EFFECT OF SEDATIVE MUSIC AND SCHEDULED REST ON ANXIETY, PAIN, AND MYOCARDIAL OXYGEN DEMAND DURING CHAIR REST IN ADULT POSTOPERATIVE OPEN-HEART PATIENTS

By

Jo A. Voss

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TITLE

Effect of Sedative Music and Scheduled Rest on Anxiety, Pain, and Myocardial Oxygen Demand during Chair Rest in Adult Postoperative Open-heart Patients

BY

Jo A. Voss

APPROVED	DATE
Bernice Yates, Ph.D	November 24, 2003
Cecilia Barron, Ph.D	November 24, 2003
Mara Baun, DNSc.	November 24, 2003
Austin Thompson, MD	November 24, 2003
Marion Good, Ph.D.	November 24, 2003

SUPERVISORY COMMITTEE

GRADUATE COLLEGE **UNIVERSITY OF NEBRASKA**

EFFECT OF SEDATIVE MUSIC AND SCHEDULED REST ON

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DURING CHAIR REST IN

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Jo A. Voss, Ph.D.

University of Nebraska, 2003

Advisor: Bernice C. Yates, Ph.D.

Open-heart surgery patients in ICU report anxiety and pain with chair rest despite administration of opioid analgesics. In addition, chair rest increases myocardial oxygen demand (MVO_2). Non-pharmacological, complementary methods (such as sedative music and scheduled rest) used to reduce anxiety, pain, and MVO_2 during chair rest warranted further investigation. The conceptual framework was based on the transactional model of stress and coping.

A 3-group pretest-posttest repeated measures experimental design examined the effect of music and rest on anxiety, pain sensation, and pain distress and MVO_2 during chair rest in adult postoperative open-heart surgery patients. Sixty-one patients were randomly assigned to receive 30 minutes of sedative music (music group), scheduled rest (rest group), or treatment as usual (control group) during chair rest. Anxiety and pain (sensation and distress) were measured with visual analogue scales at chair rest initiation (pretest) and after 30 minutes (posttest). MVO_2 was measured by the rate-pressure product (RPP) at chair rest initiation and at 5, 10, 15, and 30-minutes.

RM MANOVA indicated significant group differences in anxiety and pain (sensation and distress) from pretest to posttest, $p < .001$. Follow-up RM ANOVA tests were significant ($p \leq .001$). Post hoc dependent t tests with Bonferroni's adjustment indicated that in the music and rest groups, anxiety and pain (sensation and distress) decreased significantly from pretest to posttest, $p < .017$; but, in the control group, there was no significant difference. In addition, post hoc independent t tests with Bonferroni's adjustment comparing the groups at posttest indicated significantly less anxiety and pain (sensation and distress) in the music group than in either the rest group or the control group ($p < .017$). The rest and control groups did not differ significantly at posttest. In the RM ANOVA, no significant difference was found for the RPP between groups.

Music was more effective than rest and treatment as usual to decrease anxiety and pain in patients after open-heart surgery during chair rest. Patients should be encouraged to use music as an adjuvant to medication.

Dedication

This is dedicated to my family:

Bruce W. Page, my father, who taught me the value of hard work and gave me the determination to strive toward a successful and fulfilling career in nursing.

In loving memory of my mother, Virginia D. Page, a guardian angel who has provided balance and guidance throughout my life.

David, my loving husband, and Stephanie and Danny, my children, who have provided me with years of patience and support during my academic endeavors.

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Chapter 1

The Study Problem

After open-heart surgery, patients experience numerous stresses that can affect their responses to illness. As early as 8 to 12 hours after surgery, patients are dangled at the side of the bed and assisted to a sitting position in a chair (chair rest). Despite opioid medication use, patients report moderate to severe anxiety and pain with chair rest (Goodwin, Bissett, Mason, Kates, & Weber, 1999; Voss, 2001). Non-pharmacological, complementary methods to reduce anxiety and pain for these patients during chair rest such as sedative music and scheduled rest warranted further investigation. Although sedative music and scheduled rest have been tested in postoperative cardiac patients and found to be an effective method to reduce postoperative anxiety and pain while at rest, no studies were found that tested the effects of sedative music and scheduled rest on anxiety and pain in these patients during chair rest.

Activity such as chair rest increases heart rate (HR) and systolic blood pressure (SBP), which results in increased aortic wall tension. Increased aortic wall tension increases myocardial oxygen demand (MVO_2), making myocardial ischemia more likely to occur (LeDoux & Shinn, 1995). Often beta-adrenergic blockers are administered to avoid the increased aortic wall tension by lowering HR and SBP. Sedative music or scheduled rest may complement the effects of these medications to reduce MVO_2 (by lowering HR and SBP) during chair rest. Although sedative music and scheduled rest were effective in reducing MVO_2 in resting patients after an acute myocardial infarction

(Updike, 1990; White, 1999), the effect of sedative music and scheduled rest on MVO_2 during chair rest had not been examined in postoperative cardiac patients.

Therefore, this study provided valuable information regarding the effect of sedative music and scheduled rest on anxiety, pain, and MVO_2 during chair rest in postoperative cardiac patients.

Incidence of Cardiac Surgery

Approximately 686,000 open-heart procedures are completed each year in the United States (American Heart Association, 2002). Open-heart surgical procedures are indicated for patients with coronary artery disease who require cardiac revascularization or for patients with valvular disease who require valve repair or replacement. The number of open-heart surgeries rises every year, and surgical intervention continues to be the mainstay of treatment for coronary heart disease and valvular disease (American Heart Association, 2002).

Cost-Effective Care

With increasing numbers of open-heart surgical procedures, there is a demand for cost-effective, quality care. Significant health care dollar savings may be accomplished by reducing postoperative complications. Early activity reduces the potential for complications associated with immobility, such as deep vein thrombophlebitis, pulmonary embolism, and pneumonia (Cheng et al., 1996). Complications from prolonged bed rest increase the length of stay and consequently the hospitalization cost. Early activity not only reduces postoperative complications, but also facilitates discharge from the expensive surgical critical care unit to a step-down unit (Goodwin et al., 1999). Although early activity in the open-heart surgical patient reduces morbidity, decreases

length of stay, and is cost-effective, early activity is associated with moderate to severe anxiety and pain.

Incidence of Anxiety and Pain

Anxiety was experienced by an estimated 70 to 87% of critical care patients, and over 50% of patients in the critical care unit experienced high levels of anxiety during the postoperative period (Bone et al., 1995; Treggiari-Venzi, Borgeat, Fuchs-Buder, Gachoud, & Suter, 1996). Treggiari-Venzi et al. (1996) assessed 32 critical care patients for anxiety and depression with the Hospital Anxiety and Depression Scale (HADS). The HADS consists of a 14-item measure of anxiety and depression with weighted responses (0 to 3 points for each item), and a score of 10 points or more indicates significant anxiety or depression (Zigmond & Snaith, 1983). After 24 hours in the critical care unit, 29% of the patients had severe anxiety (with a score > 10), and an additional 31% had borderline severe anxiety (with a score between 8 and 10).

In a study to determine sources of stress, patients identified that pain was the principal physical and psychological stress that occurred in the critical care setting (Novaes, Aronovich, Ferraz, & Knobel, 1997). Fifty patients in a critical care unit were asked to rate forty items from 1 (*not stressful*) to 4 (*very stressful*). Pain was ranked the highest with a mean score obtained from the patients' evaluations of 3.36 (SD = 1.01).

In a multi-site study with 213 patients, 64% of surgical patients reported having moderate to severe pain while in the critical care unit, and 30% of patients reported being in moderate to severe pain most of the time (Carroll et al., 1999). These patients rated their worst pain after surgery, and the mean pain intensity rating was 6.4 (SD =

2.86) on a numeric pain intensity rating scale with a rating of 0 (*no pain*) to 10 (*worst possible pain*).

Cardiac surgery patients have reported episodes of severe pain; and despite receiving oral and intravenous opioid analgesics, the pain relief was frequently incomplete (Valdix & Puntillo, 1995). Thirty-nine patients after cardiac surgery were asked to rate their worst pain while in the critical care unit on a numeric rating scale with a rating of 0 (*no pain*) to 10 (*worst pain*). The mean pain score for the worst pain experienced was 7.2 (*SD* = 2.6). When asked about how much pain relief was received from the analgesics, the patients reported average pain relief of 65% (*SD* = 29%).

Postoperative anxiety and pain with early activity such as chair rest has been documented in the literature (Voss, 2001). Patients were medicated to reduce pain prior to chair rest, but pain management was inadequate. In a pilot study, 10 postoperative cardiac patients reported moderate to severe anxiety and pain at the initiation of chair rest despite administration of opioid analgesics within 1 to 3 hours before chair rest (Voss, 2001). Anxiety and pain sensation and distress were measured with visual analogue scales (VAS). Each VAS was a horizontal line of 100 mm anchored at either end of the line by descriptive words (*not anxious about chair rest* to *most anxious about chair rest, no sensation of pain* to *most sensation of pain*, and *no pain distress* to *most pain distress*). The patients marked the lines at the point representing the degree of perceived anxiety about chair rest, pain sensation, and pain distress at chair rest initiation. The VAS were scored by measuring in mm the distance from the side marked *not anxious about chair rest, no sensation of pain*, or *no pain distress*, to the edge of the mark made by the patient. Possible scores ranged from a minimum of 0 to a maximum

of 100 mm. Mean anxiety, pain sensation, and pain distress scores upon chair rest initiation were 55.7 (*SD* = 27.0), 49.6 (*SD* = 26.8), and 39.2 (*SD* = 22.7), respectively. Despite opioid medication use, these patients reported moderate to severe anxiety and pain with chair rest.

The management of anxiety and pain in the critically ill patient is a high priority for nursing care. Because the management of anxiety and pain is often inadequate, these areas have been specified as a priority for nursing practice and research (Bloch, 1990; Lindquist et al., 1993). Investigation of complementary, non-pharmacological nursing interventions aimed at reducing anxiety and pain was warranted for these patients.

Incidence of Postoperative Myocardial Infarction

Postoperative myocardial infarction is a serious complication that can occur after open-heart surgery and increases morbidity, length of stay, and mortality. Incidence of postoperative myocardial infarction in two recent studies of patients after coronary artery bypass grafting was 1.2% and 4.2% (Aldea et al., 1999; Cartier, Brann, Dagenais, Martineau, & Couturier, 2000). Careful monitoring of the patient's response to activity and prompt intervention can reduce the risk for myocardial ischemia and infarction. Decreasing MVO_2 during activity reduces risk for myocardial ischemia, and often medications (such as beta-adrenergic blockers) are administered to lower the HR and SBP as a protective mechanism. Sedative music and scheduled rest may also be used in conjunction with these medications to reduce MVO_2 during activity.

Interventions: Sedative Music and Scheduled Rest

Sedative music is suggested for patients who are anxious and have incomplete pain relief from pain medication (Good, 1995; Good, 1996; Good et al., 1999). Sedative

music is recommended as an intervention to be used in addition to opioid medication for moderate postoperative pain (Good, 1996). The literature suggests that sedative music for the purpose of reducing anxiety and pain should be 60 to 80 beats per minute, without lyrics, and 20 to 30 minutes in length (Buckwalter, Hartsock, & Gaffney, 1985; Chlan & Tracy, 1999; Guzzetta, 1995). Also, patient preferences should be determined, and the patient given a selection of music types (Good et al., 2000).

Several investigators have studied the effects of sedative music and scheduled rest on anxiety and pain in critically ill patients while resting in bed (Barnason, Zimmerman, & Nieveen, 1995; Broscious, 1999; Chlan, 1995; Chlan, 1998a; Davis-Rollans & Cunningham, 1987; Elliot, 1994; Guzzetta, 1989; Lueders-Bolwerk, 1990; Updike, 1990; White, 1992; White, 1999; Zimmerman, Nieveen, Barnason, & Schmaderer, 1996; Zimmerman, Pierson, & Marker, 1988). Findings from these studies indicate a reduction in anxiety and pain when listening to sedative music and when receiving a scheduled rest period. No studies were found that tested the effects of sedative music or scheduled rest during chair rest in critically ill patients.

Although sedative music has shown promise when tested in critically ill patients to reduce anxiety and pain, the differences between experimental and control groups have not been consistently significant. The treatment of the control groups may have affected the results. While some investigators provided scheduled rest periods for the control groups, others provided routine treatment and care (treatment as usual) during data collection, and a scheduled rest period was a treatment that reduced anxiety and pain (Barnason et al., 1995; White, 1999; Zimmerman et al., 1996). Further

investigation was warranted to compare the effect of sedative music, scheduled rest, and treatment as usual on anxiety and pain in critically ill patients.

To justify the use of sedative music to reduce anxiety and pain during chair rest, critical care nurses needed evidence that sedative music was more effective than either scheduled rest or treatment as usual. Current nursing practice (treatment as usual) in critical care does not include the use of either sedative music or a scheduled rest period during chair rest after open-heart surgery. Music therapy requires equipment (i.e., taped music selections, tape recorders, and headphones), training of nurses, and preparation of the patient; thus, scheduled rest is less time intensive and more cost-effective. Evidence was needed to determine the effect of sedative music and scheduled rest on anxiety and pain in these patients during chair rest.

Sedative music and scheduled rest have also been found to be effective in reducing MVO_2 in a resting state in critical care patients after an acute myocardial infarction (Updike, 1990; White, 1999). The rate-pressure product (RPP) was used to measure MVO_2 and was calculated by multiplying HR by SBP, and the RPP is considered a reliable noninvasive indicator of MVO_2 (White & Mattson-Porth, 2000). To date, no studies had been conducted to test the effect of sedative music or scheduled rest on MVO_2 (as measured by RPP) in critical care patients during chair rest.

Purpose of the Study

The primary aim of this study was to examine the effect of sedative music, scheduled rest, and treatment as usual on the self-reported intensity of anxiety, pain sensation, and pain distress after 30 minutes of chair rest in adult postoperative open-heart surgery patients. The hypotheses that tested the primary aim were:

1. The sedative music group will report greater reductions in anxiety, pain sensation, and pain distress after 30 minutes of chair rest than the scheduled rest group.
2. The sedative music group will report greater reductions in anxiety, pain sensation, and pain distress after 30 minutes of chair rest than the control (treatment as usual) group.
3. The scheduled rest group will report greater reductions in anxiety, pain sensation, and pain distress after 30 minutes of chair rest than the control (treatment as usual) group.

A secondary aim was to examine the effect of sedative music, scheduled rest, and treatment as usual on MVO_2 (as measured by the RPP) at 5, 10, 15, and 30 minutes after the initiation of chair rest in the adult patient after cardiac surgery. The hypotheses that tested the secondary aim were:

4. The sedative music group will have greater reductions in MVO_2 (as measured by the RPP) over time (at 5, 10, 15, and 30 minutes) after the initiation of chair rest than the scheduled rest group.
5. The sedative music group will have greater reductions in MVO_2 (as measured by the RPP) over time (at 5, 10, 15, and 30 minutes) after the initiation of chair rest than the control (treatment as usual) group.
6. The scheduled rest group will have greater reductions in MVO_2 (as measured by the RPP) over time (at 5, 10, 15, and 30 minutes) after the initiation of chair rest than the control (treatment as usual) group.

Chapter Two

Definitions and Conceptual Framework

The theoretical base for the use of sedative music and scheduled rest in critical care to reduce anxiety, pain, and myocardial oxygen demand (MVO_2) during chair rest is addressed in this chapter. Chair rest, sedative music, scheduled rest, anxiety, pain, and MVO_2 as measured by the rate-pressure product (RPP) are defined, and the conceptual framework supporting this study is presented.

Chair Rest

In this study, activity referred to movements that are accomplished in the course of meeting human physiologic needs, including activities of daily living such as bathing, dressing, eating, and walking (Mansfield, Sivarajan, & Bruce, 1978). Exercise referred to physical exertion at a prescribed frequency, duration, and intensity to prevent deconditioning, improve health, correct physical deformity or disability, and provide cardiovascular conditioning (Mansfield et al., 1978). Bed rest, dangling, standing, and chair rest were considered activities according to the above definitions.

Bed rest was defined as lying in a well-supported reclining or semi-sitting position on a bed with a thick mattress and a pillow or pillows under the head and shoulders (McCarthy, 1968). Dangling was defined as raising a patient up from a supine position (flat or with the head slightly elevated) in a bed to a sitting position with the legs hanging over the side of the bed (Winslow, Lane, & Woods, 1995). Chair rest was

defined as an activity in which the patient was in a sitting position in a chair (Voss, 2001).

Sedative Music

Listening to music is a complex phenomenon. Music was defined for this study as an organization of sounds with some degree of rhythm, melody, and harmony used for a therapeutic purpose (Buckwalter et al., 1985; Guzzetta, 1995). Pitch, interval, intensity, tone color, and rhythm are the elements of music, and the effect of music depends on the qualities of these elements and the relationships to each other and on the person who listens to the music (Alvin, 1975; Meyer, 1956).

The pitch of a sound is the number of vibrations occurring per second. High-pitched sounds act as a stimulant, while low-pitched sounds result in relaxation (Chlan, 1998b; Chlan & Tracy, 1999; Gaston, 1951). The interval is the difference in pitch between two notes and affects both the melody and the harmony of the music. The harmony is three or more pitches played simultaneously (Alvin, 1975). Personal preference and musical experience determines whether harmony is pleasing or not. Intensity is the volume of the sound or the amplitude of the vibrations. Loud music was found to increase muscle tension, whereas soft music relaxed muscles and decreased muscle tension (Alvin, 1975; Buckwalter et al., 1985; Chlan & Tracy, 1999). Emotions are also affected by the intensity of the music. Tone color (or timbre) is the quality of a sound that distinguishes it from others of the same pitch and volume. Tone color is a sensuous element of music and is based on the persons' past experiences (Alvin, 1975). Rhythm is the time pattern fitted into a certain speed and is derived mainly from the duration and intensity of sounds and the tempo. The tempo is the relative speed at which

music is played. Beats of 60 to 80 per minute are soothing, while higher rates were found to increase tension (Cook, 1981; Hanser, 1988; Henry, 1995).

Sound is produced when an object is vibrating in either a random or periodic repeated motion and can be heard by the human ear from 16 to 25,000 cycles per second in over 1,300 different tones (Guzzetta, 1995). The vibrations from an instrument or singing voice are air disturbances in the form of sound waves, and those waves move outward through the air, to the tympanic membrane, the ossicles, oval window, and cochlea. The movement stimulates receptor cells on the hair cells of the cochlea. Once stimulated, hair cells transmit impulses along the cochlear nerve to the auditory cortex of the temporal lobe in the brain and interpretation of the sound occurs (Ludwig-Beymer, Huether, & Schoessler, 1994). The organization of sound can be defined in terms of rhythm, melody, and harmony and will vary depending on the type of music (Guzzetta, 1995). For example, to produce sedative music, the rhythm would be between 60 and 80 beats per minute, and the melody and harmony would be soft, tranquil, and instrumental without lyrics (Gaston, 1951).

Music therapy is the prescribed use of specific kinds of music to elicit positive changes in psychological and physical function of individuals to restore, maintain, and improve health (Chlan, 1998b; Munro & Mount, 1978; Snyder, 1992). The environment is an essential component to consider before using music for therapeutic purposes. A quiet and comfortable environment is more suitable when using music therapy to decrease anxiety and pain, to induce relaxation, or to reduce physiologic stress (Chlan, 1998b; Chlan & Tracy, 1999; Guzzetta, 1995). The literature suggests that to create a relaxing environment, the lights should be dimmed, the drapes and door should be

closed, and a sign should be posted on the door to prevent unnecessary interruptions (Chlan & Tracy, 1999; Guzzetta, 1995).

Personal factors are also essential to consider when using music therapy (Halpern & Savary, 1985). Personal factors such as musical preferences and past experiences with music need to be considered prior to instituting music therapy (Hamel, 1979; Herth, 1978). Musical selections that are relaxing to one person may be annoying to another, and the type of music used will have an effect on the outcome of the therapy session. For example, sedative music with a slow tempo has produced such physical effects as reduced heart rate (HR), systolic blood pressure (SBP), and MVO_2, and psychological effects have included decreased anxiety and pain (Buckwalter et al., 1985). In this study the patients in the sedative music group were offered a selection of music tapes. The music included six selections of music without lyrics with 60 to 80 beats per minute. Music selections included synthesizer, harp, piano, orchestral, slow jazz, and flute (DeRuyter, 2000; Good, 1995). Also, patients who have used music as a relaxation method in the past may benefit more from a single music session than patients who do not use music. To control for this variable in this study, the patients were randomly assigned to the three groups.

Scheduled Rest

Scheduled rest was conceptualized as a specified period of time in which the environmental stimuli particularly light, noise, and interruptions are reduced to facilitate rest (White, 1999). During rest an awareness of the environment is maintained, but motor and mental work is decreased. Closing the blinds and dimming the lights darken the room, and closing the door and posting a sign to prevent being disturbed by visitors

and health care personnel decrease interruptions. Patients should receive instructions to sit quietly with their eyes closed and to rest. Investigators have reported decreased anxiety, pain, and MVO_2 in critically ill patients who received scheduled rest periods (Barnason et al., 1995; Chlan, 1995; Chlan, 1998a; Elliot, 1994; White, 1992; White, 1999; Zimmerman et al., 1996; Zimmerman et al., 1988).

Anxiety

Anxiety was defined as a subjective feeling of apprehension, tension, and worry in relation to a threatening situation (chair rest), and anxiety activates the autonomic nervous system (Spielberger, 1983). Anxiety may compel a person to act to decrease the feeling of apprehension, tension, and worry, and the efficacy of these efforts depends on the nature of the threat and on the coping strategies used. Arousal of the autonomic system may lead to potentially lethal complications, such as myocardial arrhythmias, ischemia, infarction, or sudden death (Bone et al., 1995).

Pain

Postoperative pain after cardiac surgery was defined as a composite of sensory and affective pain (Good, 1995; Johnson, 1973; Melzack & Casey, 1968). The sensory component of pain or pain sensation was the unpleasant, physical perception of hurt related to tissue damage following surgery (Good, 1995). The affective component of pain or pain distress was the emotional tension or unpleasant emotional feelings that are associated with the sensation (Melzack & Casey, 1968).

The gate-control theory is a comprehensive pain theory and is viewed as consisting of sensory-discriminative, motivational-affective, and cognitive-evaluative components (Melzack & Casey, 1968; Melzack & Wall, 1965). Tissue stress

concurrently activates both affective-motivational and sensory-discriminative components of pain (Melzack & Casey, 1968). The sensory-discriminative component is the identification of the stimulus (thermal, mechanical, or chemical) and the location, intensity, and temporal aspects of the pain experience. The affective-motivational component of pain is the emotional feelings that occur concurrently with the sensory component of pain (Good, 1995; Johnson, 1973; Melzack & Casey, 1968). Pain distress is the emotional tension or unpleasant affect that is associated with the sensation of pain (Melzack & Casey. 1968).

The gate-control theory of pain provides a broad perspective to conceptualize pain and explains the relationship between pain and emotion. Prior to the development of this theory, pain was interpreted as a sensory phenomenon (Melzack & Wall, 1965). The gate-control theory provided the conceptual framework for the integration of sensory, affective, and cognitive dimensions of pain (Melzack & Wall, 1983).

Melzack and Wall (1965) suggest the existence of a gate that could either facilitate or inhibit the transmission of pain signals. Cells in the spinal cord's dorsal horn control the gate, and the substantia gelatinosa (SG) within the dorsal horn is the anatomic location of the gate. Both large diameter and small diameter fibers converge in the SG. Also, descending fibers from the brain send pain-inhibitory information and act in the SG. Melzack and Wall (1983) propose that a spinal cord transmission cell (T cell) exists in the SG, and depending on the input from other cells, the T cell either facilitates (opens the gate) or inhibits (closes the gate) pain transmission. Whether the gate is open or closed can be influenced by fibers carrying information from many different brain centers down to the T cells.

The gate can be closed by conflicting impulses from the skin conducted over large-diameter fibers, by impulses from the reticular formation in the brainstem, or by impulses from the entire cortex or thalamus (central control system). Impulses from the peripheral fibers, brainstem, thalamus, or cortex can effectively block the transmission of pain impulses or can intensify the impulse. Such variables as thoughts and past experiences can also modify or intensify the pain experience.

The gate-control theory changed the idea that pain was a simple sensation, but a combination of affect, sensation, and central processing. The gate-control theory proposes that the responses to pain are triggered when the firing in the T cells in the dorsal horn reach a critical level. The output of the T cells is transmitted towards the brain in the ventrolateral spinal cord and is projected via the neospinothalamic fibers into the ventrobasal thalamus and somatosensory cortex and via medially coursing fibers into the reticular formation, the medial and intralaminar thalamus and the limbic system. Both projection systems are activated by the noxious stimulus (Melzack & Wall, 1983).

Melzack and Casey (1968) proposed that the selection and modulation of the sensory input through the neospinothalamic projection systems provides the neurological basis of the sensory-discriminate dimension of pain, while the activation of the reticular and limbic structures is responsible for the motivational-affective responses. The higher central control processes (such as past experience) exert control over activity in both the motivational-affective and sensory-discriminative systems.

The assumption is that the three categories interact to provide perceptual information regarding the location, magnitude, and spatiotemporal properties of the noxious stimulus, motivation tendency toward escape or attack, and cognitive

information based on the analysis of information, past experience, and probability of outcome of different response strategies (Melzack & Wall, 1983). This influences the motor mechanisms responsible for the complex pattern of overt responses that characterize pain.

Emotional aspects of pain (pain distress) can be discriminated from sensory (pain sensation) qualities (Johnson, 1973). This is consistent with the separate projection systems suggested in the gate-control theory. Also, pain distress tends to differ dramatically across different forms of clinical pain and within individuals over time quite independently of the sensory qualities (Katz, 1995).

Myocardial Oxygen Demand

Myocardial oxygen demand was defined as the amount of oxygen used by the heart, and the RPP was an easily measured predictor (Gobel, Nordstrom, Nelson, Jorgensen, & Wang, 1978). The heart extracts oxygen from the perfusing blood, and during chair rest the oxygen requirement of the heart may increase. This additional oxygen is supplied by increasing coronary blood flow according to myocardial metabolism and oxygen demand (Bond & Halpenny, 1995).

The heart uses oxygen for activities that are independent of contraction and includes such functions as maintenance of the proper ionic environment and repair or replacement of intracellular proteins (Klocke, Braunwald, & Ross, 1966). The amount of oxygen used in these functions is relatively small and stable. Also, each contraction of the heart involves movements of ions across the cell membranes, but the oxygen cost is small.

In addition to these two fairly constant and low requirements for oxygen, there are four factors related to activity and the state of the heart that determines how much oxygen the heart will need (Bond & Halpenny, 1995). The major determinants of MVO_2 are intramyocardial tension, HR, shortening, and contractile state. The RPP is a commonly used noninvasive indicator of MVO_2 (Gobel et al., 1978; Kitamura, Jorgensen, Gobel, Taylor, & Wang, 1972), and the RPP takes into account the HR and tension (as measured by pressure). Although a direct measure of MVO_2 by invasive monitoring is a more accurate measure, the RPP compared to direct MVO_2 measurements has been shown to be an accurate and reliable indicator in healthy subjects and subjects with ischemic heart disease (Gobel et al., 1978; Kitamura et al., 1972).

The RPP has been used in numerous studies to provide an indirect measure MVO_2 (Bairey-Merz, et al., 1998; Jain et al.1998; Kavanagh, Matosevic, Thacker, Belliar, & Shephard, 1998; Villella, Villella, Barlera, Franzosi, & Maggioni, 1998; White, 1999). The populations studied had diagnoses of coronary artery disease or acute myocardial infarction. Although the RPP has not been used as a physiological measure in studies of postoperative open-heart patients, the RPP is a commonly used measure in cardiac rehabilitation programs to estimate MVO_2.

The RPP increases during chair rest, indicating increasing MVO_2 (Kitamura et al., 1972; Ritchie & Sivarajan-Froelicher, 1995; Voss, 2001). If the increased MVO_2 cannot be met, signs of ischemia, such as angina and electrocardiogram changes, appear. Protective measures can be taken to reduce MVO_2 by modifying the activity intensity or

by beta-adrenergic blockers that lower HR and SBP. Sedative music or scheduled rest may also be indicated to reduce MVO_2 during activity by reducing HR and SBP.

Conceptual Framework

The conceptual framework guiding this program of research to understand the effects of interventions used to decrease anxiety, pain, and MVO_2 in critically ill patients was based on Lazarus and Folkman's (1984) transactional model of stress and coping (see Figure 1). The level of stress at any time is a result of a dynamic transaction between the person and the environment. The net result of a transaction between personal and environmental stressors and resources following cognitive appraisal determines a critically ill patient's stress level. Personal factors that affect the transaction include internal demands (e.g., resolving tissue trauma from surgery), coping resources (e.g., energy, problem solving skills, family, social skills), and coping constraints (e.g., frequent interruptions, lack of control, unexpected surgery, pain). Environmental factors include external demands (e.g., restricted movement, increasing activity such as chair rest), material resources (e.g., health insurance), and environmental constraints (e.g., bright lights, unfamiliar setting, alarms, noise, attachment to wires and tubes). According to the transactional model, a stressor is any potential threat, and the stressor only results in stress if the critically ill patient cognitively appraises the stressor as a threat that exceeds resources.

Cognitive appraisal is an assessment that evaluates whether and to what extent the transaction is stressful to the person, and there are two phases to cognitive appraisal, primary and secondary (Lazarus & Folkman, 1984). Primary appraisal assesses the

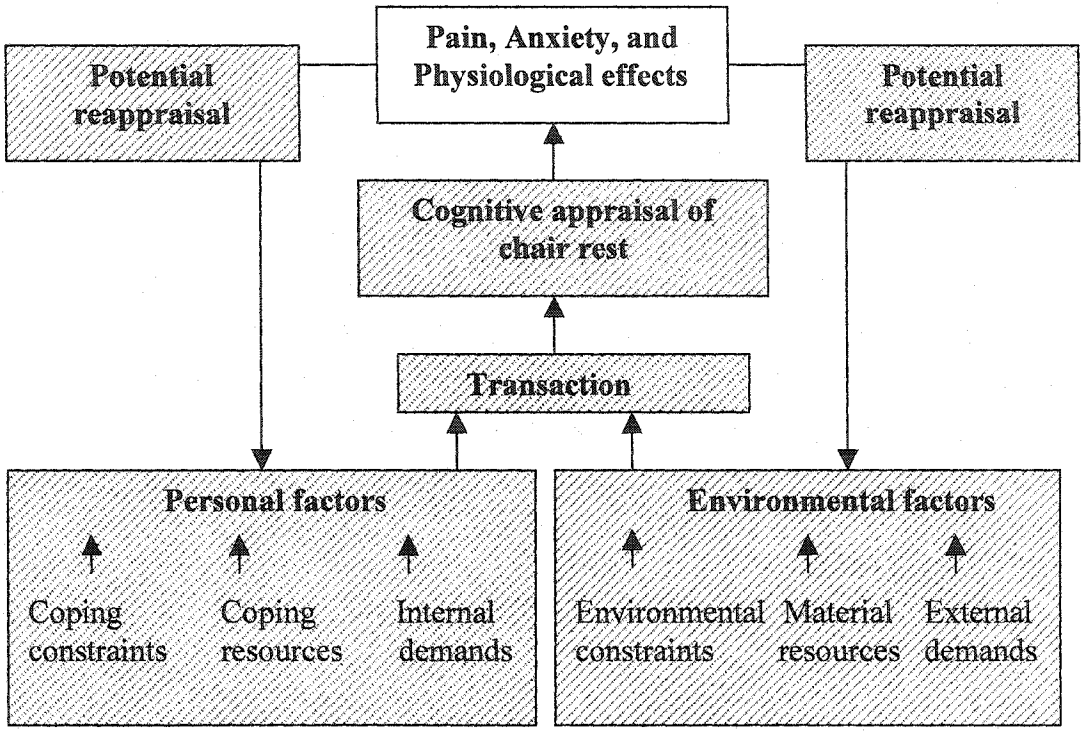

Figure 1. A transactional model of the effect of chair rest on the critically ill patient and use of the model in the proposed study. Shaded areas will not be measured in this study. Adapted from Lazarus and Folkman (1984).

potential effect of the stressor on the person, and secondary appraisal considers available coping options and their potential efficacy in reducing harm. The stress level is the net result of primary and secondary appraisal and the personal and environmental demands, coping resources and coping constraints at that moment. The transaction is ongoing and reappraisal may occur at any time.

Coping resources and constraints are considered during secondary appraisal (Lazarus & Folkman, 1984). Coping is a constantly changing cognitive and behavioral

effort to manage external and internal demands that are appraised as exceeding the resources of the person. Coping effectiveness in reducing stress depends on the balance between coping resources, constraints, and strategies.

The transaction of personal and environmental factors influences the cognitive appraisal of chair rest, resulting in changes in perception of anxiety and pain about chair rest and changes in physiological measures. Factors in the environment that affect a person include environmental constraints, external demands, and material resources. Chair rest is an external demand.

After cognitive appraisal, a person tries to use coping strategies to minimize stress. The success of coping activities is determined by a person's balance of coping resources, coping constraints, and internal demands (Lazarus & Folkman, 1984). Critically ill patients may not be able to use their previously successful coping strategies, therefore, these patients may benefit from offering alternative coping resources such as sedative music and scheduled rest.

Research has demonstrated the important roles that cognitive factors such as appraisals, beliefs, and expectancies play in exacerbating the pain experience (Boothby, Thorn, Stroud, & Jensen, 1999; Turk & Rudy, 1992). Cognitive behavioral interventions are designed to help patients identify maladaptive patterns and acquire, develop and practice more adaptive ways of responding to anxiety and pain. Cognitive behavioral interventions such as sedative music and scheduled rest are suggested for patients who are anxious, have a desire to participate in the intervention, and have incomplete relief from opioid medication or could benefit from less opioid medication (Acute Pain Management Guideline Panel, 1992).

The exact mechanisms by which cognitive behavioral interventions such as sedative music and scheduled rest reduce anxiety and pain are unknown. But, researchers have explained that the effects are a result of distraction, the relaxation response, a reduction of anxiety, or providing a sense of control (Good, 1995; Good et al., 1999; Heitz, Symreng, & Scamman, 1992; Updike, 1990). Others have postulated that the reduction in pain is related to the modulation of pain transmission in congruence with the gate-control theory of pain (Good, 1995; Good & Chin, 1998; Good et al., 1999; Zimmerman et al., 1996). According to the gate-control theory of pain, the gating mechanism can increase or decrease the flow of nerve impulses from the painful stimulation of the peripheral fibers to the central nervous system (Melzack & Casey, 1968). This system also includes the brain processes that exert descending control over sensory input at the level of the spinal cord.

The conceptual framework for this study is presented in Figure 2. Sedative music and scheduled rest were conceptualized as cognitive behavioral interventions that provide an alternative way of coping with anxiety and pain (Turk & Okifuji, 1999). Sedative music created a distraction or diversion of attention from anxiety and pain onto something more pleasant. Scheduled rest reduced anxiety and pain by eliminating interruptions and facilitating decreased physical and mental work. These interventions reduced MVO_2 by decreased activation of the autonomic system. Anxiety about chair rest, pain sensation, and pain distress are perceptions of intensity and were measured by visual analogue scales (VAS). The MVO_2 is a physiologic effect and was measured by the RPP.

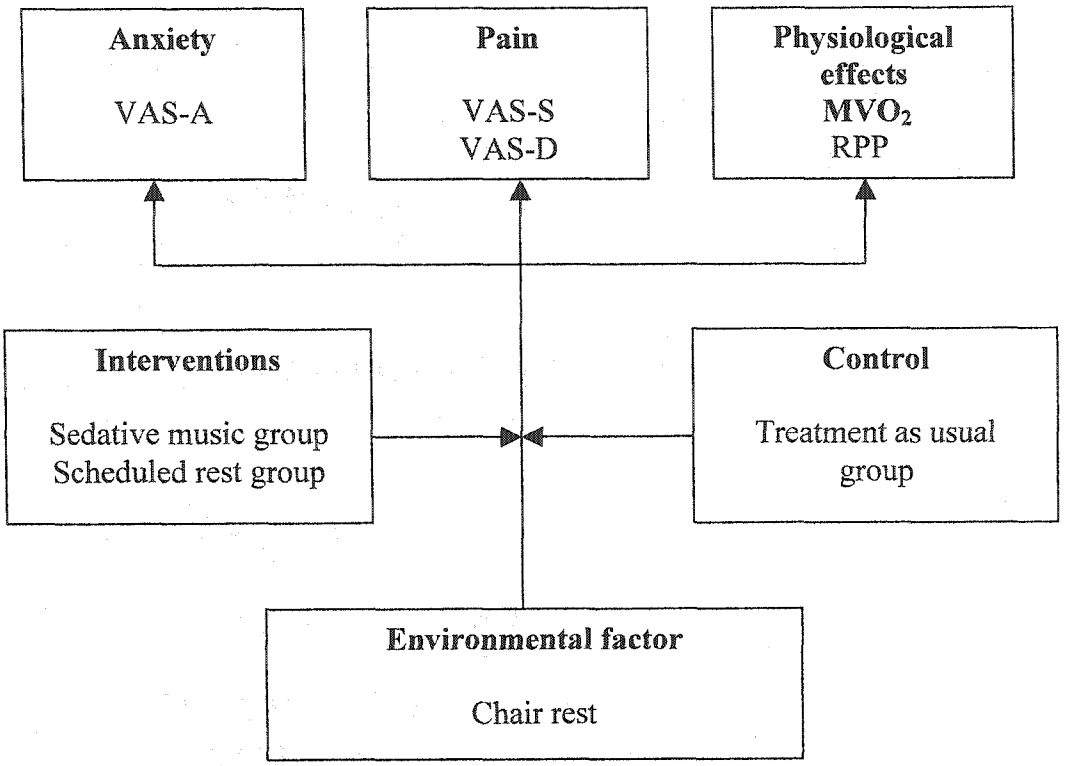

Figure 2. Conceptual framework for the proposed study. VAS = visual analogue scale. A = anxiety. S = sensation of pain. D = distress of pain. MVO_2 = myocardial oxygen demand. RPP = rate-pressure product.

Chapter Three

Literature Review

Over the years, studies have demonstrated that sedative music and scheduled rest have improved self-reported measures of anxiety and pain. Also, sedative music and scheduled rest have reduced myocardial oxygen demand (MVO_2) as measured by the rate-pressure product (RPP), which is the product of the heart rate (HR) and the systolic blood pressure (SBP). Empirical evidence has been provided related to the usefulness of sedative music and scheduled rest, and there is evidence that both interventions are therapeutic in the critical care setting. The research literature related to sedative music and scheduled rest used to reduce self-reported anxiety and pain and RPP is reviewed in this chapter.

Published studies of the effects of music therapy and scheduled rest on self-reported anxiety and pain and RPP were located by searching Medline from 1985 to 2002 using the keywords music, rest, anxiety, pain, and RPP. This review focuses on those studies examining the effect of sedative music and scheduled rest on self-reported anxiety and pain and RPP in either critical care or postoperative patients, and 20 studies are described. The purpose, methodology, and primary conclusions of the studies will be highlighted, and methodological issues will also be addressed.

Effect of Sedative Music and Scheduled Rest on Anxiety

Several investigators have studied the effect of music and scheduled rest on self-reported anxiety in the critical care setting (see Appendix A). Each of the reviewed

studies examining the effect of sedative music and scheduled rest on self-reported anxiety is described and methodological issues discussed.

An interview of 24 coronary care patients was conducted before and after listening to classical music (Davis-Rollans & Cunningham, 1987). The emotional state reported by the patients before the music varied from tranquil to worried or depressed, but after the music, patients reported feeling tranquil to happy or satisfied. Another investigator reported similar results in 20 patients with suspected acute myocardial infarction (Updike, 1990). These patients were asked about their emotional state before and after listening to classical or contemporary music. After listening to music, patients in this study reported feeling calm, relaxed, and serene and reported diminished pain or an absence of pain. The change in the patients' emotional states in these two studies indicated that sedative music was capable of reducing anxiety, depression, worry, and pain. In a similar study, 80 presumptive acute myocardial infarction patients were asked to qualitatively evaluate the helpfulness of soothing music or a relaxation technique to induce relaxation (Guzzetta, 1989). The patients were randomly assigned to receive music, relaxation, or routine care (control). The relaxation and music groups participated in three sessions over a two-day period. Only the patients receiving an intervention ($n = 53$) were asked the evaluative questions. Nearly all the patients who received either music or relaxation reported the interventions as being helpful to extremely helpful to induce relaxation (92.5%).

In an experimental study, Zimmerman et al. (1988) studied the effects of listening to relaxation-type music on anxiety in 75 patients with suspected myocardial infarction. The patients were randomly assigned to one of three groups, music group,

white noise group, or control group (that received scheduled rest). Spielberger's (1983) State Anxiety Inventory (SAI) was administered before and after each testing session. The SAI is a 20-item scale for measuring anxiety as the feeling that is experienced at a particular moment, and the scale consists of 20 statements that the patient rates on a scale from 1 (not at all) to 4 (very much so) to describe how they feel. The 20 items are anxiety-present and anxiety-absent items, and each item is given a weighted score of 1 to 4. Possible scores range from a minimum of 20, indicating low anxiety, to a maximum of 80, indicating high anxiety. Although there was no significant difference between the three groups, the mean SAI scores in all three groups decreased from pretest to posttest (see Table 1). The low level of patient anxiety was a factor in failure to demonstrate significant group effects. The mean SAI score for this study was lower than the mean SAI score for medical-surgical patients (42.4) in a normative sample (Spielberger, 1983). The investigators excluded extremely critical patients from participating in this study, and those patients who were excluded may have had higher anxiety. With low anxiety levels, the effect size of the interventions was small, and to attain a power level of .80, the sample size would need to be increased. Most likely, this study had an inadequate sample size to detect significant differences. Also, since the mean posttest anxiety scores were reduced in both groups, patients received benefit from a period of uninterrupted rest. Zimmerman et al. (1988) suggested that a group should have been included that received routine care, because the control group in this study received scheduled rest, which was an intervention.

To examine the effects of music and muscle relaxation techniques in reducing anxiety of 56 patients in coronary care with ischemic heart disease, Elliot (1994)

Table 1

Mean Pretest and Posttest Scores on State Anxiety Inventory Scale as Adapted from Zimmerman, Pierson, and Marker (1988)

Group	*n*	Pretest *M(SD)*	Posttest *M(SD)*
Music	25	41.1(11.2)	33.0(11.6)
White noise	25	37.8(13.1)	32.1(12.5)
Control	25	35.7 (9.2)	31.4 (9.7)

Note. State Anxiety Inventory has a range from 20 to 80. Control group received scheduled rest period. No significant difference in mean posttest scores between the three groups.

conducted a study in which patients were randomized to receive two to three 30-minute sessions of music, muscle relaxation, or control (scheduled rest). The SAI, the Hospital Anxiety and Depression Scale for Anxiety (HADS-A), and a Linear Anxiety Analogue Scale (LAAS) were measured as indicators of anxiety. The HADS-A is an eight-statement instrument with weighted responses (0 to 3 points for each item), and a score of 10 points or greater indicates significant anxiety. The LAAS was a 10 cm bipolar line in which the patient checked a point along the horizontal line to indicate the degree of anxiety, and scores ranged from 0 to 100. Measurements were obtained at baseline and

after the second or third session of music, muscle relaxation, or scheduled rest (control). No significant reductions in anxiety were achieved for patients using music or muscle relaxation interventions when compared with the control group. The calculated effect size of the interventions was .17, indicating a small effect with a power of .19. Therefore, there was a high probability that a Type II error occurred because of an inadequate sample size to detect significant differences between groups. The small effect size was consistent with other studies that compared music or muscle relaxation to a control group that received scheduled rest (Barnason et al., 1995; Zimmerman et al., 1988). Although no significant differences were detected, all three groups had a reduction in anxiety scores (SAI, HADS-A, and LAAS) from pretest to posttest (see Table 2).

In a pilot study, Chlan (1995) used a short form of the Profile of Mood States (POMS) to measure the effect of music on anxiety in ventilated patients. The short form of the POMS is a standardized instrument that measures six mood states: tension-anxiety, depression-dejection, anger-hostility, vigor-activity, fatigue-inertia, and confusion-bewilderment (McNair, Lorr, & Droppleman, 1992). Patients responded to how they were feeling on 30 items (e.g., tense, shaky, nervous, anxious, etc.). The responses were scored on a 5-point Likert scale with a range from 0 (*not at all*) to 4 (*extremely*). Possible scores range from a minimum of 0 to a maximum of 20. A total mean mood disturbance POMS score reflects negative mood states associated with the distress of illness. Patients were randomized to receive music or control. The music group ($n = 11$) listened to 30 minutes of classical music, and the control group ($n = 9$) was provided 30 minutes of uninterrupted rest with headphones only. The mean scores

Table 2

Mean Pretest and Posttest Anxiety Scores as Adapted from Elliot (1994)

		SAI		HADS-A		LAAS	
		Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
Group	*n*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*
Music	19	40.3(11.0)	32.1(6.3)	8.4(4.3)	6.8(2.9)	39.4(21.1)	30.8(17.0)
Muscle relaxation	18	39.7(11.0)	33.2(10.0)	8.8(5.1)	8.4(4.7)	35.0(18.3)	24.2(15.1)
Control	19	36.0(11.6)	30.1(10.4)	6.5(4.0)	6.5(4.0)	29.2(23.2)	26.4(23.7)

Note. State Anxiety Inventory (SAI) has a range of scores from 20 to 80. Hospital Anxiety and Depression Scale-Anxiety (HADS-A) score of 10 points or greater indicates significant anxiety. Linear Anxiety Analogue Scale (LAAS) has a range from 0 to 100. Control group received scheduled rest. No significant differences in mean posttest anxiety scores (SAI, HADS-A, and LAAS) between music, muscle relaxation, and control groups.

on the short form of the POMS in the music group and control group at pretest were 16.5(10.7) and 15.0(9.0), respectively, and the music group had a posttest mean score of 9.9(8.9) compared to the control group with a mean posttest score of 18.4(13.1). Although the music group had a lower mean posttest score than the control group, the difference was not significantly different. But, the small sample size ($N = 20$) resulted in inadequate power to detect significant differences between the music and control groups.

Because of the time necessary for completing the 20-item SAI, Chlan (1998a) used a 6-item short form of the SAI in a subsequent study to measure anxiety in 54 ventilator patients. The 6-item SAI consists of 6 statements that the patient rates on a

scale similar to the 20-item SAI. Possible scores range from a minimum of 6, indicating low anxiety, to 24, indicating high anxiety (Marteau & Bekker, 1992). Patients were randomized to the music and control groups. The music group received 30 minutes of music while resting in bed, and the control group received a 30-minute rest period without interruptions. Mean pretest and posttest scores are reported in Table 3. Patients who received music reported significantly less anxiety at posttest than those patients in the control group. A single music session was more effective for decreasing anxiety than the control situation in which patients received scheduled rest. This finding was not consistent with others who compared music to scheduled rest as a control (Elliot, 1994; Zimmerman et al., 1988), but the ventilator patients in this study had high anxiety levels at pretest, and the calculated effect size was large (*ES* = .67) for this group of ventilator-dependent patients in critical care.

Table 3

Mean Pretest and Posttest Scores on 6-item State Anxiety Inventory Scale as Adapted from Chlan (1998a)

		Pretest	Posttest
Group	*n*	*M(SD)*	*M(SD)*
Music	27	17.3(4.1)	10.1(3.8)*
Control	27	17.7(4.1)	16.2(4.1)

Note. 6-item State Anxiety Inventory has a range from 6 to 24. Control group received scheduled rest. Significant difference in the mean posttest scores between music and control groups. *$p < .001$.

The best evidence that music is more effective in reducing state anxiety (as measured by the SAI) than scheduled rest and treatment as usual in patients hospitalized for acute myocardial infarction has been from research conducted by three investigators (Lueders-Bolwerk, 1990; White, 1992; White, 1999). Lueders-Bolwerk (1990) examined the effect of music on state anxiety in 61 patients with a diagnosis of acute myocardial infarction and a pretest SAI score of greater than 40. The patients were randomized to receive classical music or treatment as usual (control group). The music group received three 22-minute sessions of music for three consecutive days. The music group had a significantly lower mean posttest anxiety score than the control group who received treatment as usual (see Table 4).

White (1992) conducted a similar study in which 40 patients with acute myocardial infarction were randomized to a music group or a control group. The music group received one 25-minute session of classical music, and the control group received one 25-minute session of quiet, uninterrupted rest. Anxiety was measured before and after the music intervention or the control period. The music group had a significantly lower mean posttest anxiety score than the control group who received quiet, uninterrupted rest (see Table 4).

In a later study, White (1999) compared the effects of music, quiet, uninterrupted rest, and treatment as usual on anxiety levels in 45 patients with acute myocardial infarction. Patients were randomly assigned to 20 minutes of music (music group), quiet, restful environment (rest group), or treatment as usual (control group). Anxiety levels were measured at pretest and posttest (see Table 4). The music group had a significantly lower mean posttest anxiety score than the rest and control groups,

Table 4

Mean Pretest and Posttest Scores on State Anxiety Inventory Scale

Group	*n*	Pretest *M(SD)*	Posttest *M(SD)*
		Lueders-Bolwerk, 1990	
Music	17	46.6(7.2)	31.2(7.6)**
Control[a]	18	48.7(8.8)	39.6(9.7)
		White, 1992	
Music	20	48.2(5.9)	37.2(8.0)***
Control[b]	20	45.4(4.5)	42.2(7.5)
		White, 1999	
Music	15	39.3(2.7)	31.7(2.5)[c]*
Rest	15	47.1(6.5)	37.9(2.0)[d]
Control[a]	15	38.3(2.8)	42.0(3.3)[d]

Note. State Anxiety Inventory scores range from 20 to 80. [a]Control group received treatment as usual. [b]Control group received quiet, uninterrupted rest. [cd]Posttest scores with differing superscripts are significant, scores with same superscripts are not significant. Significant difference in the mean posttest scores. *p <.01. **p = .007. *** p <.002.

but the mean posttest anxiety score increased from pretest in the control group. The music and rest group had a reduction in the mean posttest anxiety score from pretest, but the mean posttest anxiety score increased from pretest in the control group. These studies provided evidence that patients recovering from acute myocardial infarction benefited from music and a quiet, restful environment.

To examine the effect during the early postoperative period of selected nursing interventions on anxiety of patients after open-heart surgery, Barnason et al., (1995) studied 96 patients after heart bypass surgery. The patients were randomized to one of three groups: music therapy, music-video therapy, or scheduled rest group. The patients received their assigned 30-minute intervention at two episodes on postoperative days 2 and 3. Anxiety was evaluated immediately before and after each session with a numeric rating scale (NRS). The NRS consisted of having the patient rate perceived pain on a continuum of intensity ranging from 0 (*no pain*) to 10 (*pain as bad as could ever be experienced*). Patients also completed the SAI before the intervention session on postoperative day 2 and on completion of the session on day 3 (see Tables 5 and 6). No significant differences were reported for anxiety ratings as measured by the NRS and SAI between the three intervention groups, but there was reduced anxiety within all three groups. The patients in this study had relatively low levels of anxiety as measured by the SAI and the NRS on postoperative days 2 and 3. The results may have been totally different in a group of highly anxious patients on postoperative day 1.

In summary, music was found to be more efficacious than scheduled rest in three studies (Chlan, 1998a; White, 1992; White, 1999) and more efficacious than treatment as usual in two studies (Lueders-Bolwerk, 1990; White, 1999). In the studies with

Table 5

Mean Pretest and Posttest State Anxiety Inventory Scores as Adapted from Barnason, Zimmerman, and and Nieveen (1995)

Group	*n*	Pretest *M(SD)*	Posttest *M(SD)*
Music	33	34.1(13.8)	31.8(11.4)
Music-video	29	31.6(11.0)	33.1(12.9)
Rest	34	38.2(12.9)	34.7(16.0)

Note. State Anxiety Inventory has range of scores from 20 to 80. No significant differences for mean posttest anxiety scores among the three groups.

significant findings, the investigators used stronger research designs with adequate sample sizes to detect significant differences. Also, comparison of music with scheduled rest as opposed to treatment as usual may be a methodological issue to consider, since scheduled rest may be considered a treatment to reduce anxiety. White (1999) has provided the best evidence that music was more effective than scheduled rest and treatment as usual in patients hospitalized for acute myocardial infarction, but further research was indicated to determine the effect of sedative music in postoperative, open-heart surgical patients while in the critical care unit. Also, an experimental study with an adequate sample size to detect significant group differences in anxiety was needed to

compare the effect of sedative music and scheduled rest with a control group who received treatment as usual.

Table 6

Mean Numeric Rating Scale Scores on Postoperative Days 2 and 3 for Anxiety as Adapted from Barnason, Zimmerman, and Nieveen (1995)

		Postoperative Day 2		Postoperative Day 3	
		Pretest	Posttest	Pretest	Posttest
Group	*n*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*
Music	33	2.9(2.9)	1.9(2.6)	1.4(1.6)	1.8(2.2)
Music-video	29	3.0(3.0)	1.8(3.0)	3.0(3.1)	2.3(3.2)
Rest	34	3.8(2.9)	2.9(2.6)	3.0(2.8)	2.6(2.5)

Note. Numeric Rating Scale has a range from 0 to 10.

No significant group differences between posttest anxiety ratings on postoperative day 2 or postoperative day 3.

Effect of Sedative Music and Scheduled Rest on Pain

Several investigators have studied the effect of sedative music and scheduled rest on self-reported pain in postoperative patients (see Appendix B). Each of the reviewed

studies examining the effect of sedative music and scheduled rest on self-reported pain is described and methodological issues discussed.

Investigators have studied the effect of sedative music in the post-anesthesia care unit (PACU). Heitz et al. (1992) examined the effect of music in PACU patients after neck or breast surgery. Sixty patients were randomly assigned to the music group, the headphone group (wearing headphones, but not listening to music), or the control group (not wearing headphones). A visual analogue pain scale (VAS) was used to rate patients' perception of pain every 15 minutes while in the PACU. The VAS was a 100 mm horizontal line with two verbal descriptors at each end (*no pain* to *most pain*). Patients marked across the line to indicate the level of pain. The VAS was then measured in mm from the left anchor to the patients' mark, and possible scores ranged from 0 to 100. No significant differences were found between the groups for pain, and the lack of significance was attributed to a small sample size and the small effect size of the music intervention. Although no significant differences were noted between the groups with respect to self-reported pain, patients in the music group who completed an interview described their experience with music as beneficial (94%), stated the music was relaxing (80%), and reported that the music decreased their pain and discomfort (33%).

Other investigators have reported similar results in PACU patients after surgery. Heiser, Chiles, Fudge, and Gray (1997) evaluated the effect of music on pain and anxiety (affective distress) levels of 10 lumbar surgery patients who were emerging and recovering from anesthesia. Patients in the music group listened to music with headphones during the first hour in the PACU while the control group received treatment

as usual. Pain and anxiety (affective distress) were measured with a VAS that corresponded to a numeric scale ranging from 0 (*no pain* or *no anxiety)* to 10 (*the most pain* or *the worst anxiety*). Pain and anxiety were measured after one hour in PACU and 24 hours later. No significant differences were found between the 5 patients who listened to music and the 5 patients who received treatment as usual in the PACU after lumbar surgery. The lack of significance was related to the small sample size and the lack of control for analgesic medication use between the two groups. However, patients in the music group stated that music helped them relax and functioned as a distraction.

In another study conducted in the PACU, 61 abdominal hysterectomy patients were randomly assigned to receive music, headphones only, or treatment as usual (Taylor, Kuttlor, Parks, & Milton, 1998). Two instruments were used to evaluate pain. The first instrument was a verbal pain scale of 1 (*no pain*) to 10 (*the worst possible pain*), and the other instrument was a Graphic Numeric Pain Intensity Scale (GNPIS). The GNPIS consisted of a 9-inch line with the ends defined as the number 1 representing *no pain* and the number 10 representing *the worst possible pain.* The patients marked an "X" on the scale at their perceived level of pain. The verbal pain scale was administered every 15 minutes, and the GNPIS was administered just before discharge from the PACU. There were no significant differences in pain ratings over time as measured by the verbal pain scale or at discharge as measured by the GNPIS between the three groups (see Table 7). The insignificant findings were related to the small sample size, a lack of control between groups for anesthesia and pain medications, and the intense pain experienced by patients when awakening from anesthesia before analgesics are

administered. Although the results were not significant, the patients in the music group reported satisfaction with this intervention and felt the music helped them.

Table 7

Mean Posttest Pain Scores on Graphic Numeric Pain Intensity Scale as Adapted from Taylor, Kuttler, Parks, and Milton (1998)

Group	*n*	*M(SD)*
Music	20	5.8(1.6)
Headphones	21	5.8(1.9)
Control	20	6.5(1.7)

Note. Graphic Numeric Pain Intensity Scale scores had a range from 1 to 10. No significant differences among groups.

Mullooly, Levin, and Feldman (1988) examined the role of music in reducing postoperative pain in 28 women who underwent abdominal hysterectomies. On the first and second postoperative day, the treatment group received ten minutes of easy listening instrumental music and the control group received usual care. Pain was measured with a VAS, which consisted of a 100 mm line with verbal descriptors on either end (*no pain at all* to *pain bad as could be*), and anxiety was measured with a five point graphic scale, which included both verbal and numerical descriptors from 0 (*calm*) to 4 (*extremely anxious*). Measurements were taken at pretest and posttest on the first and second

postoperative days. The mean posttest pain score in the music group was not significantly lower than the control group on the first postoperative day, but was significant on the second postoperative day (see Table 8). The mean posttest anxiety scores were significantly lower in the music group than the control group on the first and second postoperative days. The lack of significant difference in the mean posttest pain score on the first postoperative day was a result of patients' drowsiness and the difficulty in completing the rating scales. Only 11 of the 28 patients were able to complete the rating scales on the first postoperative day. Also, the researchers did not control for the timing of pain medication administration. Music was the most effective after the first 24 postoperative hours when patients were more alert and reactive.

In an experimental study, abdominal surgical patients ($N = 84$) were randomly assigned to receive music, relaxation, a combination of music and relaxation, or control (routine care) during the first ambulation after surgery (Good, 1995). Sensation of pain was measured by the Sensation of Pain Scale, and the affective component of pain was measured by the Distress of Pain Scale and the SAI. The Sensation of Pain Scales and the Distress of Pain Scales each consisted of a horizontal line numbered from 0 to 10 with three verbal anchors: *no sensation, medium sensation*, and *most sensation*, and *no distress*, *moderate distress*, and *extremely distressing* (Johnson, 1973). Patients marked the sensation scale to indicate the amount of physical pain and marked the distress scale to indicate how much the sensations bothered them and the rest of their body. Patients completed the scales and the SAI prior to ambulation and at post-ambulation. At the first ambulation after surgery, no significant differences were found in sensation, distress, or anxiety between the music and control groups (see Table 9). However, after

Table 8

Mean Pretest and Posttest Scores for Pain and Anxiety as Adapted from Mullooly, Levin, and Feldman (1988)

		Pain		Anxiety	
		Pretest	Posttest	Pretest	Posttest
Group	*n*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*
			Day 1		
Music	6	70.3(28.0)	64.2(35.1)	1.7(1.7)	0.7(0.8)**
Control	5	88.6(19.9)	87.6(21.7)	2.4(0.9)	2.8(0.5)
			Day 2		
Music	14	42.2(26.1)	29.6(26.6)*	0.8(0.7)	0.4(0.7)*
Control	14	50.9(21.9)	53.4(19.7)	1.1(0.8)	1.1(0.9)

Note. Pain was measured with a visual analogue scale that has a range from 0 to 100, and anxiety was measured with a five point graphic scale that has a range from 0 to 4.

Significant difference in mean posttest scores between music and control.

*$p = .03$. **$p = .00$.

two days of self-care use, 89% of patients receiving music, relaxation, or a combination reported the interventions as helpful for pain sensation and distress. Insignificant findings at initial ambulation may have occurred related to a number of factors. First, the difficulty of demonstrating an effect might have been due to higher and more variable pain scores in these patients. In addition, the use of relaxation or distraction

Table 9

Mean Posttest Scores for Pain Sensation, Pain Distress, and Anxiety as Adapted from Good (1995)

	Sensation	Distress	Anxiety
Groups	*M(SD)*	*M(SD)*	*M(SD)*
Music	6.6(2.3)	5.7(2.5)	40.0(12.7)
Control	5.2(2.5)	5.3(2.7)	41.7(10.4)

Note. Pain sensation and distress were measured with Sensation of Pain Scale and Distress of Pain Scale that have a range from 0 to 10. Anxiety was measured with the State Anxiety Inventory that has a range from 20 to 80.

No significant differences in mean posttest scores between the music and control groups.

techniques may have been difficult for patients during initial ambulation, and the interventions may not be strong enough for the complex activity of ambulation. The patients (89%) in this study reported a preference to use the interventions while resting in bed.

In a subsequent study, Good and Chin (1998) examined the effect of music to reduce postoperative pain in 35 patients in Taiwan after upper and lower abdominal surgeries. Patients were randomly assigned to receive sedative music or usual care (to lie quietly in bed) on the first and second postoperative days. Visual analogue scales measured sensation and distress of pain. The scales consisted of 100 mm lines with two verbal anchors: *no sensation of pain* to *most sensation of pain* and *no distress* to *most distress*. Patients marked the scales to indicate the amount of sensation and distress. The scales were measured in mm from the left anchor to the patients' mark and scores could range between 0 and 100. On postoperative day 1 and day 2, the effectiveness of the music was investigated during 15 minutes of rest in bed. There was a significant interaction between time and group in the distress of pain on the first postoperative day, but not on the second postoperative day, and in pain sensation on the second postoperative day, but not on the first postoperative day (see Table 10). The music group had significantly lower pain distress scores on the first postoperative day and lower pain sensation scores on the second postoperative day than did the control group who received usual care. This study showed that even in a small sample, music was effective at rest. The mixed findings in this study were related to the small sample size and pain scores with large standard deviations (due to differences in patient responses) tending to diminish the mean effect size. The patients who received music were interviewed on postoperative day 3 to determine the liking of the music, calming effects, and the helpfulness of the music. The patients indicated that they would prefer Buddhist hymns or popular songs heard in Taiwan. These findings support the use of culturally acceptable music for the sensation and distress of postoperative pain.

Table 10

Mean Pretest and Posttest Scores for Sensation and Distress of Pain as Adapted from Good and Chin (1998)

		Sensation		Distress	
		Pretest	Posttest	Pretest	Posttest
Group	*n*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*
			Day 1		
Music	16	49.7(29.4)	41.6(21.5)	45.4(33.2)	29.3(21.9)*
Usual care	16	46.6(23.4)	42.8(26.7)	41.9(27.2)	39.7(29.9)
			Day 2		
Music	13	19.9(16.7)	14.4(15.6)*	17.0(18.3)	11.7(16.1)
Usual care	21	34.9(27.5)	32.9(27.8)	35.4(32.3)	31.2(30.6)

Note. Visual analogue scale scores have a possible range from 0 to 100 mm. Significant difference in mean posttest scores between music and usual care.

*$p < .05$.

In a large randomized controlled trial ($N = 500$), the effect of jaw relaxation, music, and a combination of jaw relaxation and music on postoperative pain (sensation and distress) after abdominal surgery during ambulation and rest on postoperative days 1 and 2 was studied (Good et al., 1999). Patients were randomly assigned to a relaxation, music, relaxation plus music, or control group. Pain sensation and distress were

measured with dual VAS before and after a 15-minute rest period and at four points during ambulation on postoperative days 1 and 2 (before preparation, after preparation, after ambulation and after recovery). The VAS were 100 mm horizontal lines with verbal anchors of *none* to *most sensation* and *most distress*. Scores could range from 0 to 100. The results related to the music group compared to the control group are discussed here. The music group had significantly lower pain (both sensation and distress) at all time points except for pain distress at post ambulation on postoperative day 2 (see Table 11). The non-significant finding for pain distress at post ambulation on postoperative day 2 was attributed to patients being distracted by instructions from the nurse and not concentrating on the music. The data from this study strongly support the use of music to reduce both pain sensation and distress during ambulation and during rest.

Several investigators have studied the effect of music on pain in critically ill patients after open-heart surgery. Broscious (1999) examined the effect of music as an intervention for pain relief during chest tube removal after open-heart surgery ($N = 156$). In a randomized pretest posttest experimental study, patients were randomly assigned to one of three groups: music, white noise, or control. The music group listened to music during chest tube removal, the white noise group listened to a white noise tape, and the control group received treatment as usual. Patients rated their perceived pain intensity by using a numeric rating scale before chest tube removal, immediately after chest tube removal, and 15 minutes after chest tube removal. The numeric rating scale was a 10 cm horizontal line marked in equal segments from 0 (*no pain*) to 10 (*pain as bad as it can be*). No significant difference was found in pain before, during and after chest tube

Table 11

Mean Pretest and Posttest Scores on Visual Analogue Scales for Pain as Adapted from Good et al. (1999)

	Day 1		Day 2	
	Music	Control	Music	Control
Data points	(n = 89[a], 122[b])	(n = 89, 111)	(n = 100, 118)	(n = 106, 109)
		Sensation		
Ambulation				
Preparatory	45(25)	38(25)	33(26)	33(24)
Post preparatory	36(26)*	39(25)	27(24)*	33(24)
Post ambulation	44(27)*	47(24)	32(26)*	37(26)
Post recovery	34(26)*	38(25)	25(24)*	30(24)
Rest				
Pre rest	45(27)	44(25)	35(25)	29(22)
Post rest	33(26)*	39(26)	25(23)*	29(23)
		Distress		
Ambulation				
Preparatory	38(28)	36(26)	30(28)	32(25)
Post preparatory	31(27)*	38(26)	24(24)*	31(24)
Post ambulation	37(27)*	45(26)	29(26)	34(26)
Post recovery	29(27)*	34(26)	21(24)*	27(24)
Rest				
Pre rest	38(28)	42(30)	31(26)	27(23)
Post rest	28(26)*	36(28)	23(24)*	28(25)

Note. Pain sensation and pain distress were measured with visual analogue scales that had a range from 0 to 100. [a]n at ambulation, [b]n at rest.

Significant difference in mean posttest scores between music and control groups for ambulation (post preparatory, post ambulation, post recovery) and for rest (post rest).

*$p < .05$.

removal between the three groups (see Table 12). The patients in this study reported that procedural pain from chest tube removal was intense, and the patients in the music group had difficulty focusing on the music intervention. Also, with intense pain the dose of music may have been ineffective especially for those patients with no prior experience in relaxation techniques used to reduce pain.

Table 12

Mean Pretest and Posttest Pain Scores as Adapted from Broscious (1999)

Group	*n*	Pretest *M(SD)*	Posttest[a] *M(SD)*	Posttest[b] *M(SD)*
Music	70	2.5(2.8)	5.9(2.8)	2.1(2.4)
White noise	36	3.0(2.9)	5.6(3.0)	2.2(2.1)
Control	50	2.6(2.8)	5.4(2.6)	2.3(2.3)

Note. Numeric rating scale had a range from 0 to 10. [a]Immediately after chest tube removal. [b]15 minutes after chest tube removal. No significant differences in mean posttest numeric rating scale scores between music, white noise, and control groups.

Zimmerman et al. (1996) examined the effect of music interventions (music and music-video) and scheduled rest administered on the second and third postoperative day after open-heart surgery in 96 patients. In the repeated measures experimental study, pain was measured by both a verbal rating scale (VRS) and the Pain Rating Index of the

McGill Pain Questionnaire (MPQ-PRI). The VRS consisted of having the patient rate perceived pain on a continuum of intensity ranging form 0 (*no pain*) to 10 (*pain as bad as could ever be experienced*). The MPQ-PRI is a multidimensional instrument and consists of 78 descriptors of pain in 20 groups of two to six words (Melzack, 1975). The words are categorized within four major categories (sensory, affective, evaluative, and miscellaneous). Patients choose one word from each group (if there is one) to describe their pain. The rank assigned to that descriptor is the score for that group of words. Sub-scores for the categories are: sensory (range 0-42), affective (range 0-14), evaluative (range 0-5), and miscellaneous (range 0-17). The MPQ-PRI also includes the present pain intensity (PPI) item, which asks patients to rate their pain on a scale of 0 (*no pain*) to 5 (*excruciating pain*). Statistical analysis revealed no significant differences among the three groups for the VRS (see Table 13) and the MPQ-PRI (except for the evaluative component of pain). The music group had significantly lower scores on postoperative day 2 on the evaluative component than the scheduled rest group. Lack of significance may related to the mild intensity of pain on postoperative day 2 and day 3 after surgery, which suggests that music may be more effective during the first 24 hours after surgery when pain is more intense. Also, the scheduled rest group received the treatment of rest. Therefore, this study did not include a control group. Further research was needed to compare a control group that received treatment as usual with groups who received music and scheduled rest.

In summary, a number of studies have been conducted in postoperative and critical care patients to examine the effect of music on self-reported pain. Some investigators have found that music and scheduled rest significantly reduced pain, but

Table 13

Mean Pretest and Posttest Pain Scores on Verbal Rating Scales as Adapted from Zimmerman, Nieveen, Barnason, and Schmaderer (1996)

		Day 2		Day 3	
		Pretest	Posttest	Pretest	Posttest
Group	*n*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*
Music	32	1.3(2.3)	0.9(1.7)	1.4(2.0)	0.7(1.3)
Music-video	32	1.6(2.3)	0.9(1.5)	1.7(2.4)	1.0(2.1)
Rest	32	2.5(2.5)	1.8(2.3)	1.5(1.9)	0.9(1.8)

Note. Verbal rating scales have a range from 0 to 10.

No significant differences in mean posttest verbal rating scale scores among music, music-video, and rest groups on postoperative day 2 or day 3.

other results have been mixed or non-significant due to small sample sizes, lack of control for analgesic medication between groups, mild intensity of pain, variable pain responses, and use of scheduled rest as a control group. In the large randomized study, Good et al. (1999) provided the best evidence that sedative music is effective in reducing pain in ambulating postoperative abdominal surgical patients. But, the usefulness of sedative music and scheduled rest to reduce postoperative pain after open-heart surgery

remained unclear. Also, no studies examined pain in cardiac surgical patients during chair rest.

Researchers have suggested that sedative music may be more effective if the patient is able to concentrate on the intervention (Broscious, 1999; Good et al., 1999). Chair rest provided such an opportunity to test the effectiveness during activity other than ambulation or during a procedure in which the patient can concentrate on relaxation. Future research was needed with adequate sample sizes to determine if there was a significant difference in self-reported pain during chair rest among patients who received sedative music, scheduled rest, or treatment as usual.

Effect of Sedative Music and Scheduled Rest on Myocardial Oxygen Demand

In the reviewed studies, two investigators examined the effect of music on MVO_2 as measured by the RPP (Updike, 1990; White, 1999). Updike (1990) studied the effect of music on the RPP in 20 critical care patients with various diagnoses (i.e., acute myocardial infarction, sudden death syndrome, multiple trauma, and cancer) at pretest and posttest. The RPP was measured before and after the music intervention, and there was a significant reduction in RPP from pretest to posttest measures (see Table 14). Although the study provided evidence that music reduced RPP, this one-group study was limited by not including a control group.

In a repeated measures experimental study, White (1999) randomized 45 acute myocardial infarction patients into three groups. The groups received music, quiet, uninterrupted rest (scheduled rest), or treatment as usual (control). Myocardial oxygen demand was measured with the RPP immediately after and one-hour after receiving music, scheduled rest, or treatment as usual. Immediate posttest RPP was

Table 14

Rate-Pressure Product as Adapted from Updike (1990)

	Pretest	Posttest
N	*M(SD)*	*M(SD)*
20	11410(3380)	10630(2830)*

Note. Significant difference between pretest and posttest. *$p \leq .01$.

significantly less in the music group than in the control group, but the RPP in the scheduled rest group did not differ significantly from the music or the control group (see Table 15). Also, no significant differences were found in RPP at one-hour posttest. Initially, music had a short-term effect on RPP, but the same effect was not present after one hour.

Results from these two studies provided supportive evidence for the usefulness of sedative music in a quiet, restful environment to reduce MVO_2 as measured by RPP, especially for patients following an acute myocardial infarction. But, no studies were found that investigated the effect of sedative music and scheduled rest on the MVO_2 of postoperative open-heart cardiac patients either at rest or during chair rest.

Table 15

Mean Pretest and Posttest Rate-Pressure Product as Adapted from White (1999)

Group	*n*	Pretest *M(SD)*	Posttest *M(SD)*	Posttest 1 hour *M(SD)*
Music	15	9304(2036)	8069(1947)[a]*	8277(2016)
Rest	15	9874(2457)	9058(2090)[a]	9854(1927)
Control	15	9020(2159)	9471(2047)[b]	9454(2225)

Note. Rate-pressure product (product of heart rate and systolic blood pressure. *SD* calculated from *SE.*

[ab]Posttest scores with differing superscripts are significant, scores with same superscripts are not significant.

Significant difference in the mean posttest scores. *$p = .01$.

Music Therapy Interventions in Reviewed Studies

Variation existed in the type of musical selection(s) used, the choice of preferred music, and the dose of the intervention including the length of exposure and the number of sessions (see Table 16). Diversity existed in the types of musical selections offered to patients. Most investigators used relaxing, sedating, or soothing selections, but two investigators included choices of rock and roll or movie musicals (Broscious, 1999; Taylor et al., 1998). These musical selections may not have had the intended response that sedating, soothing selections have on anxiety and pain, and the lack of significant

differences in the study results may have been related to the types of music offered to patients.

Most investigators (14 out of 20) provided a choice of selections. Although most studies noted the general types of music used, the specific selections were often not reported (11 out of 20). Personal preferences are essential to consider when using music therapy and can influence the outcomes. Providing patients with choices is considered preferable as music likes and dislikes vary greatly across individuals (Synder & Chlan, 1999). Certainly, more consistency across studies or consistency in allowing patients to use their own selections would allow for more definitive conclusions to be made about the comparative efficacy of music in the reduction of anxiety and pain.

Also, variation existed across the studies in the length of exposure to the musical selection during a session and the number of sessions used. The length of a session ranged from 10 to 90 minutes. The purpose for which music was implemented may have influenced the length of exposure chosen by an investigator (i.e., during ambulation or during chest tube removal). However, considerable variation was found in the length of time music was played for the achievement of similar outcomes. For example, in the management of anxiety, exposure to music varied from 10 to 37 minutes. In addition to differences in the length of the sessions, 13 studies were designed to use only one session while the remaining 7 studies had two to three sessions. The most frequent time interval for a music session was 30 minutes. Studies with physiologic variables (i.e., heart rate, blood pressure, and respiratory rate) indicate that these variables decrease over time, but the effect stabilizes after approximately 30 minutes (Chlan, 1998a; White, 1999).

Table 16

Comparison of Music Interventions in the Reviewed Studies

Author, Year	Type	Choice	Minutes	Sessions
Barnason et al., 1995	soothing[a]	yes	30	2
Broscious, 1999	variety[b]	yes	varied[c]	1
Chlan, 1995	classical	yes	30	1
Chlan, 1998a	relaxing	yes	30	1
Davis-Rollans et al., 1987	classical[a]	no	37	1
Elliot, 1994	classical[a]	no	30	2-3
Good, 1995	sedative[a]	yes	varied[d]	1
Good & Chin, 1998	sedative[a]	yes	15	1
Good et al., 1999	sedative[a]	yes	41/15[e]	2
Guzzetta, 1989	classical/popular	yes	20	3
Heiser et al., 1997	country/classical	yes	90	1
Heitz et al., 1992	instrumental[a]	yes	90	1
Lueders-Bolwerk, 1990	classical[a]	no	22	3
Mullooly et al., 1988	instrumental	no	10	2
Taylor et al., 1998	variety[f]	yes	60	1
Updike, 1990	classical/other	yes	30	1
White, 1992	relaxing	no	25	1
White, 1999	classical	no	20	1
Zimmerman et al., 1988	instrumental/relaxing	yes	30	1
Zimmerman et al., 1996	soothing[a]	yes	30	2

Note. [a]Specific selections described. [b]Big band, blues, classical, country western, easy listening, gospel, movie musicals, New Age, patriotic, rock. [c]Varied with procedure length. [d]Two minutes before and during ambulation. [e]41 (approximated) minutes during ambulation and 15 minutes during rest. [f]Classical, jazz, light rock, country, rock and roll, easy listening, gospel, country, rock and roll.

The current study tested the effect of a 30-minute session of sedative music. The patients in the music group were given a choice of five sedative music selections that have been previously used (Good, 1995; Good & Chin, 1998; Good et al., 1999). The selections developed by Good (1995) included synthesizer, harp, piano, orchestral, and slow jazz. In addition, an American Indian flute selection was included to appeal to the American Indian patients that are served at the hospital. All music selections were instrumental with 60 to 80 beats per minute.

Chapter Four

Methodology

Design

An experimental, pretest and posttest, repeated measures three-group design was used to study the effect of sedative music and scheduled rest on self-reported anxiety about chair rest, self-reported pain (sensation and distress), and the rate-pressure product (RPP) in postoperative open-heart surgical patients during chair rest. Sixty-two patients were randomly assigned to receive sedative music, scheduled rest, or treatment as usual (control group). After the patients were assisted to chair rest, baseline measures (i.e., anxiety about chair rest, pain sensation, pain distress, and RPP) were obtained. The patients in the sedative music group and the scheduled rest group received the interventions for 30 minutes while the control group received treatment as usual for 30 minutes. Anxiety about chair rest, pain sensation, and pain distress were obtained 30 minutes after the baseline measures. The RPP was obtained at 5, 10, 15, and 30 minutes after the baseline measures.

Sample

No previous studies examining the effect of sedative music on anxiety and pain sensation and distress were similar to this study; therefore a medium effect size was used to estimate sample size. Using an effect size of .33 (Cohen's f), with a power of .80, at a significance level of .05 using repeated measures analysis of variance (RM ANOVA), a sample of 30 patients per group was planned (Stevens, 2001). Therefore, the sample

size calculated for this study was 90 patients, but to allow for attrition, 96 patients were to be recruited.

A convenience sample was obtained from eligible patients in a surgical critical care unit at a midwestern hospital. The patients were in the first postoperative day following an open-heart surgical procedure and had an activity order for chair rest. To sign the consent form and to complete the measurement tools the inclusion criteria stipulated that: the patients were alert, oriented, able to follow commands, read, write, hear a normal tone of voice, understand English, and be at least 18 years of age. In addition, because of the potential to be randomly assigned to the sedative music group, the patients had a self-reported absence of any major hearing defect. The patients also needed to be in stable condition. Stable was defined as temperature less than 101° F, systolic blood pressure greater than 90 mm Hg, resting heart rate between 50 and 100 beats per minute, and an absence of unstable dysrhythmias (i.e., greater than 6 premature ventricular contractions per minute, ventricular tachycardia, or ventricular fibrillation). In order to control for variations in the dependent variables that could be affected by the time of day, patients were included if transferred to chair rest in the morning hours. Patients were excluded from the study if a femoral arterial sheath had been inserted because a 6 to 8 hour period of bed rest was indicated to prevent hemorrhage after the device was removed.

Random Assignment

Patients were randomly assigned to one of the three groups: sedative music, scheduled rest or treatment as usual (control). To obtain an equal number of patients in each group, a varied block size of 6, 9, or 12 was developed by the investigator's

statistician to randomly assign patients to one of the three groups. The statistician placed the group assignment in a sealed envelope; thus, the investigator was blinded to the size of the varied blocks. After obtaining informed consent and enrolling the patient in the study, the investigator opened each envelope to determine the group assignment.

Interventions

The three groups for this study were the sedative music group, the scheduled rest group and the control (treatment as usual) group. Patients were randomly assigned to one of these three groups. All patients in this study were at chair rest. Chair rest was defined as an activity in which the person was in a sitting position in a chair with the back elevation between 45 and 90 degrees and the lower extremities in either a dependent position with the feet resting on the floor or elevated on a footrest (Voss, 2001).

Controlled chair rest included the procedures performed prior to chair rest. Prior to chair rest, the patients were in bed with the head of bed elevated. The staff nurses assisted the patients to a dangling position from the bed rest position. The patients remained in a dangling or standing position for no longer than 1 to 3 minutes because this position would accelerate pooling of blood into the legs (Winslow et al., 1995). To promote venous return while in the dangling position, the patients were instructed by the staff nurses to flex, extend, and rotate the lower extremities and feet (McDaniel, 1989). Next, the staff nurses assisted the patients to the chair by a pivot transfer. The patients were seated in a comfortable padded chair with armrests with a back elevation between 45 and 90 degrees, and the lower extremities were in a dependent position or elevated on a footrest.

Sedative Music Group. Sedative music was defined as music without lyrics and a sustained melodic quality with a rate of 60 to 80 beats per minute, and a general absence of strong rhythms or percussion (Gaston, 1951; Good et al., 2000). The volume and pitch were controlled so that the music was heard comfortably. Patients who received sedative music selected a tape from the investigator's collection prior to chair rest by listening to a 30 second excerpt of each of the selections. The collection consisted of 6 selections of sedative music without lyrics with 60 to 80 beats per minute. Music types included synthesizer, harp, piano, orchestral, slow jazz, and flute. Good (1995) developed the music selections on the first five tapes in consultation with a music therapist, and permission to use these sedative music tapes had been granted. The synthesizer tape included new age music, the piano tape included popular music in the United States from the 1940's to the 1980's, the orchestra tape was classical music, the harp tape included both popular and new age music, and the jazz tape was slow modern jazz (Good et al., 2000). In addition, another sedative music tape featuring American Indian flute music was added to provide a culturally acceptable selection for the American Indian population served at the hospital (DeRuyter, 2000; Good et al., 2000).

After the initiation of chair rest and baseline data were collected, the environment was enhanced to promote rest by unplugging the phone, closing the blinds, dimming the lights, closing the door, and posting a sign outside each patient's door to prevent interruptions. Patients received instructions on how to use the music by the investigator reading a prepared script to the patients (see Appendix C). The patients were verbally instructed to allow the music to relax and distract and to listen and follow the music. After the instructions were read, the patients listened to the selected music tape through

soft headphones and a tape player (WM-EX 190 Cassette Walkman with headphones) for 30 minutes.

Scheduled Rest Group. Scheduled rest was a 30-minute time period in which the environmental stimuli (i.e., light, noise, and interruptions) were reduced to facilitate rest (White, 1999). The environment was enhanced to reduce stimuli by unplugging the phone, closing the blinds, dimming the lights, closing the door, and posting a sign to prevent being disturbed by visitors and health care personnel. Patients received instructions to sit quietly with their eyes closed and to rest for 30 minutes.

Control (Treatment as Usual) Group. Patients in the control group were engaged in activities as usual for 30 minutes without intervention or environmental manipulation by the investigator.

Instruments

Anxiety. Anxiety was defined as feelings of tension, apprehension, nervousness, and worry (Spielberger, 1983; Wewers & Lowe, 1990). Anxiety about chair rest was measured with a visual analogue scale (VAS) (see Appendix D). The VAS was a horizontal line of 100 mm anchored at either end of the line by descriptive words (*not anxious about chair rest* to *most anxiety imaginable*). The patients marked the line at the point representing the degree of perceived anxiety about chair rest. The VAS was scored by measuring in mm the distance from the side marked *not anxious about chair rest* to the edge of the mark made by the patient. Possible scores ranged from a minimum of 0 to a maximum of 100 mm.

Concurrent validity of the VAS to measure self-reported anxiety has been demonstrated by comparing this instrument to the Spielberger's (1983) State Anxiety

Inventory (SAI) (Elliot, 1993; Voss, 2001). Elliot (1993) reported a strong correlation between the SAI and the VAS to measure anxiety in 56 critical care patients with unstable angina pectoris or acute myocardial infarction ($r = .70$). Likewise, in a pilot study of 10 postoperative cardiac patients, the SAI and the VAS demonstrated a moderate correlation with each other ($r = .41$).

Elliot (1993) and Voss (2001) reported test-retest reliability correlations of $r = .61$ and $r = .82$, respectively, for repeated measurements of anxiety using a VAS. Elliot (1993) compared pretest and posttest measures that may not be a reliable indicator of test-retest reliability. Posttest measures were obtained about 24 hours after pretest measures and after two to three music sessions (Elliot, 1993). Voss (2001) compared measurements obtained at two time points with a 15-minute interval. These results were more reliable because the patients were at chair rest without any interventions and the measurements were obtained at a short interval because of the transitory nature of anxiety.

Pain. Pain was defined as an unpleasant sensory and affective experience. Sensory pain (pain sensation) was the unpleasant, physical perception of discomfort, while affective pain (pain distress) was the amount of emotional distress associated with the sensation (Good, 1996; Johnson, 1973). Pain sensation and pain distress were measured with VAS scales (see Appendix D). The VAS scales were horizontal lines of 100 mm anchored at either end of the line by descriptive words (*no sensation of pain* to *most pain sensation imaginable* or *no pain distress* to *most pain distress imaginable*). The patients made a mark across the lines at the point representing the degree of perceived pain (sensation and distress). The VAS scales were scored by measuring in

mm the distance from the side marked *no sensation of pain* and *no pain distress* to the edge of the marks made by the patient. Possible scores ranged from a minimum of 0 to a maximum of 100 mm.

Construct validity to measure pain sensation and pain distress was supported by Johnson (1973), who found that subjects could differentiate between pain sensation and pain distress during induced ischemic pain. The Johnson (1973) scales were two vertical scales, one for sensation and the other for distress. The sensation scale was labeled 0, 25, 50, 75, and 100 at the appropriate points. Zero on the sensation scale meant how the subjects felt prior to induced ischemic pain, and a score of one hundred meant the maximum amount imaginable. The distress scale was labeled *slightly distressing* at the bottom, *moderately distressing*, and *very distressing* at equally spaced intervals, and *just bearable* at the top. No numbers were assigned to this scale.

Good (1995) found concurrent validity of pain sensation ($r = .44, p < .001$) and distress ($r = .55, p < .001$) when comparing these two dimensions measured via the dual numeric rating scales (NRS) with the MPQ-PRI. In a more recent study, Good et al. (2001) converted the dual NRS to sensation and distress VAS scales. Correlations of the dual VAS scales for pain sensation and distress with the Johnson (1973) NRS ranged from $r = .89$ to $r = .92$ (Good et al., 2001).

Test-retest reliability of self-reported pain (sensation and distress) as measured with a dual VAS has been established in a pilot study with 10 postoperative cardiac patients during chair rest (Voss, 2001). In this pilot study, patients were sitting in a chair without interruptions or interventions for 30 minutes. Correlations between

measurements obtained at two time points with a 15 minute interval for pain sensation and pain distress were $r = .66$ and $r = .84$, respectively.

Rate-pressure product. The amount of oxygen used by the heart is the myocardial oxygen demand (MVO_2); and, the RPP was an easily measured predictor of MVO_2 that has been validated (Gobel et al., 1978; Kitmura et al., 1972). The RPP takes into account the heart rate (HR) and tension (as measured by pressure) and was calculated by multiplying the HR by the systolic blood pressure (SBP). Direct measures of MVO_2 have been compared with the calculated RPP, and the direct MVO_2 measures were highly correlated ($r = .83$ and $r = .90$, respectively) with the RPP (Gobel et al., 1978; Kitamura et al., 1972).

Kitamura et al. (1972) studied the relationship between RPP and MVO_2 as measured by the nitrous oxide saturation method in 10 healthy male subjects during rest and upright bicycle exercise. The RPP was calculated by the product of the HR and the aortic SBP. The RPP and the MVO_2 were highly correlated ($r = .90$); therefore, the RPP was considered a satisfactory predictor of MVO_2 in normal subjects. The question arises whether the blood pressure results obtained from aortic catheters can be extended to using a pneumatic cuff, since the SBP may be significantly higher peripherally than centrally. Kitamura et al. (1972) reported a significant difference in systolic measures of the aorta ($M = 105.5$, $SD = 4.2$) and the brachial artery ($M = 118.3$, $SD = 5.8$), $p < .01$. Although available data indicate that peripheral measurement of SBP may change the slope of the relationship between MVO_2 and RPP, the same degree of correlation remains (Kitamura et al., 1972).

Because changes in MVO_2 in healthy individuals may not be the same as with

individuals with ischemic heart disease, Gobel et al. (1978) compared the RPP to a direct measure of MVO_2 in 27 normotensive patients with angina pectoris. Gas chromatography was used for the measurement of nitrous oxide. The RPP was highly correlated (r = .83) with the direct measure of MVO_2 in these patients with ischemic heart disease.

Measures of RPP are only as reliable and valid as the measure of HR and SBP. The monitoring equipment used in the critical care unit where the current study was conducted is calibrated yearly by the bio-technician at the hospital according to the manufacturers directions (Hewlett Packard, 1989). Calibration includes both zeroing and verification of a simulated heart rate and noninvasive blood pressure. A biomedical equipment technologist at the hospital in which the study was conducted affirmed that the equipment for measuring the HR and noninvasive blood pressure had no variation in calibration unless the lead wires or cables were not intact. Prior to data collection, the investigator inspected the lead wires and cables and found that all wires and cables were intact.

The HR was determined by obtaining the rate from the cardiac monitoring system. The HR (i.e., the number of beats per minute) was recorded from each patient's bedside cardiac monitor (Merlin, Series 6000, Model 66, Hewlett Packard, Palo Alto, California). The accuracy of the cardiac monitor to measure HR is ± 1%, and the monitor is capable of measuring a range of 15 to 300 beats per minute (Hewlett Packard, 1989). The measurement of HR is based on the electrical signals on the skin surface, produced as the heart muscle contracts and relaxes (Krantz & Falconer, 1997). Electrodes placed on the patient detected the signals, and the electrical activity of the

heart precedes and initiates the mechanical events of the cardiac cycle. Since the electrocardiogram signals are small, the electrodes must make good contact with the patient's skin surface. Lead II was used because it produced pronounced QRS complexes. The adherence of the electrode pads to the skin and the placement of the electrodes on the skin was assessed and verified by the investigator prior to data collection. A device called a cardiotachometer measures the length of time between two successive QRS complexes and converts this to a measure of rate in beats per minute. The number displayed represents an average HR from a 2 second sampling period. This automated method of determining HR has the advantage of being less obtrusive to the patient over a pulse determined by a palpated method and was used as an estimation of the heart rate in beats per minute.

The SBP was recorded from each patient's bedside cardiac monitor (Merlin, Series 6000, Model 66, Hewlett Packard, Palo Alto, California). The accuracy of the cardiac monitor to measure blood pressure was ± 3 mmHg, and the monitor is capable of measuring SBP with a range of 30 to 270 mmHg (Hewlett Packard, 1989). In order to increase accuracy, the left arm was used to collect all data. The correct cuff size was selected for patients, the sensor was placed over the brachial artery, and the same cuff was used for all measurements. The SBP was obtained by using a noninvasive automatic oscillometric blood pressure cuff hard-wired to the cardiac monitoring system. The automated blood pressure technique detects blood pressure via an oscillometric method which estimates blood pressure indirectly based on an algorithm that relies on oscillations of pressure in the cuff during gradual cuff deflation (Krantz & Falconer, 1997). Although the standard for assessing blood pressure is invasive intra-arterial

measurements, automated oscillometric indirect measures correlate highly with direct intra-arterial measures (r = .91 to .99) (Brinton, Cotter, & Kailasam, 1997; Rithalia & Edwards, 1994).

Demographic and Descriptive Variables

Demographic and descriptive variables were collected to describe the sample and to determine differences between groups on these variables. The variables included age, gender, ethnicity, race, medical and surgical diagnoses, medications received within the previous eight hours, time of chest tube removal, and time of chair rest initiation.

Procedure

Approval to conduct the study was obtained from the institutional review boards at Rapid City Regional Hospital and the University of Nebraska Medical Center (see Appendix E and F). The investigator confirmed that potential patients met the inclusion criteria with the assigned registered nurses (see Appendix G). The assigned registered nurses approached those potential patients who met the criteria to determine if they would be interested in participating in the research study and talking with the investigator. If the patient was interested, the investigator discussed the purpose and requirements of participation in the study. Consent was obtained prior to the initiation of chair rest. Patients were assisted to chair rest in the morning hours to control for variations in dependent variables related to the time of day that data were collected. Informed consent was obtained from all patients according to the requirements of the institutional review boards (see Appendix H), and the patients were given a copy of the rights of research participants. After informed consent was obtained, patients were

randomly assigned to one of the three groups: sedative music, scheduled rest or treatment as usual as previously described.

After the patient consented to participate in the study, demographic data and descriptive data were obtained from the medical record (see Appendix I). Data included age, gender, ethnic and racial group, medical and surgical diagnoses, and medications received within the previous eight hours. The time of chest tube removal (if applicable) and the time of chair rest initiation were also recorded. All of the demographic and descriptive data were used to determine group differences, and any significant group differences were to be statistically controlled.

Prior to chair rest, each patient received instructions on how to complete the VAS scales and a script was read to the patient to assure consistency in administration of the tools (see Appendix D). Each of the VAS scales was presented to the patient individually and took the patient between 30 and 60 seconds to complete. The patients completed a practice VAS scales for anxiety about chair rest, pain sensation, and pain distress. The investigator assessed for proper placement of electrodes in Lead II, for intactness of the lead wires, cables, and tubing, and for proper placement of the correct size blood pressure cuff on the patient's left arm.

The staff nurse or nurses assisted the patient to a dangling position for one to two minutes. The patients performed ankle exercises followed by a pivot transfer to a chair. After being positioned in the chair and personal care needs (i.e., coughing, oxygen administration, hydration) performed, the patient completed the VAS scales for anxiety about chair rest, pain sensation, and pain distress, and physiologic measures (HR and SBP) were recorded from the cardiac monitoring system (see Table 17).

Table 17

Measurement of Dependent Variables

	Timing				
Dependent Variables	Initiation of Chair Rest	5 min	10 min	15 min	30 min
VAS-A	X				X
VAS-S	X				X
VAS-D	X				X
RPP	X	X	X	X	X

Note. Treatments (sedative music, scheduled rest, and treatment as usual) were initiated within 3 to 5 min after initiation of chair rest. VAS-A = visual analogue scale for anxiety. VAS-S = visual analogue scale for pain sensation. VAS-D = visual analogue scale for pain distress. RPP = rate-pressure product (product of the heart rate and systolic blood pressure). X = variable was measured at this time point.

The patients received sedative music, scheduled rest, or treatment as usual as previously described based on the random assignment. If randomized to the sedative music group, the patient listened to the music tape that was selected prior to chair rest. If the patient was randomized to the sedative music group or the scheduled rest group, the phone was unplugged, the blinds closed, the lights dimmed, door closed, and a sign posted on the door to prevent interruptions. If randomized to the control group, no interventions were initiated, and the patient received treatment as usual. The investigator recorded in anecdotal notes any incidents such as visitors, nursing care, or interruptions during the study period for all three groups.

The investigator remained in the room for the purpose of recording physiological measures for all three groups. The investigator was positioned behind the patient to allow access to the monitoring devices and to be unobtrusive. The investigator obtained physiologic measurements at 5, 10, 15, and 30 minutes after chair rest initiation. After 30 minutes of chair rest, patients completed the VAS scales for anxiety about chair rest, pain sensation, and pain distress (see Table 17).

The registered nurse assigned to the patient assumed responsibility for monitoring and care decisions related to timing of chair rest, the need to discontinue chair rest, or any patient requests during chair rest. The patients received standard instructions to use the call light for personal needs during chair rest. If the patient did not use the call light, the investigator immediately notified the assigned registered nurse of patient needs or adverse effects. No adverse events (i.e., unstable dysrhythmias, loss of consciousness or decrease in alertness, the presence of chest pain, undue dyspnea, pain, anxiety, or nausea) occurred during data collection, therefore, no patients were dropped from the study.

Immediately after the 30-minute study period while the patient remained in the chair, the investigator interviewed the patients. Patients in all three groups were asked five questions about prior experience with music and use of relaxation techniques in the past (see Appendix I). Patients in the sedative music group were asked seven questions about their experience with the sedative music, and patients in the scheduled rest group were asked three questions about their experience with scheduled rest (see Appendix I).

Method of Analysis

The data were coded and entered twice into a statistical program (SPSS Version 11.0), and a computer program was used to ensure accuracy of data entry between the dual entries (Roberts, Anthony, Madigan, & Chen, 1997). Data were correctly entered, and no missing values were detected. The dependent variables were investigated for univariate outliers by inspecting histograms, box plots and *z* scores. Identified outliers were inspected for an error in the recording of the data or an extreme value from an unusual case or situation. Anecdotal notes were used to identify possible reasons for the outliers. Dependent variables (anxiety, pain sensation, and pain distress) were investigated for multivariate outliers with Mahalanobis distance.

The sample characteristics were described by descriptive statistics (frequencies, percentages, means, and standard deviations) for each of the three groups for age, gender, race, surgical diagnoses, chest tube status (removed and time from chest tube removal to initiation of chair rest or not removed prior to chair rest), and prior use of music for relaxation. Chi-square and univariate analysis of variance (ANOVA) statistics were used to determine if the groups were similar in respect to age, gender, race, surgical diagnoses, chest tube status, and prior use of music for relaxation.

Since the use of pharmacological agents may have some influence on anxiety, pain distress, pain sensation, and RPP, the differences in the frequencies of patients in each group using various classifications of medications (e.g., use or non-use of diuretics, anti-emetics, beta-adrenergic blocking agents, and other agents) were tested using Chi-square statistics. Also, the mean morphine equivalent dose administered over the previous 4 hours prior to chair rest for each group was computed and compared using

univariate ANOVA. In addition, the types of music selected by patients in the sedative music group were described by frequencies and percentages.

The variables (i.e., anxiety, pain sensation, pain distress, and RPP) at all data collection times were tested for univariate normality by using Fisher's skewness statistics and the Shapiro-Wilk test of normality (Tabachinick & Fidell, 2001). Multivariate normality was assumed because the groups were large and not notably discrepant in size (Tabachnick & Fidell, 2001).

Confounding variables (i.e., differences in gender, race, surgical diagnoses, prior use of music for relaxation, and pharmacological agents, age, and morphine equivalents) may have an effect on anxiety, pain sensation, pain distress, and RPP. Differences between gender, race, surgical diagnoses, prior use of music for relaxation, and pharmacological agents according to drug classification received in the prior eight hours for the variables (i.e., anxiety, pain sensation, pain distress, and RPP) at baseline were completed using univariate ANOVA. Other possible confounding variables (age and morphine equivalents received in the prior four hours before chair rest) were tested for correlations with the baseline variables. If significant differences were found, the confounding effect of any of these variables would have been statistically controlled.

Differences between groups at baseline were tested using multivariate analysis of variance (MANOVA) for the variables (anxiety, pain sensation, and pain distress) followed by univariate ANOVA. Differences between groups at baseline were also tested for RPP with univariate ANOVA.

To test the primary aim, the following statistical procedures were completed. Since the pretest and posttest scores (i.e., anxiety, pain sensation, and pain distress) were

linearly correlated, and the scores were moderately correlated (> .30), repeated measures multivariate analysis of variance (RM MANOVA) was used because assumption for homogeneity of regression was not satisfied (Stevens, 2001). Multivariate significant results of the RM MANOVA concluded the significance of the within subjects interaction of group differences on the set of three dependent variables (i.e., anxiety, pain sensation, and pain distress) with Wilks' Lambda test statistic. Repeated measures analysis of variance (RM ANOVA) follow up tests indicated which of the three dependent variables differed significantly, contributing to the overall multivariate significance. Because the three groups were of unequal size, harmonic means were used (Stevens, 2001). Because of strong heterogeneity of the dependent variables (i.e., anxiety, pain sensation, and pain distress) at posttest, post hoc testing was completed with separate error terms (Keppel, 1991). Hypotheses 1, 2, and 3 were addressed with post hoc *t* tests based on estimated marginal means. Dependent *t* tests were completed for the change scores from pretest to posttest for each group, and independent *t* tests were completed on the posttest scores for all pairs of groups. Bonferroni's adjustment was used to correct for multiple comparisons, and for the comparison to be considered significant, the significance level was adjusted to $p < .017$ (.05/3).

To test the secondary aim, the effect of sedative music, scheduled rest, and treatment as usual on MVO2 (as measured by the RPP) at 5, 10, 15, and 30 minutes after the initiation of chair rest in the critically ill adult after cardiac surgery, RM ANOVA was used. Because the assumption of compound symmetry was not met, a multivariate approach was used to test hypotheses 3, 4, and 5.

Questions for all participants about prior experience with music, questions for the sedative music group about the sedative music experience, and questions for the scheduled rest group about the scheduled rest experience were described by frequencies and percentages.

Chapter 5

Results

This chapter presents the results of the study. The description of the sample is presented first, followed by the results for the research hypotheses.

Description of the Sample

Preliminary analyses of the research hypotheses were conducted after 62 patients were enrolled in the study. Significant differences were found between the three groups for the three main dependent variables (i.e., anxiety, pain sensation, and pain distress), thus data collection ceased.

Although data were collected on 62 patients, one patient was identified as an extreme outlier and dropped from the data analyses. During the study period this patient complained of severe dyspnea and was noted to having grunting respirations with a respiratory rate of 34 to 40 breaths per minute. The morphine equivalent administered within four hours of chair rest was 43.3, which was much higher than the average morphine equivalent for this sample of patients ($M = 16.4$, $SD = 9.2$). In addition, posttest scores for this patient were identified as extreme outliers for anxiety, pain sensation, and pain distress. The standardized scores at posttest for anxiety, pain sensation, and pain distress for this patient were 3.50, 3.32, and 3.39 respectively. According to Tabachnick and Fidell (2001), cases with standardized scores in excess of 3.3 are extreme outliers. Because this case was identified as an extreme outlier, it was

determined that this patient was not a member of the intended population, and the patient was deleted from the analyses.

The patients were randomly assigned to the sedative music group ($n = 19$), scheduled rest group ($n = 21$), or the control (treatment as usual) group ($n = 21$). The group characteristics are described in Table 18. The sample ($N = 61$) had a mean age of 63.2 ($SD = 12.5$) years and was primarily men (63.9%) and white (86.9%). Most patients (80.3%) had coronary artery bypass grafting (CABG) procedures completed. Other surgical procedures included valvular repair (14.8%), replacement of pulmonary homograft (1.6%), resection of atrial myxoma (1.6%), and resection of a right coronary artery aneurysm (1.6%). There were no significant differences between the three groups for age, gender, race, or type of surgery.

Other sample characteristics included prior use of music for relaxation, chest tube removal prior to chair rest, and the time from chest tube removal to chair rest (see Table 18). Prior use of music for relaxation was reported by 7 of the 61 patients (11.5%). There was no significant difference between the three groups for prior use of music for relaxation. Chest tubes were removed in 44 of the 61 patients (72.1%) prior to chair rest. No significant difference was found between the three groups for whether chest tubes were removed or left in place prior to chair rest. For those patients who had chest tubes removed, the mean length of time from chest tube removal to chair rest was 42.3 ($SD = 30.0$) minutes. There was no significant difference between the three groups for the length of time in minutes from chest tube removal to chair rest.

Table 18

Profile of Study Sample (N = 61)

Characteristic	Sedative Music $n = 19$		Scheduled Rest $n = 21$		Control $n = 21$		Statistic
	M(SD)		*M(SD)*		*M(SD)*		ANOVA
Age (years)	64.7(13.2)		62.1(12.9)		62.9(11.9)		$F(2, 58) = .209, p = .812$
Age range (years)	32 - 79		35 - 83		42 - 81		
[a]Time (min)	43.8(28.8)		34.9(25.3)		47.0(35.4)		$F(2, 41) = .585, p = .562$
[b]Time range (min)	10 - 115		7 - 95		-5 - 142		
	n	%	*n*	%	*n*	%	Chi-square
Gender							
Males	12	63.2	16	76.2	11	52.4	$\chi^2(2) = 2.589, p = .274$
Females	7	36.8	5	23.8	10	47.6	
Race							
White	14	73.7	20	95.2	19	90.5	$\chi^2(2) = 4.429, p = .134$
American Indian	5	26.3	1	4.8	2	9.5	
Surgery							
CABG	15	79.0	18	85.7	16	76.2	$\chi^2(2) = .636, p = .785$
Other	4	21.0	3	14.3	5	23.8	
Prior music use							
No	16	84.2	20	95.2	18	85.7	$\chi^2(2) = 1.443, p = .606$
Yes	3	15.8	1	4.8	3	14.3	
Chest Tubes							
Removed	16	84.2	13	61.9	15	71.4	$\chi^2(2) = 2.477, p = .290$
Not removed	3	15.8	8	38.1	6	28.6	

Note. [a]Length of time from chest tube removal to chair rest. [b]One participant's chest tubes were removed after the initiation of chair rest. CABG = Coronary artery bypass grafting.

Pharmacological agents administered in the three groups are described in Table 19. The mean morphine equivalents administered within four hours of chair rest was 16.4 (*SD* = 9.2) for the sample. No significant difference was found between the three groups for morphine equivalents administered in the four hours prior to chair rest.

Table 19

Comparison of Pharmacological Agents

Pharmacological Agents	Sedative Music $n = 19$		Scheduled Rest $n = 21$		Control $n = 21$		Statistic
	M(SD)		*M(SD)*		*M(SD)*		ANOVA
[a]Morphine equivalent	18.2(8.6)		15.4(9.2)		15.8(9.9)		$F(2, 58) = .551, p = .580$
Range	2.7 - 30.0		1.7 - 34.0		2.7 - 39.7		
	n	%	*n*	%	*n*	%	Chi-square
[b]Drug Classification							
Diuretics	7	36.8	11	52.4	8	38.1	$\chi^2(2) = 1.253, p = .534$
Anti-emetics	5	26.3	6	28.6	8	38.1	$\chi^2(2) = .744, p = .689$
Beta-adrenergic blocking agents	5	26.3	8	38.1	2	9.5	$\chi^2(2) = 4.667, p = .097$
Others combined	2	10.5	7	33.3	8	38.1	$\chi^2(2) = 4.247, p = .120$

Note. [a]Received within the four hours prior to chair rest. [b]Received within the eight hours prior to chair rest.

Diuretics, anti-emetics, and beta-adrenergic blocking agents were the most commonly used drug classifications of pharmacological agents administered in the eight hours prior to chair rest. Other drug classifications administered during this time period included calcium channel blockers, vasodilators, volume expanders, angiotensin-converting enzyme inhibitors, beta-adrenergic agonists, and inotropic agents. There were no significant differences between the three groups for the drug classifications of pharmacological agents administered in the eight hours prior to chair rest.

The music selected by the sedative music group ($n = 19$) is described in Table 20. The American Indian patients (5 out of 5) selected flute music, while white patients selected among the other five selections.

Table 20

Music Type Selected in the Sedative Music Group

	Total $n = 19$		American Indian $n = 5$		White $n = 14$	
Music Type	*n*	%	*n*	%	*n*	%
Flute	5	26.3	5	100.0	0	0.0
Orchestral	4	21.1	0	0.0	4	28.6
Harp	3	15.8	0	0.0	3	21.4
Slow Jazz	3	15.8	0	0.0	3	21.4
Piano	2	10.5	0	0.0	2	14.3
Synthesizer	2	10.5	0	0.0	2	14.3

Normality of Sampling Distributions

The variables (i.e., anxiety, pain sensation, pain distress, and rate-pressure product) were tested for univariate normality in each of the three groups. Anxiety, pain sensation, and pain distress were tested at pretest and posttest and rate-pressure product (RPP) at baseline and at 5, 10, 15, and 30 minutes after chair rest initiation. Fisher's skewness statistics were calculated for these variables. Skewness scores above +1.96 or below –1.96 are significant at the .05 level and indicate significant skewness (Hazard-Munro, 2001). Skewness scores for all the variables at all data collection points were between +1.96 and –1.96. These values indicated that the distributions were not significantly skewed, and the data were normally distributed.

Furthermore, statistical tests of normality were performed by the Shapiro-Wilk test statistic. With the Shapiro-Wilk test of normality, a p value less than .01 indicates non-normal distribution (Tabachnick & Fidell, 2001). The variables at all data collection time points in all groups were normally distributed ($p > .01$).

Multivariate normality was assumed because the groups were large and not notably discrepant in size (Tabachnick & Fidell, 2001). Therefore, the central limit theorem assured acceptably normal sampling distributions of means for use in multivariate analyses.

Outliers

No univariate outliers were found in the dependent variables for the sample of 61 patients using the criterion $z = |3.3|$ ($\alpha = .001$). In addition, no multivariate outliers were found for the sample of 61 patients using Mahalanobis distance ($p < .001$) for anxiety,

pain sensation, or pain distress (Tabachnick & Fidell, 2001). Therefore, all 61 cases were retained for analyses.

Possible Confounding Variables

The next step in data analyses was to compare possible confounding variables with baseline anxiety, pain sensation, pain distress, and RPP. Because confounding variables (i.e., differences in gender, race, surgical diagnoses, prior use of music for relaxation, and pharmacological agents, age, and morphine equivalents) may have an effect on anxiety, pain sensation, pain distress, and RPP, these variables were investigated at baseline. Differences between gender (male or female), race (white or American Indian), surgical diagnoses (CABG or other surgery), prior use of music for relaxation (yes or no), and pharmacological agents according to drug classification received in the prior eight hours (yes or no) were examined in relation to baseline anxiety, pain sensation, pain distress, and RPP using univariate analysis of variance (ANOVA). There were no significant differences between possible confounding variables (gender, race, surgical diagnoses, prior use of music for relaxation, and pharmacological agents) for anxiety, pain sensation, pain distress, or RPP (see Appendices J, K, L, and M). Also, the other possible confounding variables (i.e., age and morphine equivalents received in the prior four hours before chair rest which were measured as continuous variables) were tested using correlations with baseline anxiety, pain sensation, pain distress, and RPP. The correlations were less than .30 (see Appendix N). Therefore, no significant confounding effects were found for any of these variables.

Baseline Differences of the Dependent Variables Between Groups

Because baseline anxiety, pain sensation, and pain distress were all significantly correlated (anxiety and pain sensation, $r = .373, p = .01$; anxiety and pain distress, $r = .528, p = .01$; and pain sensation and pain distress, $r = .832, p = .01$), differences between groups were tested using multivariate analysis of variance (MANOVA). The MANOVA was not significant, $F(6, 112) = 1.525, p = .176$ indicating that there were no overall differences between the three groups at baseline. However, univariate ANOVA tests for these baseline variables indicated that there was a significant difference between groups at baseline for anxiety, $F(2, 58) = 3.431, p = .039$, but not for pain sensation, $F(2, 58) = .051, p = .950$, or pain distress, $F(2, 58) = .677, p = .512$. Post hoc pairwise comparisons (using t tests with Bonferroni's adjustment for multiple comparisons) of the mean baseline anxiety scores between the sedative music group, the scheduled rest group, and the control group were completed. The sedative music group had a significantly higher baseline mean anxiety score than the control group ($p = .045$). No significant difference was found between either the sedative music group and the scheduled rest group ($p = .162$) or the scheduled rest group and the control group ($p = 1.000$). Based on the baseline difference in anxiety between the groups, multivariate analysis of covariance (MANCOVA) would have been the most appropriate method to use, but the assumption of homogeneity of regression was not met for the interaction between the group assignment and the covariate (pretest anxiety), $p = .002$. Thus, to control for the significant pretest difference in anxiety between groups, a repeated measures multivariate analysis of variance (RM MANOVA) was used in the statistical analysis for the primary aim.

There were no significant differences between groups for baseline RPP, $F(2, 58) = .069$, $p = .933$. Therefore, repeated measures analysis of variance (RM ANOVA) was used in the statistical analysis for the secondary aim.

Findings Related to the Primary Aim

The primary aim of this study was to examine the effect of sedative music, scheduled rest, and treatment as usual on the self-reported intensity of anxiety, pain sensation, and pain distress after 30 minutes of chair rest in adult postoperative cardiac surgery patients while taking into account pretest anxiety, pain sensation, and pain distress. The hypotheses that tested the primary aim were:

1. The sedative music group will report greater reductions in anxiety, pain sensation, and pain distress after 30 minutes of chair rest than the scheduled rest group.
2. The sedative music group will report greater reductions in anxiety, pain sensation, and pain distress after 30 minutes of chair rest than the control (treatment as usual) group.
3. The scheduled rest group will report greater reductions in anxiety, pain sensation, and pain distress after 30 minutes of chair rest than the control (treatment as usual) group.

The mean pretest and posttest scores for anxiety, pain sensation, and pain distress for the sedative music group, the scheduled rest group, and the control group are described in Table 21. Figures 3, 4, and 5 depict the estimated marginal means for anxiety, pain sensation, and pain distress for the three groups.

Table 21

Pretest and Posttest Anxiety, Pain Sensation, and Pain Distress Scores (N = 61)

Scores	Sedative Music $n = 19$	Scheduled Rest $n = 21$	Control $n = 21$
	M(SD)	*M(SD)*	*M(SD)*
Anxiety			
Pretest	63.0(21.4)	47.5(28.2)	43.2(24.3)
Posttest	13.5(9.4)	33.2(26.2)	47.6(32.3)
Pain sensation			
Pretest	46.6(25.5)	48.5(24.7)	46.2(25.5)
Posttest	19.3(13.4)	39.6(27.9)	45.0(26.8)
Pain distress			
Pretest	54.5(29.4)	48.6(29.4)	44.2(25.0)
Posttest	15.1(13.5)	38.0(31.3)	48.8(28.4)

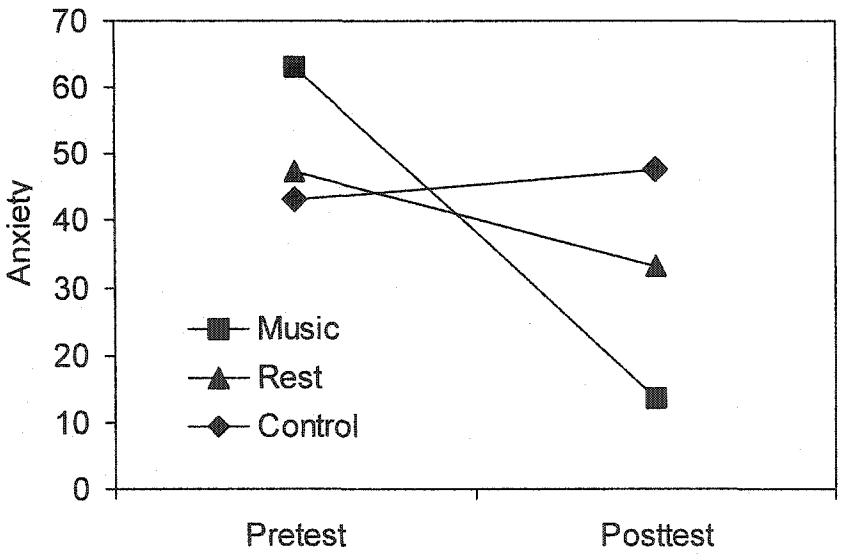

Figure 3. Comparison of the mean pretest and posttest scores for anxiety as measured on a 100 mm visual analogue scale in the sedative music group, scheduled rest group, and control group.

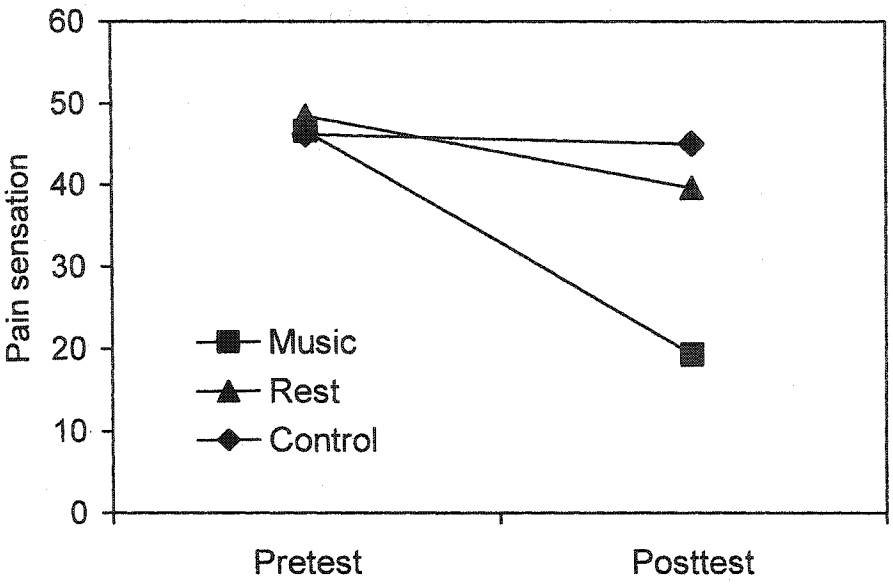

Figure 4. Comparison of the mean pretest and posttest scores for pain sensation as measured on a 100 mm visual analogue scale in the sedative music group, scheduled rest group, and control group.

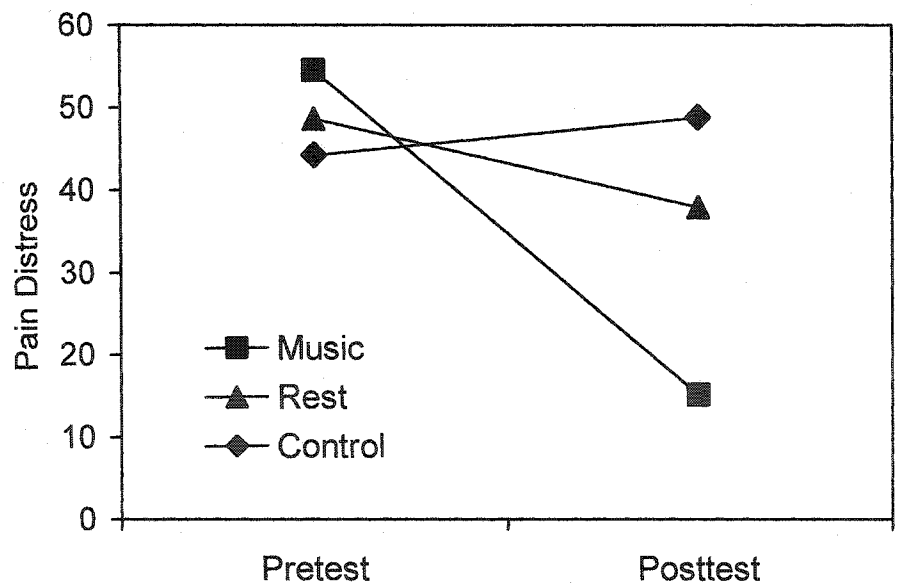

Figure 5. Comparison of the mean pretest and posttest scores for pain distress as measured on a 100 mm visual analogue scale in the sedative music group, scheduled rest group, and control group.

A RM MANOVA was used to test the hypotheses in the primary aim. RM MANOVA assumptions of normality and absence of outliers were met. Although the assumption of homogeneity of variance-covariance matrices was significant with Box's M, the log determinants of the matrices for all three groups did not differ notably between the groups and the smallest log determinant was associated with the smallest group. Therefore, the overall *F* test was appropriate. The assumption of homogeneity of variance was homogenous at pretest for anxiety, pain sensation, and pain distress, but was significantly heterogeneous at posttest. The overall *F* test in RM MANOVA is robust to violations of this assumption (Tabachnick & Fidell); however, because of the strong heterogeneity of the dependent variables at posttest, separate error terms were used in post hoc testing (Keppel, 1991). Linearity of the relationships among the dependent variables was verified by examination of scatter plots.

The RM MANOVA was significant for within subjects for time (pretest to posttest) with Wilks' Lambda, $F(3, 56) = 20.572, p < .001$ and for group by time interaction with Wilks' Lambda, $F(6, 112) = 10.363, p < .001$. The univariate RM ANOVA follow up tests for time (pretest to posttest) indicated that the three dependent variables differed significantly for anxiety, $F(1, 58) = 54.325, p < .001$, pain sensation, $F(1, 58) = 22.743, p < .001$, and pain distress, $F(1, 58) = 23.643, p < .001$. The univariate RM ANOVA follow up tests for group by time interaction indicated that the three dependent variables differed significantly for anxiety, $F(2, 58) = 33.781, p < .001$, pain sensation, $F(2, 58) = 8.455, p = .001$, and pain distress, $F(2, 58) = 16.702, p < .001$.

Post hoc comparisons using dependent *t* tests for the mean differences from pretest to posttest scores are described in Table 22 for the three groups with Bonferroni's adjustment for multiple comparisons (with an adjusted significance level of .05/3 or $p <$ .017). The sedative music and the scheduled rest group reported significantly less posttest anxiety, pain sensation, and pain distress than at pretest. No significant mean differences from pretest to posttest were found in the control group for anxiety, pain sensation, or pain distress.

Table 22

Mean Differences for Pretest and Posttest Scores

		Paired Differences					
Scores	Group	*M*	*SD*	*SEM*	*t*	*df*	*p*
Anxiety	Music	49.5	22.5	5.2	9.58	18	< .001*
	Rest	14.2	17.6	3.8	3.70	20	.001*
	Control	- 4.4	22.5	4.9	- .89	20	.383
Pain sensation	Music	27.3	22.4	5.1	5.30	18	< .001*
	Rest	9.0	15.4	3.4	2.67	20	.015*
	Control	1.2	22.8	5.0	.25	20	.806
Pain distress	Music	39.4	33.8	7.8	5.08	18	< .001*
	Rest	10.6	16.7	3.8	2.90	20	.008*
	Control	- 4.6	20.2	4.4	- 1.04	20	.312

Note. Bonferroni's adjustment for multiple comparisons (desired level of significance, $*p < .017$).

Additional post hoc pairwise comparisons using independent *t* tests for the mean posttest scores for anxiety, pain sensation, and pain distress between the sedative music group, the scheduled rest group, and the control group specifically addressed research hypotheses 1, 2, and 3. The mean differences between posttest measures are described in Table 23 for the three groups with Bonferroni's adjustment for multiple comparisons

Table 23

Mean Differences between Groups in Posttest Scores (N = 61)

	Group Assignment		Differences				
Score			*M*	*SE*	*t*	*df*	*p*
Anxiety	Music	Rest	- 19.8	6.1	- 3.24	25.5	.003*
	Music	Control	- 34.1	7.4	- 4.64	23.7	< .001*
	Rest	Control	- 14.4	9.1	- 1.59	40.0	.121
Pain sensation	Music	Rest	- 20.3	6.8	- 3.00	29.4	.006*
	Music	Control	- 25.6	6.6	- 3.88	30.0	.001*
	Rest	Control	- 5.4	8.4	- .64	40.0	.527
Pain distress	Music	Rest	- 22.9	7.5	- 3.05	27.7	.005*
	Music	Control	- 33.7	6.9	-4.87	29.2	< .001*
	Rest	Control	- 10.8	9.2	- 1.17	40.0	.248

Note. Bonferroni's adjustment for multiple comparisons (desired level of significance, *$p < .017$).

($p < .017$). The sedative music group reported significantly greater reductions in anxiety, pain sensation, and pain distress after 30 minutes of chair rest than the scheduled rest group and the control group. Therefore, research hypotheses 1 and 2 were supported. The scheduled rest group did not report significantly greater reductions in anxiety, pain sensation, or pain distress than the control group. Therefore, research hypothesis 3 was not supported.

Findings Related to the Secondary Aim

The secondary aim was to examine the effect of sedative music, scheduled rest, and treatment as usual on myocardial oxygen demand (MVO_2) as measured by the RPP at 5, 10, 15, and 30 minutes after the initiation of chair rest in the critically ill adult after cardiac surgery. The hypotheses that tested the secondary aim were:

4. The sedative music group will have greater reductions in MVO_2 (as measured by the RPP) over time (at 5, 10, 15, and 30 minutes) after the initiation of chair rest than the scheduled rest group.
5. The sedative music group will have greater reductions in MVO_2 (as measured by the RPP) over time (at 5, 10, 15, and 30 minutes) after the initiation of chair rest than the control (treatment as usual) group.
6. The scheduled rest group will have greater reductions in MVO_2 (as measured by the RPP) over time (at 5, 10, 15, and 30 minutes) after the initiation of chair rest than the control (treatment as usual) group.

The mean RPP measures at baseline, 5, 10, 15, and 30 minutes for the sedative music group, the scheduled rest group, and the control group are described in Table 24,

and Figure 6 depicts the mean RPP over time for the three groups. RM ANOVA was used to test the secondary aim. RM ANOVA assumptions of normality and absence of outliers were met. Box's test of equality of covariance matrices tested the assumption whether the variance-covariance matrices of the RPP were equal across groups. The *p* value of .102 indicated that this assumption was met. Because the assumption of compound symmetry was not met (Mauchly's test of sphericity, $p = .004$), the multivariate results are reported. The multivariate test for the overall interaction effect of time and group was not significant with Wilks' Lambda, $F = .917(6,110)$, $p = .486$. Therefore, research hypotheses 4, 5, and 6 were not supported.

Table 24

Mean Rate-pressure Product Measures Over Time (N = 61)

Time	Sedative Music $n = 19$	Scheduled Rest $n = 21$	Control $n = 21$
	M(SD)	*M(SD)*	*M(SD)*
Baseline	10571(1606)	10530(2919)	10780(2179)
5 min	9628(1387)	9892(2791)	10560(2075)
10 min	9088(1236)	9602(2515)	10240(1950)
15 min	8967(1547)	9500(2565)	9824(1938)
30 min	8737(1416)	9340(2595)	9935(1915)

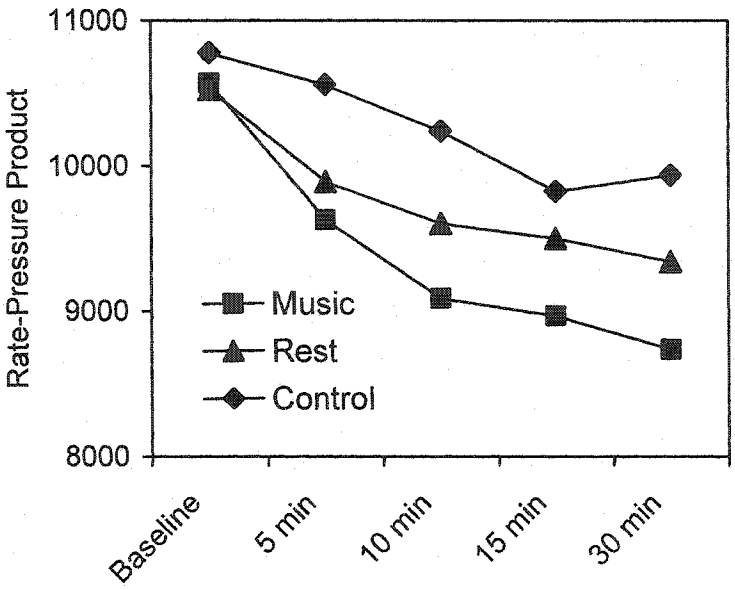

Figure 6. Comparison of the mean measurements for rate-pressure product over time in the sedative music group, scheduled rest group, and control group.

Additional Questions

Each patient was asked questions about prior experience with music at the conclusion of study participation (see Table 25). Although most patients had never played an instrument or sung with a group or solo, the majority (97%) of patients reported enjoying listening to music. In addition, 66% of patients reported listening to music frequently.

The patients in the sedative music group were asked questions about their experience with the sedative music (see Table 26). Most of these patients (95%) either liked or loved the music selection, and 75% of patients reported that the music was not irritating at all. Most patients found the music calming to them and helped them to relax

Table 25

Questions about Prior Experience with Music

Questions	Sedative Music $n = 19$		Scheduled Rest $n = 21$		Control $n = 21$	
	n	%	*n*	%	*N*	%
Do you play an instrument?						
I have never played.	13	69	18	85	13	62
I have played in the past.	5	26	2	10	7	33
I play one now.	1	5	1	5	1	5
Do you sing either with a group or solo?						
No	13	68	17	81	13	62
In the past	3	16	3	14	3	14
I have sung in the last 3 months.	3	16	1	5	5	24
Do you generally enjoy music?						
Yes	18	95	21	100	20	95
No	1	5	0	0	1	5
Do you listen to music at home/work/car?						
Frequently	13	69	12	57	15	71
Occasionally	5	26	7	33	5	24
Rarely	1	5	2	10	1	5

Table 26

Sedative Music Group (n = 19): Questions about Music

Questions	*n*	%
Did you like the music selection on the tape?		
Hated	0	0
Disliked	0	0
Neither liked or disliked	1	5
Liked	8	42
Loved	10	53
Was the music calming to you?		
Not at all	0	0
A little bit	1	5
A moderate amount	1	5
A lot	17	90
Did you use the music more to relax your body or to distract your attention away from the pain and anxiety, or both?		
To relax	9	47
To distract	1	6
Both	9	47
Neither	0	0
Was the music irritating in any way?		
Not at all	14	74
A little	3	16
A moderate amount	0	0
A lot	2	10
Would you say the music was sedative (sleepy)?		
No	1	5
Yes	18	95
Was the music tape helpful to you?		
No	0	0
A little bit	0	0
A moderate amount	1	5
Very helpful	18	95
Would you use a tape like this again if you were having surgery?		
No	1	5
Yes	18	95

and/or provided a distraction away from anxiety and pain. Also, most patients (95%) indicated the music selection was sedative, was very helpful, and would use a similar tape again after surgery.

The patients in the scheduled rest group were asked questions about their experience with scheduled rest (see Table 27). Most patients in this group reported liking the rest period, and 47% found the rest period calming. In addition, most of these patients (52%) rated the rest period as very helpful.

Table 27

Scheduled Rest Group (n = 21): Questions about Rest

Questions	*n*	%
Did you like the rest period?		
Hated	0	0
Disliked	0	0
Neither liked or disliked	1	5
Liked	16	76
Loved	4	19
Was the rest period calming to you?		
Not at all	0	0
A little bit	2	10
A moderate amount	9	43
A lot	10	47
Was the rest period helpful to you?		
No	0	0
A little bit	1	5
A moderate amount	9	43
Very helpful	11	52

Chapter 6

Discussion

This chapter discusses the findings of this study within the context of the literature. The discussion includes the sample profile, the conceptual framework, the results of the effect of sedative music and scheduled rest on anxiety, pain, and rate-pressure product (RPP), sedative music therapy, study limitations, research and practice implications, and conclusions.

Sample Profile

The study sample was 61 patients who had open-heart surgery at one midwestern regional hospital, and the composition of this sample was similar to national descriptive statistics for open-heart surgeries for age, gender, and specific surgical procedure. The age range for this sample was from 32 to 83 years, and the patients were primarily male (64%). In addition, most patients in this study had coronary artery bypass grafting (80%) procedures. National statistics indicate that patients who have open-heart surgeries have an age range from 20 to over 65 and are primarily male (67%) (American Heart Association, 2002). Also, of the types of open-heart surgery procedures completed in the United States, approximately 77% had coronary artery bypass grafting.

Previous studies of the effect of music on patients after open-heart surgical procedures have had similar sample characteristics (age, gender, and race) to the current study except for race. Barnason et al. (1995) reported the following characteristics: mean age of 67 years, 67% males, and 100% white. Likewise, Broscious (1999)

reported a mean age of 66 years, 69% males, and 97% white, and Zimmerman et al. (1996) reported a mean age of 67 years, 67% males, and 100% white. The current study included a more diverse group by including both whites (77%) and American Indians (13%). However, these percentages are representative of the percentages of whites and American Indians served at the hospital in which this study was conducted.

Conceptual Framework

This study provided evidence that sedative music and scheduled rest decreased anxiety about chair rest, pain sensation, and pain distress in postoperative open-heart patients during chair rest. In addition, RPP was reduced over time in all three groups (sedative music group, scheduled rest group, and the control group). These findings provide support for this study's conceptual framework that was based on Lazarus and Folkman's (1984) transactional model of stress and coping. Sedative music and scheduled rest were conceptualized as cognitive behavioral interventions that provide the patient with a more adaptive way of responding to anxiety and pain. These interventions were suggested for patients who are anxious about chair rest and have incomplete pain relief from opioid medication.

Although the exact mechanism by which these interventions reduce anxiety and pain remains unknown, the patients in the sedative music group reported using the music as a distraction and/or as a method to induce relaxation. Patients in the scheduled rest group had reduced interruptions that facilitated decreased motor and mental work. Further research is indicated to determine the exact mechanisms by which these interventions reduce anxiety, pain, and RPP.

Anxiety

Findings from this study provide evidence that both sedative music and scheduled rest are effective interventions to reduce anxiety in patients during chair rest after open-heart surgery. Sedative music and scheduled rest significantly reduced anxiety in these patients while at chair rest. However, for patients who received treatment as usual, anxiety increased slightly during chair rest.

In addition, after 30 minutes of chair rest the patients who received sedative music had significantly greater reductions in anxiety than the patients who received scheduled rest or treatment as usual. In contrast, those patients receiving scheduled rest did not have significantly greater reductions in anxiety after 30 minutes of chair rest than the patients receiving treatment as usual.

In the current study, the sedative music group had a significantly higher pretest anxiety score (63.0) than the control group (43.2), and this difference was controlled for in the data analyses. The reason for this difference is unclear, but the investigator suspects that the stress of added equipment (headphones) and instructions to listen to music might have transiently increased anxiety for these patients. For clinical use of sedative music during chair rest and in future studies, the investigator recommends practice with the equipment and practice listening to sedative music prior to surgery.

Findings from the current study support the findings from previous studies that sedative music was effective in reducing anxiety of patients in the intensive care setting. Sedative music was found to be more effective than scheduled rest to reduce anxiety in mechanically ventilated patients and patients after an acute myocardial infarction (Chlan, 1998a; White, 1992; White, 1999). In addition, sedative music was more efficacious

than treatment as usual in patients after an acute myocardial infarction (Lueders-Bolwerk, 1990; White, 1999).

Previous study results also indicate that music was more effective than scheduled rest and treatment as usual in patients who were moderately or highly anxious. For example, Chlan (1998a) and White (1992) studied intensive care patients who had high pretest anxiety. The patients who received the music intervention had significantly lower posttest anxiety scores than the patients who received scheduled rest. Lueders-Bolwerk (1990) also reported similar results when comparing a music intervention to treatment as usual in patients who were anxious. The patients who received the music intervention had significantly less posttest anxiety than the patients who received treatment as usual. In addition, White (1999) compared the effects of a music intervention, scheduled rest, and treatment as usual on anxiety levels in patients with a diagnosis of acute myocardial infarction. Pretest anxiety in these patients was moderate to high. Posttest anxiety was significantly reduced in the music group when compared to the scheduled rest and the treatment as usual group, and no significant difference was found between posttest anxiety in the scheduled rest group and the treatment as usual group. The results reported by White (1999) and from the current study provide compelling evidence that sedative music was more efficacious than either scheduled rest or treatment as usual especially in patients who are moderately to highly anxious.
In contrast, other studies have not provided support for the effectiveness of sedative music and scheduled rest to reduce anxiety in the intensive care setting (Barnason et al., 1996; Elliot, 1994; Zimmerman et al., 1988). Although findings from these studies indicated an overall reduction of anxiety, the results were not significant. Inconsistent

results were related to low pretest anxiety scores and using scheduled rest as a control situation.

For example, Zimmerman et al. (1988) reported the lack of significant findings for anxiety between the music and the control group was related to low pretest anxiety scores and the use of scheduled rest in the control group. Music or scheduled rest did not appear to have a large effect on already low anxiety scores. Therefore, it may not be possible to further reduce low anxiety scores with music or scheduled rest. Also, Zimmerman et al. (1988) speculated that the control group in this study was actually an intervention group that was allowed 30 minutes of scheduled rest that reduced anxiety. A true control group of patients who did not receive an intervention would have been helpful for comparison of differences in anxiety. Likewise, in the studies conducted by Barnason et al. (1988) and Elliot (1994) the patients had low pretest anxiety scores, and the patients in the control groups received scheduled rest. Again, no significant differences were found between the posttest anxiety scores in the music and control groups in these studies. Future research is recommended to examine the effect of music on low, moderate, and high anxiety levels and to compare the effect of music on anxiety to both scheduled rest and treatment as usual.

Pain

Findings from the current study provided evidence that sedative music and scheduled rest were effective interventions to decrease both pain sensation and distress during chair rest. However, patients who received sedative music had significantly greater reductions in pain sensation and pain distress after 30 minutes of chair rest than either the patients who received scheduled rest or treatment as usual.

Anecdotal notes made by the investigator provided a plausible explanation for the lack of significant findings after 30 minutes of chair rest for pain sensation and distress in the patients who received scheduled rest. The patients in the sedative music group remained quiet during the 30 minutes and stated being either distracted or relaxed by the music selection. In contrast, the patients who received scheduled rest shifted position, opened their eyes occasionally, and reported hearing noises from the hallway during the 30 minutes of rest. Sedative music most likely acted as a distraction and assisted the patients to concentrate on something more pleasant and relaxing. Without a distraction (such as the sedative music), scheduled rest was less beneficial to patients to reduce pain sensation and pain distress.

There were no significant differences from pretest to posttest in pain sensation or distress for the patients who received treatment as usual. These patients had a small decrease in pain sensation during chair rest, and there was a small increase in pain distress during chair rest. These patients continued to experience pain of similar intensity at the initiation of chair rest (pretest) and 30 minutes later (posttest).

The findings in the current study are similar to the results reported by Good et al. (1999). In a large randomized study ($N = 500$), Good et al. (1999) found that sedative music was effective in reducing pain sensation and distress in ambulating postoperative abdominal surgical patients. Good et al. (1999) measured pain sensation and distress after a 15-minute rest period and at four points during ambulation on postoperative days 1 and 2 (before preparation, after preparation, after ambulation and after recovery). The music group had significantly lower pain (both sensation and distress) at all time points except for pain distress at post ambulation on postoperative day 2. The non-significant

finding for pain distress at post ambulation on postoperative day 2 was attributed to patients being distracted by instructions from the nurse and not concentrating on the music.

Although the results in the current study and the study conducted by Good et al. (1999) provided evidence that sedative music significantly reduced pain, other study results have been mixed or non-significant due to small sample sizes, lack of control for analgesic medication between groups, variable pain responses, and the use of scheduled rest in the control group. Non-significant or mixed findings occurred in studies with small sample sizes (Good & Chin, 1998; Heiser et al., 1997; Heitz et al., 1992; Mullooly et al., 1988; Taylor et al., 1998). In addition, Good and Chin (1998) found that large variations in pain scores decreased the effect size, and a larger sample size was needed to obtain significant results.

In the current study morphine equivalents received within four hours of chair rest were not significantly different between groups. Therefore, analgesia received by these patients was not a confounding variable in this study. However, the administration of pain medication was not controlled in previous studies with non-significant results, and the investigators in these studies reported that lack of control for analgesia might have been a factor (Heiser et al., 1997; Heitz et al., 1992; Mullooly et al., 1988; Taylor et al., 1998). For that reason, future studies should control for the possible confounding effect of medications administered for pain relief.

Another methodological problem identified in previous studies was the intensity of pain experienced by the patients during the study periods. Zimmerman et al. (1988) studied the effects of music on pain in 96 open-heart patients on the second and third

postoperative days. The lack of significance in this study was related to the mild intensity of pain on postoperative day 2 and day 3 after surgery, which suggests that music may be more effective during the first 24 hours after surgery when pain is more intense. But, several other investigators have determined that with intense, sudden pain during chest tube removal or upon awakening from surgery, patients may have difficulty focusing on the music intervention (Broscious, 1999; Mullooly et al., 1988; Taylor et al., 1998). In addition, with intense, sudden pain the dose of music may be ineffective especially for those patients with no prior experience in relaxation techniques. Experts have suggested that sedative music may be more effective if the patient is able to concentrate on the intervention (Broscious, 1999; Good et al., 1999). In the current study, chair rest provided an opportunity for the patients to concentrate on the sedative music, and thus, the sedative music was effective in reducing pain.

Additionally, Zimmerman et al. (1996) attributed non-significant differences in postoperative pain between open-heart patients who received a music intervention and those patients who received a 30-minute rest period (control group) to the possibility that both music and rest reduced pain and are comparable. A confounding factor in this study was that the control group received a rest period, which was not a true control situation. A true control group (receiving treatment as usual) may have yielded entirely different results.

Rate-pressure Product

Although no significant differences were found for RPP between the patients who received sedative music, scheduled rest, and treatment as usual, there was a decrease in RPP at 5, 10, 15, and 30 minutes. In addition, the patients who received

sedative music had a lower mean RPP at all time points than patients who received scheduled rest or treatment as usual. Also, the patients who received scheduled rest had a lower mean RPP at all time points than the patients who received treatment as usual. However, the changes in RPP were not clinically significant.

The current study conceptualized RPP as a measure of myocardial oxygen demand during chair rest and was determined by multiplying the heart rate by the systolic blood pressure. Although RPP is a good indicator of myocardial oxygen demand during activity such as walking or exercising for cardiac patients, this measure may not be an appropriate study variable in these patients during the first postoperative day with the initial attempt at chair rest. These patients developed orthostatic hypotension with standing. Also, the effects of medications (i.e., analgesics, anesthetics) may have increased the hemodynamic instability of these patients and precipitated hypotension with changes in position. In addition, the systolic blood pressures remained low with stable heart rates while at chair rest. Lower systolic pressures with only small changes in heart rate may have contributed to the smaller effect of music and scheduled rest. Therefore, RPP may be a better indicator of myocardial oxygen demand on successive postoperative days once the vascular system has stabilized as used in cardiac rehabilitation programs to evaluate cardiac response to activity and exercise. Future studies should investigate the effect of sedative music on myocardial oxygen demand (as measured by RPP) during activity such as walking or exercises performed in a cardiac rehabilitation program.

Limited research has been completed on the effect of sedative music and scheduled rest on RPP in patients in the intensive care setting, and the results of this

study did not support previous findings by other investigators. Updike (1990) studied the effect of music on the RPP in 20 intensive care patients with various diagnoses (i.e., acute myocardial infarction, sudden death syndrome, multiple trauma, and cancer). There was a significant reduction in RPP from pretest to posttest measures. In another study, White (1999) compared the effect of music, quiet, uninterrupted rest (scheduled rest), and treatment as usual (control) on RPP in 45 patients with a diagnosis of acute myocardial infarction. The posttest RPP was significantly less in the music group than in the control group, but the RPP in the scheduled rest group did not differ significantly from the music or the control group.

Sedative Music Therapy

In this study the patients in the sedative music group were offered a choice of six tapes that were instrumental with 60 to 80 beats per minute. Five of the music selections had been previously used in research studies (Good, 1995; Good & Chin, 1998; Good et al., 1999). The selections developed by Good (1995) included synthesizer, harp, piano, orchestral, and slow jazz. In addition, an American Indian flute selection was included to appeal to the American Indian patients who are served at the hospital.

Investigators in previous studies have indicated that musical choices were related to cultural background (Good et al., 2000). For example, Good et al. (2000) found that most Caucasians chose orchestra music, African Americans chose jazz, and Taiwanese chose harp music. In this study, five American Indians were randomized into the sedative music group, and all of these patients chose the American Indian flute selection. Although this was a small sample of American Indians, the patients in this study preferred this type of music. For music to have a therapeutic effect, it is important for

nurses to be aware of cultural differences in music preference and provide culturally appropriate selections (Good et al., 2000).

Variation exists in previous studies related to the length of exposure to the musical selection and the number of sessions used. The most frequent time interval for a music session was 30 minutes in prior studies, and investigators have estimated that the effect of sedative music stabilizes after approximately 30 minutes (Chlan, 1998a; White, 1999). Patients in the current study used sedative music for one session of 30 minutes. Six patients in the sedative music group reported to the investigator that the length of time should be shortened to between 15 and 20 minutes. In addition, these patients thought that additional sessions would be beneficial to reduce anxiety and pain after surgery. Certainly, additional research is warranted to determine the optimal length for each session and the effect of repeated sessions on postoperative anxiety and pain.

In previous studies, investigators interviewed patients who received sedative music. Generally, these patients found that the music was helpful, assisted in relaxation, and was beneficial (Good, 1995; Good & Chin, 1998; Heiser et al., 1997; Heitz et al., 1992; Mullooly et al., 1988; Taylor et al., 1998). These findings are similar to the findings in this study. Most patients in the sedative music group enjoyed the music selection, found the music calming, assisted in relaxation, and provided a distraction away from anxiety and pain. Also, most patients indicated the music selection was sedative and very helpful.

Study Limitations

Several limitations have been identified. The study involved only those patients who had open-heart surgery in a rural hospital setting, thus limiting the generalizability

of the study. Also, factors such as previous experience with surgery or open-heart surgery, previous pain experiences, chronic pain, and preoperative state anxiety may have affected the results, and no attempt was made to control for these.

Patients' knowledge of the study could have also influenced their behavior and possibly altered the outcome of this study. Certainly, the patients could have guessed the outcome of this study and changed their behavior to achieve this outcome. From the informed consent process, all patients were introduced to the interventions (sedative music and scheduled rest) and the control (treatment as usual) situation.

In addition, the investigator remained in the room during the 30 minutes for all groups. Every effort was made by the investigator to be as unobtrusive as possible while obtaining the blood pressure and pulse readings from the monitor, but it is not known what effect, if any, this may have had on patient responses. Although the effect of the investigator's presence is unknown, the investigator believes that being in the room did not appear to have an influence on the study outcomes.

Finally, because data collection ceased after significant results were obtained for the primary aim (i.e., for the effect of sedative music and scheduled rest on anxiety and pain), it is unknown if a larger sample would have resulted in significant results for a change in RPP between the three groups. The calculated power for a repeated measures analysis of variance test and an alpha level of .05, an *n* value of .05, and three groups yielded a power level of .64. To achieve a power level of .80 or greater, and assuming that the other factors (effect size, alpha level) remained constant, a sample size of approximately 30 per group would be required. Perhaps with a larger sample size the differences in RPP between groups would have been statistically significant.

Implications for Research and Clinical Use of Music Therapy

While the numbers of studies examining the effects of sedative music on anxiety, pain, and RPP are increasing, findings are inconsistent. Lack of significant findings may be due to small sample sizes, individual differences among subjects (i.e., prior experience with music, medications, varied experiences with anxiety and pain, varied levels of anxiety and pain), and variation in use of scheduled rest as a control situation. Future studies should attempt to address these methodological issues with carefully planned and controlled experimental studies.

In addition, little is known about prescribing music for anxiety, pain, and decreasing myocardial oxygen demand. Research is needed to determine the effect of repeated sessions, the optimal length of each session, and types of music selections that are most effective. Also, most studies have examined only short-term effects of music therapy. More research is needed to determine if any long-term or carry over effects occur with music therapy.

From a clinical perspective, sedative music provided a reduction of anxiety and pain in postoperative open-heart patients during chair rest. This intervention is low risk and is recommended as an adjunct to pain medication to relieve anxiety and pain. Music should be of sedative quality, and patients should be offered a selection of culturally appropriate music. Also, patients should be offered an opportunity to practice with sedative music prior to surgery to become familiar with the equipment to prevent increased anxiety. In addition, nurses should assess anxiety, pain and physiological parameters before and after the music intervention, and patients should be asked to describe their experience.

Summary

In conclusion, the findings in this study strongly support the use of sedative music in the treatment of anxiety and pain in combination with pharmacological treatment during early activities such as chair rest in the intensive care unit after open-heart surgery. Anxiety, pain sensation, and pain distress were reduced for patients who received sedative music and scheduled rest, however, sedative music was more effective than scheduled rest. These findings provide empirical evidence that postoperative open-heart patients benefit from sedative music therapy during chair rest. Nurses should feel confident in using sedative music for postoperative open-heart patients during chair rest to decrease anxiety and pain. Further research is suggested to determine the effect of sedative music on RPP during activities (such as chair rest, ambulation, and cardiac rehabilitation exercises) after open-heart surgery.

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Appendix A

Effect of Sedating Music and Scheduled Rest on Anxiety

Author, Year	Sample	Anxiety Measure	Results
Barnason, Zimmerman, & Nieveen, 1995	96 patients after open-heart surgery	Numeric rating scale, State Anxiety Inventory	Patients' anxiety post-test scores were reduced for the music, music-video, and rest groups, but no significant difference among groups.
Chlan, 1995	20 ventilator patients in critical care units	Short form of the Profile of Mood States	Patients' anxiety post-test scores were reduced for both the music and control group, but no significant difference between groups.
Chlan, 1998a	54 ventilator patients in critical care units	6-item State Anxiety Inventory	Patients' anxiety post-test scores in the music group was significantly lower than the control group ($p < .001$).
Davis-Rollans & Cunninham, 1987	24 coronary care patients	Interview about emotional state	Patients more tranquil, happy, satisfied after listening to music.
Elliot, 1994	56 coronary care patients with unstable angina pectoris or acute myocardial infarction	State Anxiety Inventory, Hospital Anxiety and Depression Scale, & Linear Analogue Anxiety Scale	Patients' anxiety post-test scores were reduced in all 3 groups (music, relaxation, and control) from pre-test, but no significant difference among groups at post-test.

Appendix A (continued)

Author, Year	Sample	Anxiety Measure	Results
Guzzetta, 1989	80 presumptive myocardial infarction patients (only patients in music and relaxation groups were interviewed ($n = 53$)	Interview about helpfulness of intervention to induce relaxation	Patients reported interventions (music and relaxation) were helpful to extremely helpful in inducing relaxation (92.5%).
Lueders-Bolwerk, 1990	35 myocardial infarction patients	State Anxiety Inventory	Patients' mean anxiety post-test score in the music group was significantly lower than the control group ($p = .007$).
Updike, 1990	20 coronary care patients	Interview about emotional state	Patients more calm, relaxed, and serene, with diminished pain or an absence of pain after listening to music.
White, 1992	40 myocardial infarction patients	State Anxiety Inventory	Patients' mean anxiety post-test score in the music group was significantly lower than the control group ($p < .002$).

Appendix A (continued)

Author, Year	Sample	Anxiety Measure	Results
White, 1999	45 myocardial infarction patients	State Anxiety Inventory	Patients' mean anxiety post-test score in the music group was significantly lower than the scheduled rest group and the control group ($p < .01$). Patients' mean anxiety post-test score in the scheduled rest group was not significantly lower than the control group.
Zimmerman et al., 1988	75 presumptive myocardial infarction patients	State Anxiety Inventory	Patients' anxiety post-test scores were reduced in all 3 groups (music, white noise, and control) from pre-test, but no significant difference among groups at post-test.

Appendix B

Effect of Sedating Music and Scheduled Rest on Pain

Author, Year	Sample	Pain Measure	Results
Broscious, 1999	156 patients after open-heart surgery during chest tube removal	Numeric rating scale	No significant differences were found in pain among the music, white noise, or control (treatment as usual) groups.
Good, 1995	84 patients after abdominal surgeries at initial ambulation	Sensation of Pain Scale, Distress of Pain Scale, State Anxiety Inventory	No significant differences were found in sensation, distress, or anxiety between relaxation and music, the individual treatments and the combination of relaxation and music, or the three treatment groups and the controls after first ambulation. After 2 days use, patients receiving music, relaxation, or a combination reported the interventions as helpful for pain sensation and distress and would prefer to use interventions while resting in bed.

Appendix B (continued)

Author, Year	Sample	Pain Measure	Results
Good et al., 1999	500 patients after abdominal surgeries during ambulation and during rest	Visual analogue scales for pain sensation and distress	The music group had significantly lower pain (both sensation and distress) at all time points except for pain distress at post ambulation on postoperative day 2.
Heiser, Chiles, & Fudge, 1997	10 patients in the PACU after back surgery	Visual analogue scale with corresponding numeric scale	No significant difference after one hour in PACU and 24 hours later between the music and control groups for pain or anxiety. Music group stated the music helped them relax or feel less anxious and a few believed that music diminished their pain.
Heitz, Symreng, & Scamman, 1992	60 patients in the PACU after neck and breast surgery	Visual analogue scale	No significant difference over time among the three groups (music, headphone only, and control) for pain. Music group described the music as beneficial and relaxing, and the music was helpful to decrease pain and discomfort.

Appendix B (continued)

Author, Year	Sample	Pain Measure	Results
Mullooly, Levin, & Feldman, 1988	28 patients on postoperative day 1 and 2 after abdominal hysterectomy	Visual analogue scale for pain, Graphic scale with verbal and numerical descriptors for anxiety	On day 1, anxiety was significantly reduced in the music group, but not pain. On day 2, both pain and anxiety were significantly reduced in the music group.
Taylor, Kuttlor, Parks, & Milton, 1998	61 patients in the PACU after abdominal hysterectomies	Verbal numeric rating scale, Graphic Numeric Pain Intensity Scale	No significant difference over time among the three groups (music, headphone only, and control) for pain. Music group reported satisfaction and felt the music helped them.
Zimmerman, Nieveen, & Barnason, 1996	96 patients on postoperative day 2 and 3 after open-heart surgery	Verbal rating scale and MPQ-PRI	No significant difference among the music, music-video, and control groups for pain on the verbal rating scale. Significant difference for the evaluative component only of the MPQ-PRI (music group had significantly lower score than control group).

Appendix C

Verbal Instructions for Use of Sedative Music

Script: The purpose of the music is to help you relax and distract you from your anxiety and your pain. Close your eyes as you listen to the music and find a comfortable position. At any time you may change position, scratch, or swallow. Listen to the music and allow yourself to follow the music. The music will play for 30 minutes. Let the music suggest to you what to think and what to feel.

Appendix D

Visual Analogue Scale (Anxiety)

Mark the anxiety scale to show how much anxiety related to sitting in the chair that you have right now.

Not anxious about chair rest **Most anxiety imaginable**

Visual Analogue Scale (Pain Sensation)

Mark the sensation scale to show how much pain sensation you have right now.

No pain sensation **Most pain sensation imaginable**

Visual Analogue Scale (Pain Distress)

Mark the distress scale to show how much pain distress you have right now.

No pain distress **Most pain distress imaginable**

Appendix D (continued)

Instructions for Visual Analogue Scales

Anxiety

I will ask you about how much anxiety you feel about sitting in a chair.
I want you to tell me how much anxiety you are having about sitting in a chair.
I want you to think of your anxiety as a feeling of tension or apprehension about sitting in a chair.
I want you to mark how much anxiety you are having about sitting in a chair on the line of the scale. (Show anxiety scale to the patient.)
If you are having a lot of anxiety right now, you will make your mark closer to the right end.
If you are not having much anxiety, you will make your mark closer to the left end. (Point to ends as you speak.)
Use one slash that crosses the line at the point that shows how much anxiety you are having.

Think about how you feel right now.
Mark the anxiety scale to show how much anxiety you have right now.

Pain

I will ask you about pain in the area of your incision(s).
I want you to tell me how much pain you are having.
I want you to think of your pain in two ways:
First think about how strong or intense the sensations are. Sensation is the physical feel of the pain at the area of your operation
Then think about how much distress the sensations of pain cause. Distress means how much those sensations bother you or how unpleasant the sensations are.
I want you to mark how much pain you are having on the line of each scale. (Show sensation and distress scales to the patient.)
If you are having a lot of pain sensation right now, you will make your mark closer to the right end. If you are not having much pain sensation, you will make your mark closer to the left end. (Point to ends as you speak.)
If you are having a lot of pain distress right now, you will make your mark closer to the right end. If you are not having much pain distress, you will make your mark closer to the left end. (Point to ends as you speak.)
Use one slash that crosses the line at the point that shows how much sensation or distress you are having.

Think about how you feel right now.
Mark the sensation scale to show how much sensation of pain you have right now.
Next, the distress scale to show how much distress of pain you have right now.

Adapted with permission from Good et al. (2001).

Appendix E

Approval Letter from Rapid City Regional Hospital

RAPID CITY REGIONAL HOSPITAL

MEDICAL STAFF OFFICE
(605) 719-8107 • FAX (605) 719-1027

December 5, 2001

Jo A. Voss
[redacted]

Dear Ms. Voss,

After your presentation at the December 4, 2001 IRC meeting, the IRB approved your protocol and consent for the study entitled Effect of Music on Pain and Anxiety at Chair Rest.

The IRB requests that you provide a final report on the results within one year or sooner if the study is completed prior to December 2002.

We will appreciate your updates and final report.

Sincerely,

[redacted]
Victoria Herr, M.D.
IRC Chair

Appendix F

Approval Letter from University of Nebraska Medical Center

University of Nebraska Medical Center

NEBRASKA'S HEALTH SCIENCE CENTER
A Partner with Nebraska Health System

Institutional Review Board (IRB)
Office of Regulatory Affairs (ORA)

January 23, 2002

Jo Voss, RN
[redacted]

IRB # 486-01-FB

TITLE OF PROPOSAL: Effect of Music on Pain and Anxiety at Chair Rest

SECONDARY INVESTIGATORS: Bernice Yates, RN, PhD

DATE OF FULL BOARD REVIEW 12-20-01 DATE OF EXPEDITED REVIEW _____

DATE OF FINAL APPROVAL 01-23-02 VALID UNTIL 12-20-02

The Institutional Review Board (IRB) for the Protection of Human Subjects has completed its review of the above-titled protocol and informed consent document(s), including any revised material submitted in response to the IRB's review. The Board has expressed it as their opinion that you are in compliance with HHS Regulations (45 CFR 46) and applicable FDA Regulations (21 CFR 50.56) and you have provided adequate safeguards for protecting the rights and welfare of the subjects to be involved in this study. The IRB has, therefore, granted unconditional approval of your research project. This letter constitutes official notification of the final approval and release of your project by the IRB, and you are authorized to implement this study as of the above date of final approval.

Please be advised that only the IRB approved and stamped consent/assent form can be used to make copies to enroll subjects. Also, at the time of consent all subjects/representatives must be given a copy of the rights of research participants.

The IRB wishes to remind you that the PI or Co-PI, is responsible for ensuring that ethically and legally effective informed consent has been obtained from all research subjects. For protocols posing greater than minimal risk, the PI/Co-PI must counter sign and date all consent forms where they are not the individual obtaining and documenting informed consent. This countersignature should occur as soon as possible, but at least within 10 business days of the time the subject/representative signs the consent form.

Finally, under the provisions of this institution's Multiple Project Assurance (MPA #1509), the PI/Co-PI is directly responsible for submitting to the IRB any proposed change in the research or the consent document(s). In addition, any unanticipated adverse events involving risk to the subject or others must be promptly reported to the IRB. This project is subject to periodic review and surveillance by the IRB and, as part of their surveillance, the IRB may request periodic reports of progress and results. For projects which continue beyond one year, it is the responsibility of the principal investigator to initiate a request to the IRB for continuing review and update of the research project.

Sincerely,

[redacted]

Ernest D. Prentice, Ph.D.
Co-Chair, IRB

EDP/kje

Service Building 3000 / 987830 Nebraska Medical Center / Omaha, NE 68198-7830 / 402-559-6463 / FAX: 402-559-3300
Email: irbora@unmc.edu / http://www.unmc.edu/irb

Appendix G

Selection Procedure (Inclusion Criteria)

Date_____

Surgical procedure _____ Valvular repair
_____ Coronary artery bypass grafting
_____ Other: _____

Inclusion criteria	Yes	No
a) Age 18 or over	*____	____
b) First postoperative day	*____	____
c) Activity order for chair rest	*____	____
d) Alert and oriented	*____	____
e) Able to follow commands	*____	____
f) Read	*____	____
g) Write	*____	____
h) Hear a normal tone of voice	*____	____
i) Understand English	*____	____
j) Temperature < 101° F	*____	____
k) Systolic blood pressure > 90 mm Hg	*____	____
l) Heart rate between 50 and 100 bpm	*____	____
m) Absence of dysrhythmias	*____	____

Exclusion criteria		
a) femoral arterial sheath	____	*____

Eligible	**____	____
Consented	____	____

Reason for refusal _____
_____

**If all of the responses are marked with a *, the person is eligible to be in the study.

Appendix H

Informed Consent Form

University of Nebraska Medical Center
Nebraska's Health Science Center
A Partner with Nebraska Health System

College of Nursing
985330 Nebraska Medical Center
Omaha, NE 68198-5330
Fax: (402) 559-4303

IRB # 486-01-FB

ADULT INFORMED CONSENT FORM

TITLE OF THE RESEARCH STUDY

EFFECT OF MUSIC ON PAIN AND ANXIETY AT CHAIR REST

INVITATION

You are invited to participate in this research study. The information in this consent form is provided to help you decide whether to participate. If you have any questions, please do not hesitate to ask.

WHY ARE YOU ELIGIBLE?

You are eligible to participate because you are an adult and have had open-heart surgery.

WHAT IS THE PURPOSE OF THIS STUDY?

The purpose of this study is to compare how well listening to music or resting quietly works in the treatment of pain, anxiety, and the amount of oxygen used by the heart while sitting in a chair when compared to usual care.

WHAT DOES THIS STUDY INVOLVE?

This study will take 45 minutes to complete. The following are the procedures you will undergo as a subject in this study. You will be asked if you have ever used music for relaxation, and if so, to describe your prior experiences with using music for relaxation. The investigator will review your medical record for information about your condition.

You will be randomly assigned (similar to a roll of a die) to receive music, quiet rest, or usual care while you sit in a chair.

While resting in bed, you will be asked to complete 3 scales measuring pain and anxiety. In order to complete the scales, you will make a mark across a line. The 3 scales will take you less than 1 minute to complete. You will have your blood pressure taken and your heart rate will be recorded.

IRB APPROVED
VALID UNTIL 12/20/02

Participant's Initials _____

Appendix H (continued)

You will be assisted to sit on the side of the bed for 2 minutes. You will be helped to a stand at the side of the bed and pivot to sit in a comfortable chair. Once you are seated in the chair, you will be asked to complete 3 scales measuring pain and anxiety. In order to complete the scales, you will make a mark across a line. The 3 scales will take you less than 1 minute to complete. You will have your blood pressure taken and your heart rate will be recorded.

If you are assigned to receive music, you will be asked to select the type of music that you prefer. You will be instructed to concentrate on the music with your eyes closed. Headphones will be placed over your ears, and you will listen to the music for 30 minutes. You will not be interrupted during the 30 minutes. The curtains will be closed, the lights dimmed, and the door closed.

If you are assigned to receive quiet rest, you will be instructed to close your eyes and rest for 30 minutes. You will not be interrupted during the 30 minutes. The curtains will be closed, the lights dimmed, and the door closed.

If you are assigned to receive usual care, the curtains will be open, the lights on, and the door open. No restrictions will be made on possible interruptions during the 30 minutes.

The following procedures apply to all participants:

Your blood pressure will be taken and your heart rate recorded 4 times during the 30 minutes that you are sitting in the chair.

After 30 minutes, you will be asked to complete 3 scales measuring pain and anxiety. In order to complete the scales, you will make a mark across a line. The 3 scales will take you less than 1 minute to complete.

Your assigned nurse will determine based on your condition when you will be assisted back to bed.

WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS YOU COULD EXPERIENCE?

Possible risks and discomforts you could experience during this study include:
Sitting in a Chair: pain, anxiety, abnormal heartbeats, chest pains, difficulty breathing, nausea, dizziness, or low blood pressure. These risks are unrelated to this study. In order to minimize these risks and discomforts, your assigned nurse will closely monitor you for these symptoms and will give you pain medication prior to sitting in the chair.
Music: emotional discomfort. In order to minimize this risk and discomfort, you will be given a choice of music selections.
Completing the Scales: emotional discomfort or fatigue. In order to minimize these risks and discomforts, the scales to measure pain and anxiety are easy to use and understand.

Participant's Initials _____

Appendix H (continued)

WHAT ARE THE POSSIBLE BENEFITS TO YOU?

Both music and quiet rest have been shown to be effective in controlling pain, anxiety, and the amount of oxygen used by the heart. It is unknown whether music or quiet rest is better. It is also unknown if those who get usual care will do better or worse than those who get music or quiet rest. If you get music and it turns out to be better, you may benefit from participating in this study. If you get quiet rest and it turns out to be better, you may benefit from being in this study. If you get usual care, you are not anticipated to directly benefit from being in this study. This is because usual care can be obtained without being in the study.

WHAT ARE THE POSSIBLE BENEFITS TO SOCIETY?

The information obtained from this study may help other patients who suffer from pain, anxiety, and increased oxygen used by the heart while sitting in a chair.

WHAT ARE THE ALTERNATIVES TO PARTICIPATING?

The alternative to participation in this study is to receive usual care.

WHAT ARE YOUR FINANCIAL OBLIGATIONS AS A PARTICIPANT?

Any equipment needed for this study will be provided to you free of charge.

WHAT SHOULD YOU DO IN CASE OF AN EMERGENCY?

If you are injured or have an adverse reaction because of this research, you should immediately contact one of the personnel listed at the end of this consent form.

HOW WILL YOUR CONFIDENTIALITY BE PROTECTED?

The only persons who will have access to your research records are the study personnel, the Institutional Review Board (IRB), and any other person or agency required by law. The results of clinical tests and therapy performed as part of this research may be included in your medical record. The information from this study may be published in scientific journals or presented at scientific meetings but your identity will be kept strictly confidential.

WHAT ARE YOUR RIGHTS AS A RESEARCH PARTICIPANT?

You have rights as a research participant. These rights are explained in The Rights of Research Participants, which you have been given. If you have any questions concerning your rights, you may contact the Institutional Review Board (IRB) at University of Nebraska Medical Center, telephone [redacted] or the IRB at Rapid City Regional Hospital, telephone [redacted]

Participant's Initials _____

IRB APPROVED
VALID UNTIL 12/20/02

Appendix H (continued)

IRB # 486-01-FB

WHAT WILL HAPPEN IF YOU DECIDE NOT TO PARTICIPATE?

You can decide not to participate in this study or you can withdraw from this study at any time. Your decision will not affect your care or your relationship with the investigator(s), the University of Nebraska Medical Center, or Rapid City Regional Hospital. Your decision will not result in any loss of benefits to which you are entitled.

If any new information develops during the course of this study that may affect your willingness to continue participating, you will be informed immediately.

DOCUMENTATION OF INFORMED CONSENT

YOU ARE VOLUNTARILY MAKING A DECISION WHETHER TO PARTICIPATE IN THIS RESEARCH. YOUR SIGNATURE MEANS THAT YOU HAVE READ AND UNDERSTOOD THE INFORMATION PRESENTED AND DECIDED TO PARTICIPATE. YOUR SIGNATURE ALSO MEANS THAT THE INFORMATION ON THIS CONSENT FORM HAS BEEN FULLY EXPLAINED TO YOU AND ALL YOUR QUESTIONS HAVE BEEN ANSWERED TO YOUR SATISFACTION. IF YOU THINK OF ANY ADDITIONAL QUESTIONS DURING THE STUDY, YOU SHOULD CONTACT THE INVESTIGATOR(S). YOU WILL BE GIVEN A COPY OF THIS CONSENT FORM.

_____ _____

SIGNATURE OF PARTICIPANT **DATE**

I CERTIFY THAT ALL THE ELEMENTS OF INFORMED CONSENT DESCRIBED ON THIS CONSENT FORM HAVE BEEN EXPLAINED FULLY TO THE PARTICIPANT. IN MY JUDGEMENT, THE PARTICIPANT IS VOLUNTARILY AND KNOWINGLY GIVING INFORMED CONSENT AND POSSESSES THE LEGAL CAPACITY TO GIVE INFORMED CONSENT TO PARTICIPATE IN THIS RESEARCH.

_____ _____

SIGNATURE OF INVESTIGATOR **DATE**

AUTHORIZED STUDY PERSONNEL

PRINCIPAL INVESTIGATOR
Jo A. Voss, RN, PhD(c) **Office:** [redacted] **Home:** [redacted]

SECONDARY INVESTIGATOR
Bernice C. Yates, RN, PhD **Office:** ([redacted]3 **Home:** [redacted]

IRB APPROVED
VALID UNTIL 12/20/02

Appendix I

Data Collection Tool

1. Subject Number	1. _____
2. Random assignment 1. Sedative music group 2. Scheduled rest group 3. Control group	2. _____
Patients in the sedative music group will listen to 30-second excerpt of each of the six tapes and choose a selection.	
3. If randomized to sedative music group, music selected: 1. synthesizer 2. harp 3. piano 4. orchestral 5. slow jazz 6. flute 7. not applicable	3. _____
Patients will be instructed in how to use the VAS for anxiety, pain sensation, pain distress by reading the prepared script. Patients will practice using the VAS for anxiety, pain sensation, pain distress.	
Assess adherence and placement of electrodes in Lead II; assess BP cuff placed on left arm, proper size cuff, sensor over brachial artery. Assess lead wires and cables for intactness.	
4. Age in years	4. _____
5. Gender 1. Female 2. Male	5. _____
6. Ethnicity 1. Hispanic or Latino 2. Not Hispanic or Latino 3. No response	6. _____
7. Race 1. American Indian/Alaska Native 2. Asian 3. Black or African American 4. Native Hawaiian or Other Pacific Islander 5. White 6. No response	7. _____

Appendix I (continued)

8. Medical Diagnoses:

9. Surgical Diagnoses:
   1. Valvular Repair
   2. Coronary Artery Bypass Grafting
      _____ vessels
      Graft site(s) _____
      _____
      _____
      _____
   3. Both
   4. Other _____
   5. Other _____

9. _____

10. Medications received within past 8 hours:

Class	Drug	Dose	Route	Time
____	_____			
____	_____			
____	_____			
____	_____			
____	_____			
____	_____			
____	_____			
____	_____			
____	_____			
____	_____			

1. ACE inhibitors
2. Calcium channel blockers
3. Diuretics
4. Beta-adrenergic blocking agents
5. Vasodilators
6. Antihypertensive agents
7. Antianginals
8. Antiarrhythmics
9. Anticholinergics
10. Antiemetics
11. Other _____
12. Other _____
13. Other _____

10. _____

Appendix I (continued)

Opioid analgesic medications within past 4 hours	
11. Drug	11. _____
1. Morphine sulfate	
2. Codeine	
3. Hydrocodone	
4. Hydromorphone	
5. Meperidine	
6. Oxycodone	
7. Other _____	
12. Dose	12. _____
13. Morphine equianalgesic equivalent	13. _____
14. Time administered	14. _____
15. Route	15. _____
1. oral	
2. subcutaneous	
3. intramuscular	
4. intravenous	
5. epidural	16. _____
16. Drug	
1. Morphine sulfate	
2. Codeine	
3. Hydrocodone	
4. Hydromorphone	
5. Meperidine	
6. Oxycodone	
7. Other	17. _____
17. Dose	18. _____
18. Morphine equianalgesic equivalent	19. _____
19. Time administered	20. _____
20. Route	
1. oral	
2. subcutaneous	
3. intramuscular	
4. intravenous	21. _____
5. epidural	
21. Drug	
1. Morphine sulfate	
2. Codeine	
3. Hydrocodone	
4. Hydromorphone	
5. Meperidine	
6. Oxycodone	22. _____
7. Other	23. _____
22. Dose	24. _____
23. Morphine equianalgesic equivalent	25. _____
24. Time administered	
25. Route	
1. oral	
2. subcutaneous	
3. intramuscular	
4. intravenous	
5. epidural	

Appendix I (continued)

26. Time of chest tube removal	26. _____
Staff nurse assists patient to dangle position for 1-2 minutes (leg exercises) followed by pivot transfer to padded chair with armrests. Patient's back elevation is between 45 and 90 degrees with feet on floor or elevated on foot rest.	
27. Time of chair rest initiation	27. _____
Chair Rest Initiation 28. VAS-A 29. VAS-S 30. VAS-D 31. HR 32. SBP 33. RPP	 28. _____ 29. _____ 30. _____ 31. _____ 32. _____ 33. _____
Scheduled music group: *Enhance environment. Read script. Place headphones on patient, start tape with selected music.* ***Scheduled rest group:*** *Enhance environment. Instruct patient to sit quietly with eyes closed and to rest for 30 minutes.* ***Control group:*** *Treatment as usual without environmental manipulation. Record interruptions, visitors, nursing care, etc.*	
5 Minutes after Chair Rest Initiation 34. HR 35. SBP 36. RPP	 34. _____ 35. _____ 36. _____
10 Minutes after Chair Rest Initiation 37. HR 38. SBP 39. RPP	 37. _____ 38. _____ 39. _____
15 Minutes after Chair Rest Initiation 40. HR 41. SBP 42. RPP	 40. _____ 41. _____ 42. _____

Appendix I (continued)

30 Minutes after Chair Rest Initiation *End of Sedative Music and Scheduled Rest* 43. HR 44. SBP 45. RPP 46. VAS-A 47. VAS-S 48. VAS-D	 43. _____ 44. _____ 45. _____ 46. _____ 47. _____ 48. _____
Investigator will ask the patients in all three groups the following questions.	
49. Do you play an instrument? 1. I have never played. 2. I have played in the past. 3. I play one now	49. _____
50. Do you sing either with a group or solo? 1. No 2. In the past 3. I have sung within the last 3 months.	50. _____
51. Do you generally enjoy music? 1. No 2. Yes	51. _____
52. Do you listen to music at home/work/car? 1. Rarely 2. Occasionally 3. Frequently	52. _____
53. Have you used relaxation techniques in the past, before this study? 1. No 2. Yes If yes, describe _____	53. _____

Appendix I (continued)

Investigator will ask the following questions to the patients in the sedative music group.	
54. Did you like the music selections on the tape? 1. Hated 2. Disliked 3. Neither liked or disliked 4. Liked 5. Loved What did you like best? What did you dislike most?	54. _____
55. Was the music calming to you? 1. Not at all 2. Aa little bit 3. A moderate amount 4. A lot	55. _____
56. Did you use the music more to relax your body, or to distract your attention from the pain and anxiety, or both? 1. To relax 2. To distract 3. Both 4. Neither	56. _____
57. Was the music irritating in any way? 1. Not at all 2. A little 3. A moderate amount 4. A lot	57. _____
58. Would you say the music was sedative (sleepy)? 1. No 2. Yes (specify) _____	58. _____
59. Was the music tape helpful to you? 1. No 2. A little bit 3. A moderate amount 4. Very helpful What was most helpful? _____	59. _____
60. Would you use a tape like this again if you were having surgery? 1. No 2. Yes 3. Don't know	60. _____

Appendix I (continued)

Investigator will ask the following questions to the patients in the scheduled rest group.	
61. Did you like the rest period? 1. Hated 2. Disliked 3. Neither liked or disliked 4. Liked 5. Loved What did you like best? What did you dislike most?	61. _____
62. Was the rest period calming to you? 1. Not at all 2. A little bit 3. A moderate amount 4. A lot	62. _____
63. Was the rest period helpful to you? 1. No 2. A little bit 3. A moderate amount 4. Very helpful What was most helpful? _____	63. _____

Appendix I (continued)

Anecdotal Notes:

Time	Note

Appendix J

Confounding Variables for Baseline Anxiety

Confounding Variables	Anxiety *M(SD)*	ANOVA
Gender		
Male ($n = 39$)	51.8(23.7)	
Female ($n = 22$)	49.1(29.7)	$F(1, 59) = .157$, $p = .693$
Race		
White ($n = 53$)	49.8(26.7)	
American Indian ($n = 8$)	58.1(19.8)	$F(1, 59) = .722$, $p = .399$
Surgical diagnoses		
CABG ($n = 49$)	51.1(25.4)	
Other surgery ($n = 12$)	50.0(28.9)	$F(1, 59) = .016$, $p = .900$
Prior use of music for relaxation		
No ($n = 54$)	52.2(25.3)	
Yes ($n = 7$)	40.4(30.0)	$F(1, 59) = 1.286$, $p = .261$
[a]Pharmacological agents		
Diuretics		
No ($n = 35$)	50.2(24.1)	
Yes ($n = 26$)	51.8(28.6)	$F(1, 59) = .056$, $p = .814$
Beta-adrenergic blocking agents		
No ($n = 46$)	50.6(27.2)	
Yes ($n = 15$)	51.5(22.1)	$F(1, 59) = .014$, $p = .908$
Anti-emetics		
No ($n = 42$)	50.3(27.1)	
Yes ($n = 19$)	52.0(23.7)	$F(1, 59) = .053$, $p = .818$
Other pharmacological agents		
No ($n = 44$)	49.5(27.6)	
Yes ($n = 17$)	54.5(21.3)	$F(1, 59) = .456$, $p = .502$

Note. [a]Received within the eight hours prior to chair rest. CABG = coronary artery bypass grafting.

Appendix K

Confounding Variables for Baseline Pain Sensation

Confounding Variables	Pain Sensation *M(SD)*	ANOVA
Gender		
Male (n = 39)	48.9(23.3)	
Female (n = 22)	43.9(27.6)	$F(1, 59) = .553$, $p = .460$
Race		
White (n = 53)	46.4(24.1)	
American Indian (n = 8)	52.0(30.5)	$F(1, 59) = .353$, $p = .555$
Surgical diagnoses		
CABG (n = 49)	45.5(25.6)	
Other surgery (n = 12)	53.8(21.1)	$F(1, 59) = 1.096$, $p = .299$
Prior use of music for relaxation		
No (n = 54)	47.4(25.7)	
Yes (n = 7)	45.2(17.8)	$F(1, 59) = .042$, $p = .838$
[a]Pharmacological agents		
Diuretics		
No (n = 35)	47.1(24.7)	
Yes (n = 26)	47.1(25.4)	$F(1, 59) = .000$, $p = .992$
Beta-adrenergic blocking agents		
No (n = 46)	48.0(25.5)	
Yes (n = 15)	44.2(23.1)	$F(1, 59) = .259$, $p = .613$
Anti-emetics		
No (n = 42)	48.8(25.2)	
Yes (n = 19)	43.3(24.3)	$F(1, 59) = .642$, $p = .426$
Other pharmacological agents		
No (n = 44)	46.0(25.6)	
Yes (n = 17)	50.1(23.3)	$F(1, 59) = .328$, $p = .569$

Note. [a]Received within the eight hours prior to chair rest. CABG = coronary artery bypass grafting.

Appendix L

Confounding Variables for Baseline Pain Distress

Confounding Variables	Pain Distress *M(SD)*	ANOVA
Gender		
Male (n = 39)	49.7(27.5)	
Female (n = 22)	47.6(28.9)	$F(1, 59) = .081$, $p = .777$
Race		
White (n = 53)	48.1(27.5)	
American Indian (n = 8)	54.4(31.1)	$F(1, 59) = .346$, $p = .558$
Surgical diagnoses		
CABG (n = 49)	48.6(28.0)	
Other surgery (n = 12)	50.5(28.0)	$F(1, 59) = .046$, $p = .832$
Prior use of music for relaxation		
No (n = 54)	48.8(28.8)	
Yes (n = 7)	50.4(20.0)	$F(1, 59) = .022$, $p = .883$
[a]Pharmacological agents		
Diuretics		
No (n = 35)	47.8(28.1)	
Yes (n = 26)	50.5(27.9)	$F(1, 59) = .139$, $p = .711$
Beta-adrenergic blocking agents		
No (n = 46)	48.2(28.5)	
Yes (n = 15)	51.2(26.5)	$F(1, 59) = .136$, $p = .714$
Anti-emetics		
No (n = 42)	51.8(28.1)	
Yes (n = 19)	42.7(26.9)	$F(1, 59) = 1.410$, $p = .240$
Other pharmacological agents		
No (n = 44)	47.7(27.9)	
Yes (n = 17)	52.3(28.2)	$F(1, 59) = .337$, $p = .564$

Note. [a]Received within the eight hours prior to chair rest. CABG = coronary artery bypass grafting.

Appendix M

Confounding Variables for Baseline Rate-Pressure Product (RPP)

Confounding Variables	RPP *M(SD)*	ANOVA
Gender		
Male ($n = 39$)	10922(2327)	
Female ($n = 22$)	10109(2154)	$F(1, 59) = 1.805$, $p = .184$
Race		
White ($n = 53$)	10735(2248)	
American Indian ($n = 8$)	9928(2540)	$F(1, 59) = .867$, $p = .356$
Surgical diagnoses		
CABG ($n = 49$)	10721(2492)	
Other surgery ($n = 12$)	10252(1060)	$F(1, 59) = .403$, $p = .528$
Prior use of music for relaxation		
No ($n = 54$)	10721(2350)	
Yes ($n = 7$)	9912(1628)	$F(1, 59) = .776$, $p = .382$
[a]Pharmacological agents		
Diuretics		
No ($n = 35$)	10997(1978)	
Yes ($n = 26$)	10133(2595)	$F(1, 59) = 2.181$, $p = .145$
Beta-adrenergic blocking agents		
No ($n = 46$)	10412(2171)	
Yes ($n = 15$)	11292(2558)	$F(1, 59) = 1.701$, $p = .197$
Anti-emetics		
No ($n = 42$)	10547(2301)	
Yes ($n = 19$)	10809(2291)	$F(1, 59) = .171$, $p = .681$
Other pharmacological agents		
No ($n = 44$)	10496(1993)	
Yes ($n = 17$)	10973(2948)	$F(1, 59) = .532$, $p = .468$

Note. [a]Received within the eight hours prior to chair rest. CABG = coronary artery bypass grafting.

Appendix N

Correlations for Confounding Variables

Confounding Variables	Baseline Anxiety	Baseline Pain Sensation	Baseline Pain Distress	Baseline Rate-pressure Product
Age				
Pearson correlation	.008	-.200	-.129	-.050
Significance (2-tailed)	.951	.122	.322	.700
[a]Morphine Equivalents				
Pearson correlation	.210	.054	.152	.154
Significance (2-tailed)	.104	.678	.242	.237

Note. [a]Received within the four hours prior to chair rest.