises are important for supporting patients' physical balance and efficient movements.

In spite of the importance of the upper extremity exercise, patients do not often participate to their full potential due to the following reasons. Firstly, patients may experience pain and discomfort and be afraid of further injury, since exercise programs commonly begin immediately after surgery or invasive procedures. Secondly, patients may lack motivation to exercise thinking that exercise does not help, and/or be frustrated since the process of recovery requires extended time with few observable improvements (Dishman, 1982; Lee & Nantais, 1996; Maranto, 1993). Thirdly, patients may get bored of repeated movements. Kim and Koh (2005) point out that repeated movements are likely to bring out negative thoughts and feelings in patients and consequently, subsequent frustration may intensify patients' perceived pain. Lastly, patients may become lethargic due to depression, emotional difficulties, feeling of loss, and/or concerns for their health, finances, and future.

The upper extremity exercise program in a medical setting is usually designed and implemented by occupational therapists. The main goal of occupational therapy is to help people with physical and psychological needs maximize their ability to perform activities of daily life (ADL) at home and work environments (Bureau of Labor Statistics, 2006). ADLs include a wide range of daily living skills from washing, using the toilet, grooming and dressing to handwriting, computer use, driving, cooking, housekeeping, or the tasks that an individual is expected to perform in a work setting. In this context, the upper extremity exercise program is provided as a prerequisite for further occupational performance development (Hill, 1986).

Patients' compliance with a regular exercise routine is vital to a patient's recovery process (Murrock, 2002). Occupational therapists or other staff who are implementing the exercise program need to keep encouraging patients to do their best since only time and effort can increase patient's endurance and improve their health conditions. However, it may be challenging for occupational therapists to maintain patients' motivation during a regular exercise routine because of pain and discomfort, lack of motivation and/or emotional/psychological difficulties as discussed earlier. Therefore, there is a need for creative strategies that facilitate and motivate patients' participation in rehabilitation exercise program by addressing patients' physical and emotional/psychological needs and difficulties. One approach to facilitate patients' participation in an exercise program is enhancement provided by music.

Music Therapy and Rehabilitative Upper Extremity Exercise Program

Incorporating music with rehabilitative physical exercise has been found to have positive therapeutic effects by enhancing the experience, improving patient's engagement and mood, and/or decreasing negative perceptions of difficulty, monotony, and discomfort related to exercise (Lee & Nantais, 1996; MacRae, 1992; Murrock, 2002; Paul & Ramsey, 2000; Purdie, 1997; Purdie & Baldwin, 1994). In this section, how music therapy can enhance patients with physical impairment to participate in rehabilitative upper extremity exercise program will be discussed as follows:

Music can function as physical enhancement.

Music can function as psychological motivator.

Music can facilitate positive mood change.

Music can reduce one's perception of exertion.

Music as Physical Enhancer in Exercise

Music has been shown to be very effective in enhancing exercise, since it provides structure helpful for patients to carry out their exercise regimen (Claeys et al., 1989; Cofrancesco, 1985; Johnson, Otto, & Clair, 2001; Paul & Ramsey, 2000; Purdie, 1997; Thaut, Schleiffers, & Davis, 1991). When music is heard, the rhythmic component of the music stimulates and triggers motor movements. Repetitive rhythmic auditory stimuli tend to synchronize with motor neural activity during a rhythmic motor behavior (Rossignol & Melville Jones, 1976). It functions as an external timekeeper and tends to entrain movement frequencies (Thaut, McIntosh, Rice, Miller, Rathbun, & Brault, 1996). A body of research has established that a neurological technique called rhythmic auditory stimulation (RAS) has been effective in gait rehabilitation with a variety of patients such as those with stroke (Thaut, McIntosh, Rice, & Prassas, 1993), Parkinson's disease (Thaut et al, 1996), traumatic brain injury (Hurt, Rice, McIntosh, & Thaut, 1998), cerebral palsy (Thaut, Hurt, Dragan, & McIntosh, 1998), and burn injury patients (Chen, 2004). RAS has been successfully used to promote the recovery of functional, stable, and adaptive walking patterns of patients.

Thaut, Schleiffers and Davis (1991) investigated the effect of auditory rhythm on muscle activity of one's upper extremities during the performance of a gross motor task through electromyographic (EMG) studies. They first had twenty-four participants repeatedly perform up and down swings of the forearm in a personal tempo for a pretest condition. Then, they added an auditory beat to match the internal rhythm for the posttest condition. The results of this study found that the use of auditory rhythm superimposed on a regular activity of upper extremity improved muscle activity to be smoother and therapeutically favorable by decreasing variations of muscle activity during motor performance and increasing duration of muscular activity. Similarly, Johnson, Otto and Clair (2001) found when comparing music and no music conditions that exercisers in the music condition complied better with the movement contours and range of motion indicated for desired functional outcomes. In contrast, exercisers in the no music condition tended to move in more various frequencies depending on each individual's physical functioning levels, although each movement was demonstrated by a leader throughout its prescribed duration at a tempo set by a metronome. It seems that the inherent rhythm of music functions to cue pacing of exercise movements encouraging fluid and full-range movements. These findings from both studies support that auditory rhythm of music, providing a structure for movement, can improve muscle movement of upper extremities by modifying onset, duration, and variability.

In addition to rhythm, the other components of music, i.e., melody, harmony, meter, phrasing, volume, pitch, intensity, and timbre, can be utilized to provide cues for temporal, spatial, and force patterns of exercise movements, which is labeled as patterned sensory enhancement (PSE). For example, low and high pitches can indicate target points in the vertical plane, ascending melodic lines can mean upward movement and descending lines, downward movement or long sound duration can represent an extended and even movement trajectory. For music therapists, applying

PSE principles to an exercise regimen may be somewhat challenging because it requires both a deep understanding of the principles and confident improvisational and compositional skills. When incorporating PSE principles into an exercise program, music therapists need to establish isomorphic analogies of music and movement structure initially. Then, they need to illustrate essential movement parameters with various musical elements (Thaut, 2005). Regardless of these challenges, the principles of PSE and its applications are useful when music is incorporated into therapeutic exercises since it can provide additional multidimensional cues to patients.

In summary, music has great potential as a therapeutic tool to enhance physical movement. Music provides not only structure for movement encouraging fluid and full-range movements, but also multidimensional cues to facilitate exercise movements.

Music as Psychological Motivator in Exercise

Patients in a rehabilitation unit of a general hospital often face sudden changes in various aspects. In many cases, while still in the acute phase of their illness or accident, a patient may undergo surgical or invasive procedures, participate in several assessments, and meet with medical personnel and staff from several disciplines and begin therapy programs (Kennelly & Brien-Elliott, 2001). The patients are often required to participate in daily therapy in a wide range of disciplines. The length of a patient’s stay may be relatively short due to expensive medical cost and may vary from a few days to a few weeks depending on the patient’s needs and condition.

Often, patients are discharged before treatment is completed with subsequent transfer to a rehabilitation-focused health facility as an outpatient.

A patient's motivation during this period plays an important role in determining the outcome of therapy (Upton & Finlayson, 1987). It is believed that motivated patients perform better in rehabilitation programs and make more gains from treatment than those patients who are less motivated (Maclean & Pound, 2000). However, patients during this period may be overwhelmed with the lifestyle changes, physical pain, feeling of loss, and worries for the future, and may be frustrated when observable improvement seems minimal. As a consequence, the patients may lack motivation to participate in the assigned exercise regimen thinking that exercise does not help their physical and other conditions (Dishman, 1982; Lee & Nantais, 1996; Maranto, 1993). Furthermore, repeated exercise movements may make patients bored, exacerbate patients' emotional and psychological conditions by bringing out negative thoughts and feelings as discussed earlier (Kim & Koh, 2005) and/or make patients perceive pain and exertion more intensely.

Recognizing the importance of maintaining patients' motivation and quality of life, therapists in rehabilitation program pursue and utilize purposeful and meaningful activity for specific motor patterns (Lee & Nantais, 1996). In this vein, music therapy can be an effective treatment modality for rehabilitation programs, since it provides a purposeful and enjoyable activity for specific motor movements through instrument playing (Kennelly & Brien-Elliott, 2001). In addition, since music therapy provides both auditory and physical feedback to patients (Kennelly & Brien-Elliott, 2001), patients may be more motivated, and may find it easier to follow the exercise regimen. Furthermore, music therapy can be interesting and motivating to patients reducing boredom and frustration which may come from repeated movement. Music therapy provides diverse therapeutic adaptations that address a patient's specific needs due to the multifaceted components of music and the wide range of methods and instruments available (Lee & Nantais, 1996; Thompson, Arnold, & Murray, 1990). These diverse sources of music therapy also enable music to match the current mood state of a patient and lead him/her into desired directions by changing the mood content of the music (Shatin, 1970).

An appropriate choice of instrument and method can not only help ensure patient's consistent participation in a given exercise regimen by motivating the patient psychologically, but also enable the patient to use specific muscles that should be worked on (Kennelly & Brien-Elliott, 2001). Kozak (1968) provided an adult male with polio keyboard instruction in order to improve finger strength and to keep distal finger joints partially flexed in a playing position. Results indicated that functioning of the patient's right hand improved through keyboard playing. Zelazny (2001) conducted a similar study to examine the effects of keyboard playing on the management of hand osteoarthritis in four older adults. Results of the study demonstrated positive changes in finger pinch meter and range of motion, although it varied from participant to participant. Also, three of the four made statistically significant improvements in finger strength/dexterity. While two participants showed significant decreases in perceived arthritic discomfort after piano playing, all participants expressed enjoyment in the treatment rating 3 or higher on a 5-point Likert scale. During the study, participants voluntarily remarked on potential benefits of music such as socialization and leisure opportunities for older adult patients. Results from both studies showed positive effects of active music making as an exercise tool, because keyboard playing functioned as both a physical enhancer and psychological motivator.

A study by Cofrancesco (1985) investigated the effects of playing a musical instrument on the improvement of hand grasp strength and functional tasks with three participants with cerebrovascular accident in rehabilitation settings. The 30-minute individual music therapy sessions were provided to each patient for three weeks with five sessions per week and a multiple baseline design used for analysis. Results indicated that implementation of music therapy treatment improved all participants' hand grasp strength, motor movement, coordination and functional skills. Lee and Nantais (1996) reported the effects of an electronic music program on rehabilitation of gross and fine motor skills of patients with spinal cord injury (SCI) in Toronto, Canada. Patients with SCI formed musical bands and played their preferred songs by activating upper extremity exercise devices of the computerized music program. Patients indicated that the music program was more challenging, but more enjoyable than rote exercise. They also expressed that they had enjoyed choosing which songs to play, playing in a band, and public performance. Moreover, patients indicated not only physical improvement, but also, improved self-esteem, emotional expression and peer support. Overall, patients, therapists, and public response have been positive because the music program highlighted each person's ability, not physical disability.

Taken together, music can complement one's physical rehabilitation by psychologically motivating and encouraging patients. Hence, creative, innovative and individualized music therapy approaches will warrant maximizing therapy outcomes of one's physical rehabilitation.

Music and Mood in Exercise

Patients in physical rehabilitation may often experience decreased levels of physical ability, spontaneous communication, independence, control, and/or comfort which may cause negative impact on the various aspects of one's life (Brown & Kelly, 1976; Magee & Davidson, 2002; Purdie & Baldwin, 1994; Winograd, 1995). Some patients, due to their life-long disabilities, might lose their jobs and have financial difficulties. Patients might also experience marital or sexual problems and difficulties in relationships with family members or close friends (Purdie & Baldwin, 1994). In addition, patients may become stressed when putting physical, emotional, and financial burdens on family and relatives (Lee & Nantais, 1996).

This combination of physical, functional, communicative and cognitive deficits and the difficulties and concerns that may be caused by these deficits such as losing a job, financial difficulties, marital or sexual problems, and/or difficulties in relationship with family members or friends could have a profound psychological impact on patients with physical impairments (Purdie & Baldwin, 1994). As the treatment progresses, patients may experience changes in their body image (Brown &

Kelly, 1976) and lose prestige and power and consequently, self-confidence (Purdie & Baldwin, 1994). Some patients may suffer from mood disorders including depression and withdrawal (Magee & Davidson, 2002; Purdie & Baldwin, 1994). When given therapeutic tasks which seem impossible or are perceived as insulting, patients may respond negatively and even show resentment or become negative toward their situation or therapist's eagerness to promote their potential. Furthermore, some patients may avoid new activities or unrealistic attempts to be independent which can cause greater anger and frustration (Purdie & Baldwin, 1994). It seems that these psychological deficits can influence individuals' quality of life, motivation and mood in the process of rehabilitation keeping them from returning to optimum levels of functioning even after completion of treatment. Therefore, it is essential to address psychological concerns and needs of patients with physical impairment during physical rehabilitation.

A substantial body of research has indicated that music creates emotional and physiological reactions in listeners (Blood, Zatorre, Bermudez, & Evans, 1999; Kenny, & Faunce, 2004; Krumhansl, 1997; Wale, 1985). In a study investigating the relationship between music and affect, Wales (1985) found that music with a positive disposition (upbeat/stimulative) lowered levels of anger, fatigue, and depression significantly more than music with a negative disposition (slow/sedative). Krumhansl (1997) revealed that music in a major key and with a rapid tempo produced a feeling of happiness in participants while music in a minor key and with a slow tempo induced a feeling of sadness. A study employing a PET scanning technique reported that music consisting of consonant sounds created positive emotions in listeners since it stimulated parts of the brain associated with pleasure, while music consisting of dissonant sounds created negative emotions in listeners, because it stimulated parts of the limbic system associated with unpleasant emotion (Blood et al., 1999).

Thus, music has been known to influence one's emotion because of the inherent structural characteristics that may express a certain emotional content or mood within a given culture. In addition, since music can intensify a given message with textual information or visual image, or certain music may retrieve memories and feelings of past events, well chosen music has a great potential to improve one's emotional states while listening (Gfeller, 1999). Therefore, it is not surprising that music as a therapeutic medium has been used to improve one's emotional/ psychological state, for instance, improving depressed mood and self-esteem (Hanser & Thompson, 1994) and reducing anxiety (Augustin & Hains, 1996). A body of research has shown that a diverse range of patient populations have experienced positive changes in mood as a result of music therapy including cancer patients (Burns, 2001), those with chemical dependency (Jones, 2005), depressed older adults (Hanser & Thompson, 1994), children coping with bereavement (Hilliard, 2001), battered women (Whipple & Lindsey, 1999), and forensic patients (Thaut, 1989).

Boutcher and Trenske (1990) investigated the effects of sensory deprivation and music on affect during the different intensity levels of exercise using the 10-point bipolar Feeling Scale (FS) (Rejeski, 1985). The FS is known as a sensitive measure of how an individual feels during exercise. Individuals may differ on FS during exercise even when they do not differ on perceived exertion, because fit and unfit individuals may respond differently at similar workloads and/or perceived exertion. The results of the study showed that the music condition created more positive affect than compared conditions at the moderate and heavy workloads, while no significant differences were found at the low load intensity. Magee and Davidson (2002) conducted a pilot study to examine the effect of music therapy on mood states of neurological patients using a single subject design. Fourteen participants each attended one individual music therapy session per week for two weeks. Results demonstrated significant differences between pre and post music therapy session in a positive direction in terms of composed – anxious, energetic – tired, and agreeable –hostile mood states. This study indicates that music therapy is an effective intervention to address patients' negative mood states in neurological patients even during a single short period of time. Similarly, Murrock (2002) examined the effects of music on the rate of perceived exertion and general mood of patients in a cardiac rehabilitation program. The results indicated that music significantly enhanced patients' mood during exercise, even though it failed to significantly reduce patients' perceived exertion. The researcher pointed out that patients' general mood was enhanced because music might have created positive emotional states and stimulate more enjoyable memories.

The results of these studies support positive effects of music on patients' mood in physical rehabilitation program, although there is no study available on patients participating in upper extremity exercise. Since primary emotional change can significantly influence therapeutic outcome (Kerr, Walsh, & Marshall, 2001), music has great potential as a therapeutic tool by facilitating positive mood changes, and increasing affective response (MacRae, 1992).

Music and Perceived Exertion in Exercise

How an individual perceives an exercise program that he/she is participating in has been an interesting and significant topic in the history of exercise science, because the perception of physical activity one develops while exercising may greatly influence continuation of that exercise (Patton, 1991). Particularly, perceived exertion, the subjective estimates of physical exertion and intensity of exercise, is considered very important to those who prescribe exercise for patients with physical impairment. This is because patients are more likely to engage in the assigned exercise when the comfort level and intensity of exercise fits with the patient.

Perceived exertion is a complex phenomenon because it is subjective, and an individual's perceptual response to exercise is influenced not only by physiological variables and environmental factors, but also by extraneous psychological variables (Borg, 1970). According to Morgan (1973), approximately one-third of the variance remains unexplained after physiological input is considered. Hence, emotional, motivational, and informational factors may play a significant role in the subjective assessment of exercise in addition to internal sensory information (Hardy, Hall, & Prestholdt, 1986). For instance, during exercise, memories of work situations and actual performances, the related emotions, and motivation can affect one's perception and performance along with many physiological cues such as heart rate (HR), oxygen consumption (VO_2), blood and muscle lactate, ventilation, and respiration rates, etc. (Borg, 1998)

Sport psychology researchers and practitioners have investigated the relationship between cognition and perceived exertion during exercise. Pennebaker and Lightener (1980) studied competition of internal and external information during physical exercise. In their study, the internal information implied a cognitive strategy called *association*, i.e., focusing on internal cues such as heart rate or pain during exercise, and the external information implied a cognitive strategy called *external focus*, i.e., focusing of attention on an external cue. The study showed that participants hearing their own breathing (*association*) reported more fatigue and effort than those hearing distracting street sounds (*external focus*). Padgett and Hill (1989) conducted a similar study comparing *external focus, association* and *dissociation strategies,* i.e., thinking about anything other than physical sensations. The results of the study demonstrated that *external focus* reduced effort on an endurance exercise task, stationary cycling, and reduced estimations of time duration, while increasing exercise endurance performance. Both studies attested that factors distracting one's attention from physical effort can decrease perceptions of physical symptoms and fatigue during exercise.

These results of both studies are compatible with principles relating to processing of stimulus information in the field of perception and cognition (Pennebaker & Lightner, 1980). First, is that the amount of information that can be processed at any given time is limited (Kahneman, 1973). This means that in a setting where both internal and external stimuli information are available, the processing of one can be limited by the processing of the other. Second, certain types of stimulus information get more attention than others. According to Berlyne (1960), stimuli that are novel, complex, or accompanied with motion will be more likely to be processed than redundant and simple stimuli information.

These principles lay the bases for why music can be effective in enhancing one's exercise. As the quantity of information that can be processed in a single moment is limited, music which an exerciser is listening to may be able to function as a distraction directing one's attention from sensations of fatigue (Karageorghis & Terry, 1997). In addition, as music or music therapy is a relatively novel and interesting stimuli and requires great attention, music is more likely to occupy one's attention. Therefore, music can improve exercise output by adding interest and positive experiences to monotonous and redundant exercise regimens and reducing physical exertion, fatigue and perception of discomfort.

Boutcher and Trenske (1990) examined the effects of sensory deprivation and music on perceived exertion and affect during exercise. They compared three experimental conditions consisting of control, sensory deprivation, and music at light, moderate, and heavy workloads. Participants wore opaque goggles and cottonball earplugs for the deprived condition. For the music condition, participants' favorite music was provided. The results showed that perceived exertion during the music condition was lower than the deprived condition and control condition at the low and moderate workload, while no significant differences existed at the heavy load intensity. These results imply that music as distraction can function effectively when the exercise intensity is low or moderate, but as the intensity increases, attentional switching from external stimuli, namely, music to sensations of fatigue will occur, as Rejeski (1985) had suggested.

Copeland and Franks (1991) investigated the effects of different types of music on rating of perceived exertion, heart rate (HR), and time to exhaustion during treadmill work. Twenty four subjects participated in three conditions – 1) Type A: loud, fast, exciting, popular music; 2) Type B: soft, slow, easy-listening, popular music; 3) no music. Results showed that slow, soft music reduced the perceived exertion for exercise, successfully functioning as an external focus of attention. However, fast, loud music did not significantly increase the physiological or psychological arousal, which is the opposite from their hypothesis. MacNay (1995) examined the influence of preferred music on the perceived exertion, mood, and time estimation of patients exercising in a cardiac rehabilitation program. Four participants alternated between preferred-music condition and no music condition over 15 sessions. Results demonstrated that participants one and three showed positive responses – decreased perceptions of exertion, elevated mood, and decreased time estimation scores during music condition, while participants two and four did not display any definitive trends. These results imply that preferred music listening has the potential to be beneficial to patients participating in rehabilitative exercise program, even though individuals' personality and characteristics may affect the exercise outcomes. Studies investigating the effects of music on the perceived exertion of exercisers or patients in rehabilitation program imply beneficial effects on patients in rehabilitative exercise programs, although there may be variable factors such as exercise intensity, individual characteristics, and type of music as discussed above. Future experimental designs should be examined after considering these variables.

Music therapists may be able to maximize the beneficial effects of music by carefully selecting music or creating music therapy intervention that can complement the rehabilitative exercise program. There are several factors to consider in selecting music for therapeutic purposes.

First of all, patients' music preferences, current mood, and sociocultural factors such as age, race, and ethnic background should be assessed (Good, Picot, Salem, Chin, Picot, & Lane, 2000; Murrock, 2002). In general, patients' preferred music is known to be very motivating, because preferred music may make the exercise program more enjoyable increasing positive mood. However, patients' preferred music during exercise program may cause patients to engage in singing along, and singing may distract them from their exercise program (Johnson, Otto, & Clair, 2001). The researchers recommended using unfamiliar instrumental music with a well-defined beat in order to enhance exercise adherence.

Secondly, tempo of music should be matched to the pace of exercise movements, with loudness level appropriately adjusted for sensory perception and the best comfort levels (Clair, 1996). In a rehabilitative exercise regimen consisting of warm-up stretches, active participation, cool-down and/or relaxation, music should be flexibly adjusted to each pace (Paul & Ramsey, 2000). Thirdly, when utilizing musical instruments, therapists need to create interventions and/or adapt learning styles that are suitable for the patient considering each patient's musical history, current musical interests, and musical competencies for successful experiences. If necessary and possible, diverse modalities such as visual, aural, and tactile stimulation can be combined to maximize outcomes (Zelazny, 2001).

Statement of Research Questions

This review of related literature has illustrated the potential effectiveness of music on mood and perceived exertion of patients participating in rehabilitative exercise programs. However, there have been limited studies examining the effectiveness of music on patients participating in rehabilitative upper extremity exercises, and even studies available on this topic have mostly focused on measuring functional outcomes (Cofrancesco, 1985; Kozak, 1968; Lee & Nantais, 1996; Thaut, Schleiffers, & Davis, 1991; Zelazny, 2001). Therefore, this study examined the effects of music on the perceived exertion and mood of patients participating in rehabilitative upper extremity exercise. Specific research questions are:

1) Did patients in a music therapy upper extremity exercise (MT-UEE) program experience a greater decrease in the rate of perceived exertion when compared to an occupational therapy upper extremity exercise (OT-UEE) program?

2) Did patients in a music therapy upper extremity exercise (MT-UEE) program experience a positive change in mood when compared to an occupational therapy upper extremity exercise (OT-UEE) program?
3) Did patients in a music therapy upper extremity exercise (MT-UEE) program have greater adherence to the exercises (as measured by number of repetitions and range of motion) when compared to an occupational therapy upper extremity exercise (OT-UEE) program?

CHAPTER III

METHOD

Participants

This study sampled twenty-two inpatients assigned to an upper extremity exercise program of the rehabilitation unit of a major medical center in Temple, TX. Twenty-two participants were required to detect a standard effect size of 0.8 between two groups (MT vs. OT) with 80% power at $\alpha=0.01$. Ten were male and twelve were female, age of the final sample ranged from 22 to 86 with a mean of 59.27 (SD=±15.65). Patients' diagnosis varied, so they were categorized into three groups; 1) Neuro, 2) Ortho/Orthosurgery/trauma 3) Others. Mean of time since patients' injury to the first day of research was 17.95 (SD=±10.44). The demographic information consisting of subject number, age, gender, diagnosis and time since injury was collected from each participant's chart (see Table 1).

The patients were approached and asked to participate in the study by the occupational therapists in charge of the program. The patients who met the following criteria participated in the study and served as their own controls: (a) referred to upper extremity exercise group led by an occupational therapist; (b) age 19 or older; (c) demonstrated cognitive skills through minimum score of 25 or above on the Mini Mental State Examination (MMSE), so patients could follow written and verbal instructions, and should not have any difficulties using the rating scales; (d) able to follow simple motor tasks, and (e) can consent to voluntary participation. While the criteria were used as guidelines for participation, a participant's doctor and/or

Table 1. *Demographic Characteristics*

Variable	OT-MT (*n*=11)	MT-OT (*n*=11)	Total (*N*=22)
Age	61.27±15.28 65 (28, 78)	57.27±16.50 59 (22, 86)	59.27±15.65 62.5 (22, 86)
Gender			
Male	4 (36.36%)	6 (54.55%)	10 (45.45%)
Female	7 (65.64%)	5 (45.45%)	12 (54.55%)
Diagnosis			
1	4 (36.36%)	5 (45.45%)	9 (40.91%)
2	2 (18.18%)	5 (45.45%)	7 (31.82%)
3	5 (45.45%)	1 (9.09%)	6 (27.27%)
Time since Injury to first therapy (days)	17.00 ±6.40 17 (9, 29)	18.91 ±13.63 15 (8, 54)	17.95 ± 10.44 15.50 (8, 54)

Note. For numeric variables, mean±SD and median (min,max) were listed. For categorical variables, frequency (percent) were listed.

therapist could override the criteria and each subject's participation.

Prior to the first session for each patient, an occupational therapist oriented the participant individually to the purpose and procedures of the study. To protect the rights of human subjects, each participant was informed that his privacy will be secured, his anonymity preserved, and that he can stop participation in the study at any time, for any reason, with no fear of disadvantages. The occupational therapist gave each participant the consent form (see Appendix A) and those who agreed to participate in this study signed the consent form. Then, the occupational therapist conducted a screening test with the Mini Mental State Examination (MMSE). In the first session with each patient, the researcher provided an explanation about the measurement instruments, *Feeling Scale*, and *Rating of Perceived Exertion*. All of the participants were encouraged to ask questions at any time throughout the study. Music therapy sessions were provided for both research participants and other patients not in the research pool.

Setting and Materials

The upper extremity exercise group met in an activity room of the unit for thirty minutes for two consecutive days except Tuesday, weekend, and holidays, because the unit has all-staff meeting on Tuesdays. The activity room is a spacious room with a fully functional kitchen and various kinds of occupational therapy tools. It is where occupational therapists meet their patients and work with them. During the group exercise program, the participants sitting in either a wheelchair or an arm chair with back support were positioned to form a circle with staff. A Yamaha portable keyboard (Model No.: NP-30) was used for live music and two Sony camcorders (Model No.: DCR-HC52 and DCR-HC36) were used for video recording. The researcher prepared an exercise protocol manual for occupational therapists. Several sets of copies of pre-Feeling Scale, post-Feeling Scale, and Rating of Perceived Exertion Scale clipped in a clipboard was provided for each patient in every session.

For warm-up stretching exercises, improvised keyboard music was created based on PSE principles in order to illustrate each movement of the exercises utilizing various musical elements such as melody, harmony, phrasing, pitch, intensity and timbre. Combinations of various musical elements created cues for temporal, spatial, and force patterns of exercise movements. Songs for thera-band exercises were selected considering several factors. Since music should enhance exercises, songs that are in duple meter, have a clear beat and a simple rhythm, and are appropriate for patients in terms of patients' age, cultural and religious background were considered. Also, since preferences of various patients in the group had to be considered in selecting music, familiar and well-recognizable songs were mostly decided. Although the researcher was aware that familiar or preferred songs may cause patients to engage in singing along and singing may distract them from exercises and unfamiliar instrumental music with a well-defined beat can enhance exercise adherence (Johnson, Otto, & Clair, 2001), it was observed with this exercise group that patients showed more positive affective responses with familiar sung music than instrumental music (keyboard music) or unfamiliar songs. When unfamiliar instrumental songs were played on keyboard to their exercises, some patients requested their favorite or familiar songs to be played or other patients expressed their preference of vocal music saying, "I liked your singing the other day." It seemed that while unfamiliar instrumental music may better enhance exercise adherence causing the least distraction, one's familiar or preferred songs may help to improve one's mood and psychological perceptions of the experience. Based on these points, the researcher made a song list, and in each session selected five songs for the five thera-band exercises from the list considering the make-up of participants for the day. The songs sung for thera-band exercises are listed in Figure 1.

Figure 1. *Songs Sung for Thera-band Exercises*

Beer Barrel Polka

Give My Regards to Broadway

Hail, Hail, The Gang's All Here

Hello My Baby

Here Comes the Sun

He's Got the Whole World

I've Been Working on the Railroad

Jesus Loves Me

Kum Ba Yah

Lean on Me

Oh! Susanna

Oh, When the Saints Go Marching In

Polly Wolly Doodle

Red River Valley

Take Me Home, Country Roads

Swing Low, Sweet Chariot

The Yellow Rose of Texas

This Land is Your Land

When the Rain Falls Down

Yankee Doodle Boy

Yankee Doodle Went to Town

Yellow Submarine

You Are My Sunshine

Research Design

After admission to the rehabilitation unit, patients are assessed and referred to various physical/occupational therapies by the unit's interdisciplinary team. Each patient's stay in the unit may vary from a few days to several weeks. Staff in charge of the upper extremity exercise group are informed approximately 24 hours before a patient actually joins in the program.

In consideration of these conditions, along with the need for development of empirical investigation in this area, a complete block design was chosen (see Figure 2). Each participant attended an occupational therapy upper extremity exercise program and a music therapy upper extremity exercise program. Each participant was assigned randomly but evenly to either AB (baseline-treatment) or BA (treatment-baseline) in order to control order effect. Because the number of participants in the exercise group at one time was unpredictable varying from two to ten, the experiment was repeated until twenty-two participants completed participation.

Figure 2. *Diagram of Experiment*

Phase	OT	MT	OT	MT	Continues..
AB	A (baseline)	B (Treatment)			
Day	1	2			
BA		B (Treatment)	A (Baseline)		
Day		1	2		
AB			A (Baseline)	B (Treatment)	
Day			1	2	

Occupational Therapy Upper Extremity Exercise (OT-UEE) Program

The occupational therapy upper extremity exercise (OT-UEE) program of the rehabilitation unit primarily consists of warm-up stretching exercises and five thera-band exercises (see Appendix B) designed to improve upper extremity strength, endurance, flexibility, range of motion and sitting tolerance. The warm-up stretching exercises consist of neck, wrist, elbow, arms, and shoulder stretching exercises. The thera-band exercises include five different movements such as flexion, extension, shoulder horizontal abduction, shoulder flexion, and shoulder abduction. The occupational therapy department of the hospital selected these movements from occupational therapy exercise kits (Yiu, 1990). Each exercise has a patient-friendly name like *Show Me the Money* for flexion, *Bear Claw* for extension, *Stretch Arms Strong* for shoulder horizontal abduction, *Paint the Fence* for shoulder flexion, and *Windshield Wiper* for shoulder abduction, so that patients can better remember the movements.

The Thera-bands® which occupational therapists are using have five different resistance levels determined by thickness of the band and are color-coded - yellow/ thin, red/medium, green/heavy, blue/extra heavy, black/special heavy. Occupational therapists determined the color of a thera-band given to each patient considering his/her level of physical function and target goal. The patients used the same color of thera-band for two research days. Participants were encouraged to do their best in performing each movement. However, when a participant needed to take a rest, he/she was allowed to do so, because each patient's level of physical function and target goals varied. An occupational therapist verbally introduced and demonstrated each desired movement at the appropriate tempo, while the music therapist counted repetitions during exercises and helped patients who need assistance. Three occupational therapists rotated through the program according to a regular schedule on the rehabilitation unit.

Music Therapy Upper Extremity Exercise (MT-UEE) Program

The process of the music therapy upper extremity exercise (MT-UEE) program is similar to the occupational therapy upper extremity exercise (OT-UEE) program. For the warm-up stretching exercises, improvised keyboard music which was created based on patterned sensory enhancement (PSE) principles was provided by the researcher to enhance subjects' participation in stretching exercises. For the thera-band exercises, participants exercised to live song music with strong rhythmic pulses played on keyboard. Initially, the researcher played one or two preparatory beats in harmonies to match each exercise's tempo. Then, she began to sing in a soft voice, while accompanying with strong rhythmic beats on the keyboard. At the conclusion of each exercise, singing was faded out with humming. While the music therapist provided music to exercises, the occupational therapist facilitated patients' engagement in the program by verbally introducing and demonstrating each desired movement at the appropriate tempo and counting repetitions during exercises.

Measurement Instruments

Borg Rating of Perceived Exertion (RPE) Scale: Borg created a 21-point scale for intra-individual and inter-process comparisons. Later, it was modified to a 15-point scale to provide scores that grow linearly with the increase of exercise intensity (Borg, 1998; see Appendix C). The Borg RPE scale has been found to be a valid and reliable measurement tool of perceived exertion during exercise (Borg, 1982). Many studies have shown the suitability of using it for assessing perceived exertion during physical work (Borg & Noble, 1974). It is commonly used in exercise tests on healthy people or patients in rehabilitation programs. It is also helpful to determine and to monitor the appropriate intensity level of an individual's exercise. In planning a patient's rehabilitative exercise program, it is recommended that exercise should be started with an RPE no higher than 9 to 11, then after a while progress up to about 13 (Borg, 1998). This 15-grade scale ranges from 6 (No exertion at all) to 20 (Maximal exertion). Borg (1985) has demonstrated that the RPE scale correlates strongly with heart rate (0.80-0.90).

Feeling Scale: For measurement of a participant's mood change, the 11-point bipolar Feeling Scale (FS), a measure of on-task, exercise-related affect, was utilized in pre/post sessions (Rejeski, et al., 1987; see Appendix C). The content validity of this scale is 0.95 (Hardy & Rejeski, 1989). According to Hardy and Rejeski (1989), FS was created to measure how a person feels during exercise, while rating of perceived exertion (RPE) reflects what a person feels. Scores range from +5 to -5 with descriptive text levels of +5/very good, +3/good, +1/fairly good, 0/neutral, -1/faily bad, -3/bad, and -5/very bad.

Both instruments can be readily used as participants need to simply circle a number and require a short length of time for completion. Both scales were provided for participants with written instructions to ensure understanding.

Observational Measures: Each session was videotaped to evaluate subjects' participation in the exercise program in both OT-UEE and MT-UEE programs. The researcher transferred each videotape onto a specific computer of the hospital assigned for music therapy study. Sound on each video clip was eliminated and saved by researcher with a coded file name created by a biostatician of the hospital who assisted the music therapy research. Then, the soundless video clips were coded again by the biostatician. The researcher and the independent observer reviewed each video clip not knowing which condition, and collected all frequencies of repetitions for each participant in each exercise and rated each participant's range of motion for each exercise (0 for no or minimal range attempted; 1 for range attempted, achieved less than approximately 75% of full range of motion; and 2 for range attempted, achieved greater than approximately 75% of full range of motion). Seventy five percent of full range of motion was decided as a criteria, since movements with 75% of full range of motion can be considered as functional. The two evaluators had three practice sessions before they evaluated the given data.

To determine inter-rater reliability after training, the independent observer reviewed 20% of the videotapes and took data. A percentage of agreement was calculated using the formula: Agreements/(agreements + disagreements) X 100%. A reliability coefficient of 94% was derived that exceeded the *a priori* criterion level of .80.

Procedure

Participants who met the inclusion criteria and signed a consent form met from 11:10 to 11:40 pm for two consecutive days except Tuesday, weekend, and holidays. The researcher arrived at the activity room 30-minutes before each session to set up a video camera (and a keyboard, if it is music therapy upper extremity exercise session) and to prepare materials for data collection. As each participant arrived in the activity room, he/she was greeted individually by the researcher and was given the Feeling Test for assessment of their baseline of mood. The participants sitting in either a wheelchair or an arm chair with back support formed a circle with staff. Once all expected participants came and finished taking the pre- Feeling Scale (FS), the occupational therapist began the session by having each patient introduce themselves to the group. Prior to stretching exercises and thera-band exercises, participants were told to perform exercises at a rate that is comfortable to them and to take rest periods as needed, so that the exercises do not cause significant pain and discomfort to the shoulders or other body parts.

After the exercises, participants took the rating of perceived exertion (RPE) test and retook the FS test. At the conclusion of each session, the researcher thanked participants and confirmed the next scheduled session. The research data was recorded on a data collection sheet consisting of participant number, date, gender, allocation (AB or BA), age, diagnosis, time since injury, pretest of FS, posttest of FS, and RPE scale (see Appendix D). Also, the video clips were reviewed and evaluated using the same data collection sheet by the trained observers, and were kept in the hospital research department, while the videotapes were destroyed after the data was collected.

CHAPTER IV

RESULTS

Statistical Analysis

Demographic characteristics were summarized using descriptive statistics: mean (±S.D.) for continuous variables and frequency (percent) for categorical variables. Rating of perceived exertion (RPE), change in feeling scale (FS) from pre to post exercise, and adherence to the exercises were summarized by study group (OT vs. MT) using descriptive statistics. Research questions 1 – 3 were assessed using paired *t*-test, Wilcoxon signed rank test, or McNemar's test as appropriate. The association between adherence to the exercises and each of RPE and change in feeling scale were investigated using correlation analysis. A *p*-value of less than 0.05 indicated a statistical significance. SAS 9.1.3 (Cary, NC) was used for data management and data analysis.

Results

Research Question 1: Did patients in a music therapy upper extremity exercise (MT-UEE) program experience a lower rate of perceived exertion when compared to an occupational therapy upper extremity exercise (OT-UEE) program?

Paired *t*-test and Wilcoxon signed rank test were used to compare scores between OT-UEE and MT-UEE groups (see Table 2). The Wilcoxon signed rank test is a non-parametric alternative to the *t*-test for independent samples. It is used when the sample size is small or when the population cannot be assumed to be normally distributed. Since this study included relatively small size of participants, parametric and non-parametric analyses were utilized to ensure reliability of the findings.

The rating of perceived exertion (RPE) mean score for OT-UEE group was 12.36 (SD=±1.76) and the RPE mean score for MT-UEE group was 10.41 (SD=±2.70). The results indicated that MT-UEE program has significantly lower RPE than OT-UEE program based on Wilcoxon signed rank test (*p*=0.0011). It was supported that patients in MT-UEE program experience a lower rate of perceived exertion when compared to OT-UEE program.

Table 2. *Feeling Scale (FS) and Rating of Perceived Exertion (RPE)*

Variable	OT		MT		Difference OT-MT		*p*-value
Pre FS	2.77	±1.85	3.23	±1.23	-0.45	±1.57	
	3	(-2, 5)	3	(1, 5)	0	(-3, 3)	0.2129[1]
Post FS	2.95	±1.29	4.05	±1.00	-1.09	±0.97	
	3	(0, 5)	4	(2, 5)	-1	(-3, 1)	0.0002[1]
Post FS- Pre FS	0.18	±1.62	0.82	±1.37	-0.64	±1.36	0.0401[2]
	0	(-4, 3)	1	(-2, 4)	-0.5	(-4, 2)	0.0506[1]
p-value[3]	0.5389		0.0181				
RPE	12.36	±1.76	10.41	±2.70	1.95	±2.34	
	13	(7, 15)	10.5	(6, 15)	1.5	(-2, 6)	0.0011[1]

Note. Mean ± SD and median (min, max) were listed.
[1] Wilcoxon signed rank test was used.
[2] Paired *t*-test was used
[3] To compare pre FS to post FS, Wilcoxon signed rank test was used.

Research Question 2: Did patients in a music therapy upper extremity exercise (MT-UEE) program experience a positive change in mood when compared to an occupational therapy upper extremity exercise (OT-UEE) program?

Pre Feeling Scale (FS) was not significantly different between OT-UEE group (mean=2.77, SD=±1.85) and MT-UEE group (mean=3.23, SD= ±1.23) (*p*=0.2129). There was a significant difference between pre (mean=3.23, SD= ±1.23) and post FS (mean=4.05, SD= ±1.00) for MT-UEE group (*p*=0.0181) while FS mean scores between pre (mean=2.77, SD= ±1.85) and posttest (mean=2.95, SD= ±1.29) of OT-UEE group were not significantly different. The changes from pre to post FS between OT and MT was significant based on paired *t*-test (*p*=0.0401). Results supported patients in MT-UEE program experience a positive change in mood when compared to OT-UEE program.

Research Question 3: Did patients in a music therapy upper extremity exercise (MT-UEE) program have greater adherence to the exercises (as measured by number of repetitions and range of motion) when compared to an occupational therapy upper extremity exercise program?

McNemar's test was used and the results indicated that there was no significant difference between OT and MT groups in all of the exercises (see Table 3). McNemar's test is a non-parametric method used to test the difference between paired proportions on a 2x2 classification table.

Total exercise scores were calculated for correlation analysis (see Table 4). For each exercise, observed number proportion and observed ROM proportion were calculated. Observed number proportion was defined as observed number divided by the maximum required number and observed ROM proportion was defined as observed ROM divided by the maximum required. Observed number and observed ROM proportions of all components of exercise were added up for total exercise score (0-34). Although there was no significant difference found between two groups, total exercise score of MT group (33.33 ± 1.14/34) was slightly higher than OT group (33.09 ± 1.02/34).

Table 3. *Exercise Adherence*

Variable	OT			MT			Difference OT-MT			*p*-value[1]
Neck Flexion/Extension #										
	#	*n*	%	#	*n*	%	OT\MT	2	3	1.0000
	2.5	1	4.55	2	1	4.55	2.5	0	1	
	3	21	95.45	3	21	95.45	3	1	20	
Neck Flexion/Extension ROM										
	ROM	*n*	%	ROM	*n*	%	OT\MT	1	2	-
	2	22	100.00	1	1	4.55	2	1	21	
				2	21	95.45				
Neck Rotation #										
	#	*n*	%	#	*n*	%	OT\MT	3		-
	3	22	100.00	3	22	100.00	3	22		
Neck Rotation ROM										
	ROM	*n*	%	ROM	*n*	%	OT\MT	1	2	-
	1	1	4.55	1	1	4.55	1	1	0	
	2	21	95.45	2	21	95.45	2	0	21	
Shoulder Combination #										
	#	*n*	%	#	*n*	%	OT\MT	3		-
	3	22	100.00	3	22	100.00	3	22		
Shoulder Combination ROM										
	ROM	*n*	%	ROM	*n*	%	OT\MT	1	2	0.1573
	1	1	4.55	1	3	13.64	1	1	0	
	2	21	95.45	2	19	86.36	2	2	19	
Shoulder Elevation #										
	#	*n*	%	#	*n*	%	OT\MT	3		-
	3	22	100.00	3	22	100.00	3	22		
Shoulder Elevation ROM										
	ROM	*n*	%	ROM	*n*	%	OT\MT	1	2	0.5637
	1	3	13.64	1	2	9.09	1	1	2	
	2	19	86.36	2	20	90.91	2	1	18	

Frequency score (out of 3)
[1] McNemar's test was used.

Shoulder Rotation #										
	#	*n*	%	#	n	%	OT\MT	2	3	-
	3	22	100.00	2	1	9.09	3	1	21	
				3	21	90.91				
Shoulder Rotation ROM										
	ROM	*n*	%	ROM	*n*	%	OT\MT	1	2	0.5637
	1	4	18.18	1	3	13.64	1	2	2	
	2	18	81.82	2	19	86.36	2	1	17	
Elbow Combination #										
	#	*n*	%	#	*n*	%	OT\MT	3		-
	3	22	100.00	3	22	100.00	3	22		
Elbow Combination ROM										
	#	*n*	%	ROM	*n*	%	OT\MT	2		-
	2	22	100.00	2	22	100.00	2	22		
Wrist Flexion/Extension #										
	#	*n*	%	#	*n*	%	OT\MT	2	3	1.0000
	2	1	4.55	2	1	4.55	2	0	1	
	3	21	95.45	3	21	95.45	3	1	20	
Wrist Flexion/Extension ROM										
	ROM	*n*	%	ROM	*n*	%	OT\MT	1	2	0.6547
	1	3	13.64	1	2	9.09	1	0	3	
	2	19	86.36	2	20	90.91	2	2	17	
Wrist Rotation #										
	#	*n*	%	#	*n*	%	OT\MT	2.5	3	-
	3	22	100.00	2.5	1	4.55	3	1	21	
				3	21	95.45				
Wrist Rotation ROM										
	ROM	*n*	%	ROM	*n*	%	OT\MT	2		-
	1	4	18.18	2	22	100.00	1	4		
	2	18	81.82				2	18		
Stretch Armstrong #										
		12±0			11.86±0.35			0.14±0.35		0.2500
		12 (12, 12)			12 (11, 12)			0 (0, 1)		
Stretch Armstrong ROM										
	ROM	*n*	%	ROM	*n*	%	OT\MT	2		-
	2	22	100.00	2	22	100.00	2	22		

Paint the Fence Right #										
		11.86±0.64			12.00±0.00		-0.14±0.64			1.0000
		12 (9, 12)			12 (12, 12)		0 (-3, 0)			
Paint the Fence Right ROM										
	ROM	*n*	%	ROM	*n*	%	OT\MT	1	2	0.1573
	1	3	13.64	1	1	4.55	1	1	2	
	2	19	86.36	2	21	95.45	2	0	19	
Paint the Fence Left #										
		11.86±0.35			11.82±0.85		0.05±0.95			1.0000
		12 (11, 12)			12 (8, 12)		0 (-1, 4)			
Paint the Fence Left ROM										
	ROM	*n*	%	ROM	*n*	%	OT\MT	1	2	0.1573
	1	4	18.18	1	2	9.09	1	2	2	
	2	18	81.82	2	20	90.91	2	0	18	
Windshield Wiper Right #										
		11.73±1.28			11.95±0.21		-0.23±1.31			1.0000
		12 (6, 12)			12 (11, 12)		0 (-6, 1)			
Windshield Wiper Right ROM										
	ROM	*n*	%	ROM	*n*	%	OT\MT	2		-
	1	2	9.09	2	22	100.00	1	2		
	2	20	90.91				2	20		
Windshield Wiper Left #										
		11.91±0.43			11.86±0.35		0.05±0.38			1.0000
		12 (10, 12)			12 (11, 12)		0 (-1, 1)			
Windshield Wiper Left ROM										
	ROM	*n*	%	ROM	*n*	%	OT\MT	1	2	1.0000
	1	5	22.73	1	5	22.73	1	3	2	
	2	17	77.27	2	17	77.27	2	2	15	
Show Me the Money Right #										
		11.73±1.28			12±0		-0.27±1.28			1.0000
		12 (6, 12)			12 (12, 12)		0 (-6, 0)			
Show Me the Money Right ROM										
	ROM	*n*	%	ROM	*n*	%	OT\MT	2		-
	2	22	100.00	2	22	100.00	2	22		
Show Me the Money Left #										
		12±0			11.86±0.47		0.14±0.47			0.5000
		12 (12, 12)			12 (10, 12)		0 (0, 2)			

Show Me the Money Left ROM										
	ROM	*n*	%	ROM	*n*	%	OT\MT	2		-
	1	1	4.55	2	22	100.00	1	1		
	2	21	95.45				2	21		
Bear Claw Right #										
		12±0			12±0			0±0		-
		12 (12, 12)			12 (12, 12)			0 (0, 0)		
Bear Claw Right ROM										
	ROM	*n*	%	ROM	*n*	%	OT\MT	1	2	1.0000
	1	2	9.09	1	2	9.09	1	1	1	
	2	20	90.91	2	20	90.91	2	1	19	
Bear Claw Left #										
		11.82±0.50			11.77±0.87			0.05±0.84		1.0000
		12 (10, 12)			12 (8, 12)			0 (-2, 3)		
Bear Claw Left ROM										
	ROM	*n*	%	ROM	*n*	%	OT\MT	1	2	0.1573
	1	4	18.18	1	2	9.09	1	2	2	
	2	18	81.82	2	20	90.91	2	0	18	

Table 4. *Total Exercise Score (0-34)*

Variable	OT		MT		Difference OT-MT	*p*-value
Mean ± SD	33.09±1.02	97.32% (±3.00)	33.33±1.14	98.03% (±3.35)	-0.24±0.89	0.2194[1]
Median (min, max)	33.50 (30.67,34.00)		33.92 (30.25,34.00)		-0.17 (-2.75,1.75)	

[1] Wilcoxon signed rank test was used.

Spearman's rank correlation coefficient was used to examine the relationship among RPE and total exercise score and Feeling Scale (FS) and total exercise score (see Table 5). Spearman's rank correlation coefficient is a form of the Pearson coefficient with the data converted to rankings and is used when there is non-parametric data where Pearson cannot be used. Results indicated no statistically significant correlations among them.

Table 5. *Correlation Analysis (Spearman)*

	OT		MT	
	RPE	FS change	RPE	FS change
Total Exercise	0.32 (*p*-value=0.1482)	-0.10 (*p*-value=0.6668)	0.32 (*p*-value=0.1416)	0.003 (*p*-value=0.9902)

CHAPTER V

DISCUSSION

Discussion on Treatment Effects

The purpose of this study was to investigate the effects of music therapy on mood, perceived exertion, and exercise adherence of patients participating in a rehabilitative upper extremity exercise program. To measure patients' perceived exertion levels and mood change, the patients completed a Rating of Perceived Exertion (RPE) and pre- and post-Feeling Scale (FS) across two consecutive sessions. Exercise adherence of each patient was evaluated through video analysis.

For patients participating in the group rehabilitative exercises, results indicated that they experienced a significant decrease in perceived exertion levels in music conditions. Results also showed positive mood changes between pre and posttest within music therapy upper extremity exercise (MT-UEE) group and between the occupational therapy upper extremity exercise (OT-UEE) and MT-UEE groups. These positive results were anticipated throughout research, since patients more actively participated with music than without music requesting their favorite songs for next session or expressing many positive verbal responses such as "It's much easier with music", "music helps me", "I enjoyed music very much", "It's soothing and relaxing", etc. When occupational therapists were briefly introducing the music therapy study to new patients in the group, some patients who had already completed the study voluntarily shared their positive experiences with them.

From the researcher's perspective, these significant results were gained due to the following reasons. First of all, use of appropriate music seemed to provide participants enjoyment and comfort as Wales (1985) pointed out that music with a positive disposition (upbeat/stimulative) lowered levels of anger, fatigue, and depression and as Krumhansl (1997) indicated that music in a major key and with a rapid tempo produced a feeling of happiness in participants. Improvised keyboard music and sung songs which were carefully provided seemed to merge well with exercises giving structure for exercises and facilitating smoother movements. It may be too that music distracted patients from physical exertion, fatigue, perception of discomfort, and negative thoughts or feelings (Karageorghis & Terry, 1997) and reduced boredom of monotonous and redundant movements (Lee & Nantais, 1996; Thompson, Arnold, & Murray, 1990). In particular, the salient results on perceived exertion levels (p=0.0011) attested the effectiveness of music as a means to dissociate from perceptions of fatigue and discomfort for patients participating in rehabilitative exercise program (Copeland & Franks, 1991; Karageorghis & Terry, 1997), even though sometimes a voluntary sing-a-long of participants during music conditions was observed and exercise performances of three male participants seemed to be slightly affected by their singing, as cautioned by Johnson, Otto and Clair (2001). In addition, music enriched the group experiences facilitating social interactions among patients. These factors were observed throughout the study, but it is still necessary to specify which factors most benefited patients' perceived exertion and mood state, for instance, through a questionnaire survey in future study.

Regarding the exercise adherence, no significant differences were found in all of each exercise, even though total exercise score of MT group was slightly higher than OT group. These results were also perceived during research, since the exercise programs selected and used by occupational therapists turned out to be not a very challenging program for most participants. Ninety seven point three two percent (±3.00) in OT group and 98.03 % (±3.35) in MT group were results calculated as total exercise scores (see Table 4) and accordingly, the power of discrimination seemed very low. These results seemed due in part to the participants, who were referred to exercise group, met the inclusion criteria of this study, and who passed the screening test with Mini Mental State Exam (MMSE) happened to have relatively high functioning skills. On the other hand, patients who were physically very weak, had severe pain, or emotionally depressed often refused to participate in the study. As a result, participants happened to be either physically healthier or emotionally/ psychologically healthier, or both. Since the goals of group therapy are not only to improve functional skills but also to increase socialization with other patients facing similar situations, relatively moderate-level exercises were used. In addition, since the group consists of patients with various levels of functional skills, too much of a challenging exercise program could have caused an increase in physical pain or discouraged certain patients with relatively low functioning skills. As a result of these conditions, the given exercise program was somewhat easy for most participants and could not have the power of discrimination.

Several categories were identified on why some patients failed to earn full scores from the exercise evaluation, although more than 97% of the given exercises were still completed. First, participants with stroke had weakness on one side, which impacted their exercise performance. Second, several participants got their right and left confused when following exercise movements demonstrated by the occupational therapists. This seemed because most participants were newly referred to the group upper extremity exercise program and some of them happened to mirror those unfamiliar movements demonstrated by occupational therapists. Third, participants who had weakened arms could not endure the given thera-band's resistance, so the thera-bands often slipped through their fingers during exercises. Fourth, a few participants exercised slowly with less frequency but with full range of motion (ROM), or fast with more frequency but with less full ROM. Fifth, patients who were tired or had a certain pain or mild spasm paused exercises to take a rest or stroke the painful places on the body during exercises.

Regardless of the exercises' easiness and confounding factors as discussed above, there were a few difficulties in evaluating participants' exercise performances. Since there was no standardized method for video evaluation and 75% of full range of motion was decided as a criterion, there were some vague cases for the two evaluators, even after a couple of meetings for discussion on evaluation criteria and details and three practice sessions. Furthermore, even though blind observation was determined, patients' voluntary singing was seen a few times.

Limitations

As for mood changes, some limitations of Feeling Scale (FS) were found during its implementation, although the change from pre to post FS between the occupational therapy upper extremity exercise (OT-UEE) group and music therapy upper extremity exercise (MT-UEE) group was significant (p=0.0401 based on paired t-test) and there was a significant difference between pre and post FS for MT-UEE group (p=0.0181). Scores of Feeling Scale range from +5 to -5 with descriptive text levels from +5/very good to -5/very bad. When participants were asked to rate to the question 'How do you feel?' six participants chose the highest score '+5/very good' for pretest 9 times out of total 44 chances. If these phenomena happened because all six participants were really feeling 'very good,' they would be okay, although it is not a good situation since there is no room to express improved mood on the posttest. One male participant who chose '+5 very good' for pretest chose '+5 very good' on the posttest, but wrote 'peaceful with music' next to the '+5 very good' saying, "especially with familiar music." Otherwise, some of the six participants might have selected 'very good' carelessly. This seemed to come from Americans' idiomatic conversation styles where people get accustomed to saying "very good" or "I'm fine" automatically to the question "How are you?" as an answer to a greeting, not necessarily meaning that he or she really feels 'very good'. For example, one male participant, who worried several staff on the unit about his severe depression, chose '+5 very good' on both pretests, which surprised the researcher and occupational therapists. Although it should not be assumed that all six participants rated the

Feeling Scale carelessly, there might have been a few participants who were doubtful. While '+5 very good' on the pretest appeared two times out of total 24 chances (8.3%) for 2 female participants, it appeared seven times out of 20 chances (35%) for 4 male participants. For future study, Feeling Scale may need to be used with consideration of these limitations and possible gender differences of emotional expressions.

In addition, there were several uncontrolled variables that are noteworthy for future study, although they did not significantly affect the study results. Firstly, patients' personal life events were not controllable. For instance, two female participants mentioned that they were happy since they were going home soon while rating FS. Secondly, patients sometimes had visitors including a family member or a friend with them during exercises. One male patient had to be removed from the experiment, because his girlfriend came to visit during the exercise program. He appeared to be very happy with her visiting, which consequently distracted him from the exercises. Thirdly, since each occupational therapist led the group for a week and took turns, there were noticeable differences in their leading styles, even though they used the same exercise regimen. Fourthly, several patients complained of low temperatures in the room, which might have influenced their mood states. Staff had to bring towel blankets to warm them up. Fifthly, noises outside of the activity room including TV sounds, sounds of a vacuum cleaner or a human voice were not controlled. Sixthly, medication for each patient was not controllable.

Recommendations for Future Study

Replication of this study including a larger number of participants is recommended to generalize to the greater population of rehabilitation patients. Also, the failure to find differences of exercise adherences between two groups suggests that the same method be replicated with an exercise program that has more power of discrimination or patients with less high functional skills. In addition, a longer length of research period instead of two days is recommended. The original design for this study was a series of nine sessions, but had to be revised to six sessions, and again two sessions, because most participants were discharged before their completion of the study. As mentioned above, a questionnaire survey or similar method of collecting participants' comments may help to specify which aspects of music benefited perceived exertion levels and mood state of patients. Lastly, the use of the Feeling Scale is to be examined in light of certain limitations and possible gender differences of emotional expressions as previously noted.

Conclusions

In exercise performances, the importance of an individual's positive perception on an exercise program is necessary to mention, since it can greatly influence quality and length of the performance. This is true with patients in rehabilitation programs who may be facing physical and emotional/ psychological needs and difficulties. This study showed physiological and psychological benefits of music therapy on rehab patients through examination of patients' perceived exertion levels and mood changes. Although significant positive effects in exercise adherences were not evident in this study due to unexpected limitations as discussed above, these physiological and psychological improvements of rehab patients suggest potential benefits for exercise performances. There are few studies examining the effects of music on the psychological aspects of patients in co-treatment with occupational therapy. Despite the limitations discussed, this study sets a basis for facilitating co-treatment - music therapy and occupational therapy - for patient recovery.

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APPENDICES

APPENDIX A

Informed Consent

INFORMED CONSENT STATEMENT

The Effect of Music Therapy on Mood, Perceived Exertion, and Exercise Adherence of Patients Participating in Rehabilitative Upper Extremity Exercise Program

INTRODUCTION
The Department of Music and Dance at The University of Kansas support the practice of protection for human subjects participating in research. The following information is provided for you to decide whether you wish to participate in the present study. You may refuse to sign this form and not participate in this study. You should be aware that even if you agree to participate, you are free to withdraw at any time. If you do withdraw from this study, it will not affect your relationship with this unit, the services it may provide to you, or the University of Kansas.

PURPOSE OF THE STUDY
The purpose of this study is to determine the effect of music therapy on mood, psychological perception of exertion, and exercise adherence of patients participating in a group upper extremity exercise program.

PROCEDURES
Patients who agreed to participate in this study will meet in an activity room of the rehabilitation unit from 11:10 to 11:40 pm for two consecutive days except Tuesday, weekend and holidays. According to research schedules, patients will experience one traditional occupational therapy upper extremity exercise program and one music therapy enhancing upper extremity exercise program. The traditional occupational therapy upper extremity exercise program consists of eight kinds of warm-up stretching exercises and five thera-band exercises. The music therapy enhancing upper extremity exercise program provides live music to the warm-up stretching exercises and thera-band exercises. Patients will be asked to complete both rating of perceived exertion scale and feeling scale in each session. Each session will be videotaped for later review and data collection. The videotapes will be destroyed after all the data is collected.

EXCLUSIONS
In order to be eligible to participate in this study, researchers will give you a screening questionnaire (Mini Mental State Examination) with questions about orientation, memory, arithmetic, language, etc. The questionnaire test should take about 10 minutes to complete.

RISKS
The exercises, exercise tools, and musical instruments used in the study have been chosen by the occupational therapists and music therapist, and are not expected to cause any adverse effects to your rehabilitation program. If you feel uncomfortable during this project, you may ask questions or withdraw at any time.

BENEFITS
You may find that the music accompanying the exercises provides you auditory cues for physical movements, distracts you from any discomfort the exercises may cause, and elevates mood.

PAYMENT TO PARTICIPANTS
No payment will be given to those participating in this study.

PARTICIPANT CONFIDENTIALITY
Your name will not be associated in any way with the information collected about you or with the research findings from this study. The researcher(s) will use a study number or initials of names instead of your name. The researchers will not share information about you unless required by law or unless you give written permission. Permission granted on this date to use and disclose your information remains in effect indefinitely. By signing this form you give permission for the use and disclosure of your information for purposes of this study at any time in the future.

INSTITUTIONAL DISCLAMER STATEMENT
In the event of injury, the Kansas Tort Claims Act provides for compensation if it can be demonstrated that the injury was caused by the negligent or wrongful act or omission of a state employee acting within the scope of his/her employment.

REFUSAL TO SIGN CONSENT AND AUTHORIZATION
You are not required to sign this Consent and Authorization form and you may refuse to do so without affecting your right to any services you are receiving or may receive from the University of Kansas or to participate in any programs or events of the University of Kansas. However, if you refuse to sign, you cannot participate in this study.

CANCELLING THIS CONSENT AND AUTHORIZATION
You may withdraw your consent to participate in this study at any time. You also have the right to cancel your permission to use and disclose information collected about you, in writing, at any time, by sending your written request to: Jeongmin Cho, 2801 Del Norte Blvd. Temple, TX, 76502. If you cancel permission to use your information, the researchers will stop collecting additional information about you. However, the research team may use and disclose information that was gathered before they received your cancellation, as described above.

QUESTIONS ABOUT PARTICIPATION
Questions about procedures should be directed to the researcher(s) listed at the end of this consent form.

PARTICIPANT CERTIFICATION
I have read this Consent and Authorization form. I have had the opportunity to ask, and I have received answers to, any questions I had regarding the study and the use and disclosure of information about me for the study. I understand that if I have any additional questions about my rights as a research participant, I may call (785) 864-7429 or (785) 864-7385 or write the Human Subjects Committee Lawrence Campus (HSCL), University of Kansas, 2385 Irving Hill Road, Lawrence 66045-7563, email dhann@ku.edu or mdenning@ku.edu.

I agree to take part in this study as a research participant. By my signature I affirm that I have received a copy of this Consent and Authorization form.

_______________________________ _________________________
Type/Print Participant's Name Date

____
Participant's Signature

Research Contact Information

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APPENDIX B

Exercise Protocols of Upper Extremity Exercise Program

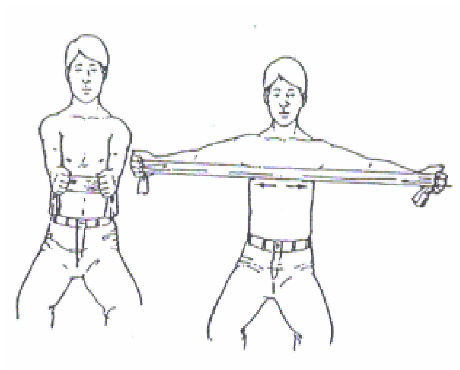
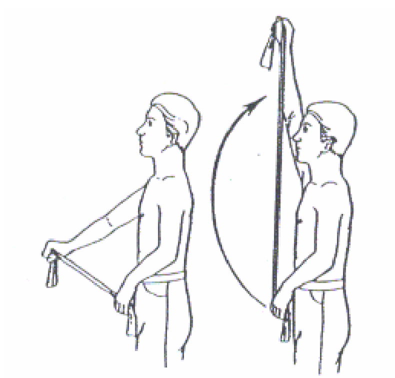
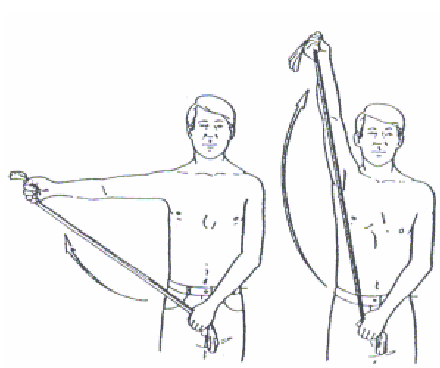
Warm-up Stretching Exercises

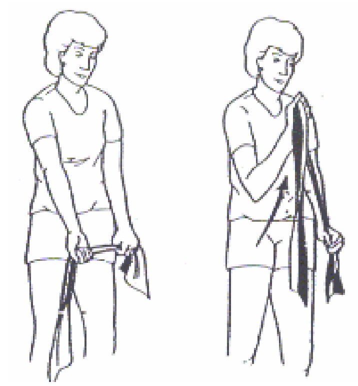
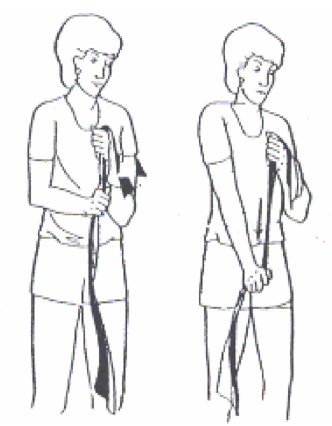
Five Thera-band Exercises

Warm-up Stretching Exercises

Exercise(s)		Description	#
Neck	Flexion/ Extension	1. Look directly forward. 2. Pull head straight back with eyes looking toward ceiling. Hold five seconds. 3. Bend head forward with eyes looking toward floor and hold five seconds and return to starting position.	3
	Rotation	1. Turn head slowly to the right toward the shoulder and hold five seconds. 2. Turn head slowly to the left toward the shoulder and hold five seconds.	3
Shoulder	Combination movement	1. Bring arms straight out to the sides and hold 2 seconds. 2. Hug yourself left over right arm and hold five seconds. 3. Bring arms straight out to the sides and hold 2 seconds. 4. Hug yourself right over left arm.	3
	Elevation	1. Shrug shoulders up and hold five seconds. 2. Relax.	3
	Rotation	1. Roll shoulders backward for three times. 2. Roll shoulders forward for three times.	3
Elbow	Combination movement	1. Place hands together with thumbs pointing inward. 2.While keeping hands together, straighten elbows and push palms away from body. Hold five seconds.	3
Wrist	Flexion/ Extension	1. Place your right hand in front of you like you are communicating "STOP". 2. Place your left hand in the palm of the right and pull back. Hold five seconds. 3. Place your right hand in front of you with fingers pointing down. 4. Place the left hand on the back side of the right hand and push toward you. Hold five seconds. 5. Complete the same protocol but reverse hands.	3
	Rotation	1. Rotate both wrists outward for three times. 2. Rotate both wrists inward for three times.	3

Five Thera-band Exercises

Exercise 1 of 5 	**Shoulder Horizontal Abduction** ("Stretch Armstrong") 1. Wrap thera-band once around each hand and hold thera-band out in front of you. 2. Keep elbows straight and arms level with hands together; pull arms apart and relax. 4. Repeat twelve times.
Exercise 2 of 5 	**Shoulder Flexion** ("Paint the Fence") 1. Hold short end of thera-band in right hand toward the thumb. 2. Place left hand 5-6 inches below the right hand and pull left hand back to left hip. 3. Raise right arm up overhead as far as you can and return to starting position. 4. Repeat twelve times. 5. Repeat steps 1-4 above with the left arm.
Exercise 3 of 5 	**Shoulder Abduction** ("Windshield Wiper") 1. Hold short end of thera-band in right hand toward the thumb. 2. Place left hand 5-6 inches below the right hand and pull left hand back to left hip. 3. Raise right arm with elbow straight to right side and overhead as far as you can and return to starting position. 4. Repeat twelve times. 5. Repeat steps 1-4 above using the left arm.

<table>
<tr>
<td>Exercise 4 of 5
</td>
<td>Flexion
(“Show Me the Money”)
1. Hold short end of thera-band in right hand with palm facing forward toward the thumb.
2. Place left hand 5-6 inches below the right hand and pull left hand back to left hip.
3. Bend elbow while bringing hand to chin and return to starting position.
4. Repeat twelve times.
5. Repeat steps 1-4 above with left hand.</td>
</tr>
<tr>
<td>Exercise 5 of 5
</td>
<td>Extension
(“Bear Claw”)
1. Hold short end of thera-band in right hand with palm facing downward.
2. Place left hand 5-6 inches below the right hand.
3. Bring left hand to left hip.
4. Starting with right elbow bent, straighten the elbow and return to starting position.
5. Repeat twelve times.
6. Repeat steps 1-5 above with left hand and right hand reversed.</td>
</tr>
</table>

APPENDIX C

Measurement Instruments

Rating of Perceived Exertion for Posttest

Feeling Scale for Pretest and Posttest

Rating of Perceived Exertion (RPE) Scale

How ***hard*** do you feel you are exercising?
Think of your breathing, your shoulder muscles, and overall fatigue when using this scale with your exercises. Please circle one of the following numbers that best represents how hard you feel you have exercised.

9 corresponds to “very light” exercise. For a normal, healthy person it is like walking slowly at his or her own pace for some minutes.

13 on the scale is “somewhat hard” exercise, but it still feels OK to continue.

17 “very hard” is very strenuous. A healthy person can still go on, but he or she really has to push him- or herself. It feels very heavy, and the person is very tired.

19 On the scale is an extremely strenuous exercise level. For most people this is the most strenuous exercise they have ever experienced.

Date:________ Session #:________ Subject #:________

Rating of Perceived Exertion (RPE Scale)

How ***hard*** do you feel you are exercising?

6 No exertion at all

7

Extremely light

8

9 Very light (easy walking slowly at a comfortable pace)

10

11 Light

12

13 Somewhat hard (It is quite an effort; you feel tired but can continue)

14

15 Hard (heavy)

16

17 Very hard (very strenuous, and you are very fatigued)

18

19 Extremely hard (You can not continue for long at this pace)

20 Maximal exertion

Date:________ Session #:________ Subject #:_______ <Pretest>

Feeling Scale

How do you ***feel***?

Think of your current mood or emotions. Please circle one of the following numbers that best represents how you feel.

+ 5 Very good

+ 4

+ 3 Good

+ 2

+ 1 Fairly good

0 Neutral

- 1 Fairly bad

- 2

- 3 Bad

- 4

- 5 Very bad

Date:________ Session #:________ Subject #:_______ <Posttest>

Feeling Scale

How do you ***feel***?
Think of your current mood or emotions. Please circle one of the following numbers that best represents how you feel.

+ 5	Very good
+ 4	
+ 3	Good
+ 2	
+ 1	Fairly good
0	Neutral
- 1	Fairly bad
- 2	
- 3	Bad
- 4	
- 5	Very bad

APPENDIX D

Data Collection Sheet

EFFECTIVENESS OF MUSIC AND OCCUPATIONAL THERAPY

Data Collection Form for Music Therapy Study

STUDYID: .... ____________

DATE FORM COMPLETED:..______-______-______
Month Day Year

GENDER: .... MALE 1
FEMALE 2
ALLOCATION:.. AB 1
BA 2
AGE IN YEARS: .... ___________

DIAGNOSIS: .... ___________

TIME SINCE INJURY:___________

Therapy			OT/MT		OT/MT	
Day			1 (/ /)		2 (/ /)	
Pre FS						
Post FS						
RPE						
Exercises			#	ROM	#	ROM
Neck	Flexion/Extension		/ 3	0 1 2	/ 3	0 1 2
	Rotation		/ 3	0 1 2	/ 3	0 1 2
Shoulder	Combination		/ 3	0 1 2	/ 3	0 1 2
	Elevation		/ 3	0 1 2	/ 3	0 1 2
	Rotation		/ 3	0 1 2	/ 3	0 1 2
Elbow	Combination		/ 3	0 1 2	/ 3	0 1 2
Wrist	Flexion/Extension		/ 3	0 1 2	/ 3	0 1 2
	Rotation		/ 3	0 1 2	/ 3	0 1 2
Stretch Armstrong			/ 12	0 1 2	/ 12	0 1 2
Paint the Fence		R	/ 12	0 1 2	/ 12	0 1 2
		L	/ 12	0 1 2	/ 12	0 1 2
Windshield Wiper		R	/ 12	0 1 2	/ 12	0 1 2
		L	/ 12	0 1 2	/ 12	0 1 2
Show Me the Money		R	/ 12	0 1 2	/ 12	0 1 2
		L	/ 12	0 1 2	/ 12	0 1 2
Bear Claw		R	/ 12	0 1 2	/ 12	0 1 2
		L	/ 12	0 1 2	/ 12	0 1 2

#: number of repetitions ROM: range of motion R: right arm L: left arm