EFFECT OF MUSIC THERAPY WITH EMOTIONAL-APPROACH COPING

ON PRE-PROCEDURAL ANXIETY IN CARDIAC CATHETERIZATION

BY

CLAIRE MATHERN GHETTI

M.M.E., University of Kansas, 2000
B.S.O.F., Indiana University, 1997

Submitted to the graduate degree program in Music Education and Music Therapy
and the Graduate Faculty of the University of Kansas
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy of Music Education (Music Therapy)

Chairperson – Alicia Clair, Ph.D.

Cynthia Colwell Dunn, Ph.D.

Christopher Johnson, Ph.D.

Nancy Hamilton, Ph.D.

Eve-Lynn Nelson, Ph.D.

Date Defended: June 20, 2011

The Dissertation Committee for Claire Ghetti certifies

that this is the approved version of the following dissertation:

EFFECT OF MUSIC THERAPY WITH EMOTIONAL-APPROACH COPING

ON PRE-PROCEDURAL ANXIETY IN CARDIAC CATHETERIZATION

_____

Chairperson – Alicia Clair, Ph.D.

Date Approved: June 27, 2011

Abstract

Individuals undergoing cardiac catheterization, and related procedures such as electrophysiological studies involving cardiac catheter placement, are likely to experience elevated anxiety periprocedurally, with highest anxiety levels occurring in the waiting period immediately prior to the procedure. Elevated anxiety has the potential to negatively impact these individuals psychologically and physiologically in ways that may interfere with the procedure itself. Pre-medication via various common anxiolytics does not always adequately lower patients' level of perceived anxiety, and at high dosages such medication may interfere with patient compliance during the procedure itself. This study evaluated the use of music therapy, with a specific emphasis on emotional-approach coping, immediately prior to cardiac catheterization in order to impact periprocedural outcomes. The randomized, pre-test/post-test control group design consisted of two experimental groups—the Music Therapy with Emotional-Approach Coping group (n = 13), and a talk-based Emotional-Approach Coping group (n = 14), compared with a standard care Control group (n = 10). Results support the use of music therapy with an emphasis on emotional-approach coping to improve positive affective states in adults awaiting elective cardiac catheterization and electrophysiological study. Statistically significant improvements in positive affect were seen after a single session of music therapy lasting 30-minutes in length. Conversely, participants who received a talk-based emphasis on emotional-approach coping or standard care did not demonstrate improvements in positive affect. There was a significant overall decrease in negative affect for all participants in the study, regardless of group membership. Heart rate, respiratory rate, and oxygen saturation levels did not differ significantly between groups. The MT/EAC group demonstrated a statistically significant increase in systolic blood pressure from pre-test to end of study intervention while the EAC

group demonstrated a significant increase in diastolic blood pressure from pre-test to post-test. The observed mean increase in systolic blood pressure was less than 10% over baseline, and thus likely reflects a benign increase in sympathetic nervous system arousal due to engagement in active music making. Though group means display a trend toward the MT/EAC group having shortest procedure length and least amount of anxiolytic required during the procedure, while the EAC group had least amount of analgesic required during the procedure, none of these differences was statistically significant.

Acknowledgements

I am indebted to many individuals who have walked with me along the path that culminated in this dissertation. I have benefitted from their guidance, support, and living example, and am grateful for their presence in my life.

Firstly, I thank Alicia Clair for fostering my desire to take calculated risks and think for myself. I have appreciated the intellectual freedom you have afforded me as your advisee, and have always felt inspired by your wild and forward style of thinking. It takes a giant to grow giants.

I have benefitted greatly from Cynthia Colwell's keen attention to detail, and from the camaraderie that comes from seemingly sharing a single brain. Your experience in the logistical navigation of conducting research in hospital settings was invaluable to my own facilitation of studies there. You are a formidable educator and director, and I have highly valued my time as part of your team.

To Chris Johnson, Nancy Hamilton, and Eve-Lynn Nelson for sharing of their time and expertise while serving on my dissertation committee. I thank you for your support, enthusiasm, and wise suggestions.

I thank the medical and support staff of the cardiac unit where this study was conducted, especially Jada Torres and Ginny Donohue, who helped rally their nursing staff to support the project. It was a pleasure working with such skilled and caring professionals.

I thank Chris Niileksela for partaking in frequent, often humorous and always painless, statistical consultations. You are carrying on the spirit of KU's great statistical educators.

I appreciate the expertise and generosity of Andrew Ramaley, CRNA, MA, who provided valuable clinical interpretation of the study's physiological outcomes.

I am grateful to my parents, Rita and Tom Mathern, for their continuous support and love throughout my life. In particular, I thank my mother, whose frequent corrections of my grammar earlier in life have served me well throughout the course of graduate studies.

I thank Anita and David Gadberry for initiating me into the doctoral program, and answering my endless questions over the course of many delicious dinners. You added a healthy dose of good times to the graduate school equation. I appreciated long walks and long talks with Melissa Brunkan—a shared process of decompressing that kept me balanced during the final stages of this project. I also thank Jeremy and Anna Manternach for helping me add wellness to the doctoral lifestyle.

And foremost, I thank Simone Ghetti, who encouraged me to follow my dreams, even when they transported me 1,200 miles away from him. His unending support is my constant.

Table of Contents

List of Tables

Page

List of Figures

Page

Chapter 1

Introduction

Cardiovascular disease is currently the single-most deadly and costly disease in the United States. According to statistics gathered by the American Heart Association, Centers for Disease Control and Prevention, National Institutes of Health, and other governmental agencies, cardiovascular disease caused 1 of every 2.9 deaths, or 33.6% of all deaths, reported in the U.S. in 2007, the year for which most recent statistics are available (Roger et al., 2011). Based on 2007 mortality rates, approximately 2,200 Americans die from cardiovascular disease (CVD) each day, with an individual dying every 39 seconds (Roger et al., 2011). There has been a steady increase in the number of cardiovascular invasive and surgical procedures taking place annually, for diagnostic and interventional purposes, with an estimated 7.2 million procedures completed annually (Lloyd-Jones et al., 2010). Direct and indirect costs related to cardiovascular disease were greater than $286 billion in 2007, making cardiovascular disease the most costly of any diagnostic group (Lloyd-Jones et al., 2010; Roger et al., 2011). For example, total costs related to cardiovascular disease are higher than total costs for cancer and benign neoplasms (Roger et al., 2011).

Greater than 1 in every 3 American adults has at least one type of cardiovascular disease, resulting in the presence of cardiovascular disease in over 82 million Americans (Roger et al., 2011). Cardiovascular disease includes the diagnoses of high blood pressure, coronary heart disease (CHD; also known as “coronary artery disease,” CAD), myocardial infarction, heart failure, stroke, and congenital cardiovascular defects. CHD is a life-threatening condition that consists of a narrowing of the blood vessels that carry blood and oxygen to the heart. In 2008, more than 16.3 million Americans over the age of 20 years had CHD, and the disease accounted

for 1 of every 6 deaths in the U.S. (Roger et al., 2011). Several kinds of invasive procedures are used for diagnosis and treatment of CHD including bypass surgeries, percutaneous coronary interventions (PCI), diagnostic cardiac catheterizations, and implantation of defibrillators and pacemakers.

Cardiac catheterization refers to a set of invasive procedures that examine the blood vessels of the heart to provide accurate diagnosis of cardiovascular problems (AHA, 2008). Common to all cardiac catheterization procedures is the insertion of a catheter into blood vessels of the heart, via an artery in the leg or arm, for diagnostic or interventional purposes. The insertion of a catheter allows the administration of contrast dye to provide X-ray visualization of the coronary arteries (AHA, 2008). Alternatively, ultrasound may be used during the process of cardiac catheterization, to view blockages in coronary arteries. Cardiac catheterization has become a routine diagnostic and interventional procedure, with over 1 million catheterizations performed annually (Roger et al., 2011). Cardiac catheterization can identify where arteries are constricted or blocked and how the heart muscle is functioning, as well as measure oxygenation of the blood and blood pressure within the heart (AHA, 2008). Identifying the presence and extent of severity of coronary heart disease is the most common indication for the use of cardiac catheterization in adults (Davidson & Bonow, 2008).

Generally considered a relatively safe procedure, the chance of experiencing major complications from diagnostic cardiac catheterization is less than 2%, with a risk of mortality lower than 0.08% (Davidson & Bonow, 2008). Despite the low chance of major risks, individuals undergoing cardiac catheterization experience significant levels of anxiety and fear related to the procedure. Individuals who have undergone cardiac catheterization (including coronary angiography with or without PCI) experienced elevated anxiety related to unknown

procedural outcomes and their potential impact on future functioning, and they experienced distress during the procedure from a decreased sense of control over bodily functions and corresponding dependence upon competence of medical staff (Beckerman, Grossman, & Marquez, 1995; Finesilver, 1978; Gallagher, Trotter, & Donoghue, 2010; Heikkilä, Paunonen, Laippala, & Virtanen, 1998; Lundén, Bengtson, & Lundgren, 2006). In their qualitative, phenomenological study of individuals who had experienced cardiac catheterization, Beckerman et al. (1995) concluded that the individuals had perceived the cardiac catheterization procedure as a "traumatic event, carrying the potential for serious complications, even death" (p.217), and that factual explanations about the procedure were not adequate to assuage the distress ensuing from this threatening appraisal of the procedure. Fears related to a lack of control over bodily functioning during the procedure, and the impact of unknown outcomes on future functioning occur in individuals who are scheduled for cardiac catheterization but who have not yet received the procedure (Caldwell, Arthur, Natarajan, & Anand, 2007). Also, women facing cardiac catheterization tend to report a higher level of fear than men (Caldwell et al., 2007; Heikkilä et al., 1998; Heikkilä, Paunonen, Virtanen, & Laippala, 1999).

Given the level of fear reported in individuals scheduled for cardiac catheterization, it is not surprising that this population also reports elevated state anxiety periprocedurally (de Jong, Erdman, van den Brand, Verhage, & Passchier, 1994; De Jong-Watt & Arthur, 2004; McCaffrey & Taylor, 2005; Ulvik et al., 2008; Uzun, Vural, Uzun, & Yokusoglu, 2008). The typical informed consent process, which details all of the potential risks of cardiac catheterization, may itself provoke increased anxiety and lead to a corresponding increased need for anxiolytic medication during the procedure (Goldberger, Kruse, Parker, & Kadish, 1997). When viewed across all aspects of the procedure, cardiac catheterization patients' state anxiety levels tend to be

highest during the waiting time immediately prior to the procedure, and lowest after the procedure has concluded (Chan & Cheung, 2003). In addition, women and younger patients (40-45 years or younger) tend to report higher state anxiety levels prior to cardiac catheterization procedures (Davis, Maguire, Haraphongse, & Schaumberger, 1994a; de Jong et al., 1994), potentially indicating a greater level of perceived threat from the procedure (Schocken, Greene, Worden, Harrison, & Spielberger, 1987).

Elevated anxiety experienced prior to cardiac catheterization may negatively impact the course of the procedure and related cardiac functioning. Individuals who become non-adherent during the procedure due to significantly elevated distress may experience increased procedure length and inaccurate intracardiac pressure and oxygen saturation readings (Finesilver, 1978, 1980). Elevated anxiety impacts the sympathetic nervous system, which may lead to increases in blood pressure, heart rate, force of heart contraction, and arrhythmias (Watkins, Blumenthal, & Carney, 2002; Watkins et al., 2006). Emotional distress experienced prior to and during cardiac catheterization may lead to the release of catecholamines, which in turn may increase platelet reactivity and contribute to the development of thrombosis and atherosclerosis (Gordon, Bowyer, Evans, & Mitchinson, 1973). Anxiety also impacts long-term outcomes for cardiac patients. Individuals who self-reported high levels of anxiety one month after myocardial infarction (MI), were more than twice as likely to experience recurrent MI or sudden cardiac death, after controlling for age and severity of coronary heart disease (Strik, Denollet, Lousberg, & Honig, 2003). Anxiety serves as an independent predictor of future cardiac events and increased health care consumption, and is a better predictor of these long-term cardiac outcomes than depression (Strik et al., 2003).

Anxiolytics are used as pre-medication to control anxiety prior to and/or during cardiac catheterization, though patients may fail to perceive any significant decrease in anxiety despite administration of these drugs (Bergeron, Enns, Delima, Dupuis, & Wynands, 1995). Woodhead, Harding, Simmonds, Dee, and McBride-Henry (2007) found that the anxiolytic oral diazepam administered as pre-medication for cardiac catheterization failed to decrease perceived anxiety significantly, and the authors questioned the utility of its use as a pre-medication. Gallagher et al. (2010) conclude that routine administration of pre-medications to all patients may not be clinically useful, though patients identified as highly anxious may benefit from targeted pharmacological intervention pre-procedurally. Low doses of anxiolytics as pre-medication may have no detrimental impact on oxygen saturation levels during cardiac catheterization, but they may also fail to adequately reduce perceived anxiety (Bergeron et al., 1995). Increasing pre-medication dosage levels to assure patient satisfaction with anxiolysis, may in turn decrease patient alertness to a level that interferes with the demands of the cardiac catheterization itself.

Anxiolytics given as pre-medication may not be a clinically effective way to decrease anxiety in all patients, and thus, the use of non-pharmacological interventions to decrease anxiety in cardiac catheterization patients is recommended (Gallagher et al., 2010). Pre-procedural interventions that provide procedural, sensory-perceptual, and/or cognitive-behavioral education reduce the amount of anxiety experienced by patients undergoing invasive procedures including coronary angioplasty (Moline, 2000). Interventions that provide sensory and procedural information as well as answer patients' questions have led to decreased pre-procedural anxiety (Moline, 2000; Peterson, 1991), though informal social support intervention may be as effective as educational intervention for decreasing pre-procedural state anxiety (Peterson, 1991). There is some evidence that coping styles may differentially impact which individuals experience reduced

state anxiety after various types of educational preparation interventions (Davis et al., 1994a). Despite the development and use of a variety of pre-procedural educational and pharmacological intervention strategies, few approaches have significantly lowered pre-procedural anxiety (Gallagher et al., 2010). Thus, methods of reducing pre-procedural anxiety in ways that impact patient perception of anxiety and distress are warranted, and may offer psychological and physiological benefits.

Individuals undergoing cardiac catheterization, and related procedures such as electrophysiological studies involving cardiac catheter placement, are likely to experience elevated anxiety periprocedurally, with highest anxiety levels occurring in the waiting period immediately prior to the procedure. Elevated anxiety has the potential to negatively impact these individuals psychologically and physiologically in ways that may interfere with the procedure. Pre-medication via various common anxiolytics does not always adequately lower patients' level of perceived anxiety, and at high dosages such medication may interfere with patient compliance during the procedure itself. Preparing patients for cardiac catheterization using procedural education interventions may help reduce anxiety during the days and weeks prior to the procedure, but may not adequately manage the heightened levels of anxiety that are expected during the waiting period on the day of the procedure. There is a need for supportive intervention immediately prior to cardiac catheterization to address both the psychological and physiological dimensions associated with heightened anxiety, in order to improve periprocedural outcomes.

In particular, non-pharmacological interventions that increase positive affective states may help to diminish the cardiovascular reactivity that occurs in response to stress (Fredrickson & Levenson, 1998), and may thus contribute to better cardiac functioning during cardiac catheterization. Music therapy employing aspects of emotional-approach coping may enable

individuals to address and express challenging emotions such as fear and loss within a supportive context. Individuals partaking in music therapy with emotional-approach coping following a stressful invasive medical procedure demonstrated an overall increase in positive affective states, with a decrease in negative affective states (Ghetti, in press). A single-session of music therapy with emotional-approach coping immediately prior to cardiac catheterization may lead to decreases in negative affect and improvements in positive affect that impact physiological parameters relevant to the efficiency of the catheterization procedure itself. Modest improvements in psychological and physiological parameters prior to the procedure may impact subsequent aspects of the cardiac catheterization procedure including length and amount of anxiolytics and analgesics required for conscious sedation. The current investigation addressed the following research questions:

1. Does a single session of music therapy with emotional-approach coping increase self-reported positive affective states more than a single session of emotional-approach coping without music therapy?
2. Does a single session of music therapy with emotional-approach coping decrease self-reported negative affective states more than emotional-approach coping without music therapy?
3. Does a single session of music therapy with emotional-approach coping decrease self-reported pain more than a single session of emotional-approach coping without music therapy?
4. Does a single session of music therapy with emotional-approach coping improve coping self-efficacy more than emotional-approach coping without music therapy?

5. Does a single session of music therapy with emotional-approach coping improve patient satisfaction more than emotional-approach coping without music therapy?
6. Does music therapy with emotional-approach coping impact physiological parameters associated with anxiety (heart rate, respiratory rate, oxygen saturation, blood pressure) differently than emotional-approach coping without music therapy?
7. Does music therapy with emotional-approach coping impact length of subsequent cardiac catheterization procedure differently than emotional-approach coping without music therapy?
8. Does music therapy with emotional-approach coping impact amount of anxiolytics required during cardiac catheterization procedure differently than emotional-approach coping without music therapy?
9. Does music therapy with emotional-approach coping impact amount of analgesics required during cardiac catheterization procedure differently than emotional-approach coping without music therapy?

Chapter 2

Review of Literature

Cardiac catheterization is considered the definitive procedure to identify the presence or severity of a suspected cardiac lesion that cannot be sufficiently evaluated by non-invasive means alone (Davidson & Bonow, 2008). Several specific procedures fall under the umbrella of cardiac catheterization, including coronary angiography (aka arteriography), left ventricle angiography, angioplasty, balloon septostomy, and electrophysiological studies. Common to each procedure is the insertion of a catheter, typically via the femoral or radial artery, that is guided toward the blood vessels of the heart. Cardiac catheterization allows visualization of physical structures, blood sampling for determination of oxygen saturation, measurement of cardiac pressure, and cardiac output calculation (Tremko, 1997). A heart may be catheterized from the left (arterial) or right (venous) sides, depending upon the purposes of the procedure (Tremko, 1997).

Patients undergoing cardiac catheterization are required to complete several actions to assist in the procedure, and thus they receive conscious sedation to remain awake, but calm during the procedure. A local anesthetic is injected at the catheter insertion site, typically either at the femoral artery in the groin, or in the arm if the brachial artery is used, and the physician inserts a sheath or cannula (Tremko, 1997). The catheter is subsequently guided to the desired location within the blood vessels of the heart, and contrast dye may be injected to enable x-ray visualization of the blood vessels (AHA, 2008). Patients may be asked to move their arms or face for radiographic images and to take and hold a deep breath until the picture is completed (Tremko, 1997). Following injection of the dye, patients may also be requested to cough to help clear the contrast dye and help promote a return to baseline heart rate (Tremko, 1997). The

procedure lasts from 30 minutes to 2 hours depending on if follow-up PCI is required. At the conclusion of the procedure, the catheter is removed and manual pressure is applied for 15 to 20 minutes to stop bleeding at the insertion site (Tremko, 1997). If the femoral artery was accessed, the patient may be required to remain in a supine position for up to six hours following the procedure in order to avoid complications of bleeding or hematoma (Tremko, 1997).

When considering in-patient invasive cardiac procedures (as opposed to out-patient procedures), the mortality rate for cardiac catheterizations is approximately 0.86%, thus, it carries a lower risk of mortality than valve replacement surgery, CABG, pacemaker placement, and PCI within in-patient populations (Roger et al., 2011). Cardiac catheterization may be performed on critically ill patients while maintaining relatively low levels of risk, and thus there are no absolute contraindications for implementing the procedure (Davidson & Bonow, 2008). However, patients experiencing recent episodes of gastrointestinal bleeding, acute stroke, acute renal failure, untreated infection, or who are un-cooperative may not be appropriate candidates for cardiac catheterization (Davidson & Bonow, 2008).

Electrophysiologic (EP) tests also involve the insertion of catheters into the blood vessels of the heart, though these tests are used to track the spread of electrical impulses through the heart (AHA, 2008). Electrophysiologic tests help to identify the nature and location of arrhythmias in the heart. Due to the use of cardiac catheters in EP tests, such procedures are often completed in cardiac catheterization labs or in an EP lab (AHA, 2008). Conscious sedation is also administered for EP tests, to enable the patient to remain calm, but awake. Catheters may be inserted via femoral or brachial arteries, and a protocol similar to that for cardiac catheterization is followed for removing catheters, stopping bleeding, and avoiding hematomas.

The chance of experiencing major complications from diagnostic cardiac catheterization is less than 2%, and mortality rates vary from 0.08% to 0.86% depending upon the co-morbidities of the populations studied (Davidson & Bonow, 2008; Roger et al., 2011). Despite the relatively low level of risk, patients may continue to perceive cardiac catheterization and related procedures as "a traumatic event, carrying the potential for serious complications, even death," and the distress resulting from this appraisal of the procedure cannot always be lowered by factual explanations alone (Beckerman et al., 1995, p. 217). Thus, the invasive diagnostic procedure itself may be perceived as a threat to one's health (Mikosch et al., 2010).

Fears Relating to Cardiac Catheterization

The prospect of cardiac catheterization can be stressful because the procedure may lead to a definitive diagnosis of CHD, which would confirm the presence of a life-threatening medical condition requiring subsequent treatment and significant lifestyle alterations. In fact, fear of the unknown, whether related to demands of the procedure itself, or to procedural outcomes and their impact on future functioning, remains one of the most central concerns for those facing the procedure. Researchers have used grounded theory and phenomenological methodologies to examine the experiences of individuals undergoing cardiac catheterization. Individuals undergoing cardiac catheterization consistently report increased anxiety related to fears of the unknown, with highest levels of anxiety occurring during the waiting period prior to cardiac catheterization (Beckerman et al., 1995). Prior to cardiac catheterization, patients may fear the possibility of subsequent procedures such as coronary artery bypass surgery, they may fear pain or death resulting from the procedure, and they may fear the discomfort of having to lay flat for prolonged periods during or following the procedure (Heikkilä et al., 1998). Fear of the unknown may be heightened for individuals who must undergo PCI immediately following angiography.

For these individuals, it may not be possible to precisely prepare them in advance, as a variety of interventional techniques may be initiated once coronary angiography identifies which intervention should be administered (Lundén et al., 2006).

Women tend to express more fears regarding cardiac catheterization than men (Caldwell et al., 2007; Heikkilä et al., 1998; Heikkilä et al., 1999), and women express concern over not being able to maintain active caregiving roles at home due to recovering from the procedure or subsequent required medical treatment (Caldwell et al., 2007). Women also express fear related to not being able to meet the catheterizing cardiologist prior to the procedure, and thus being deprived of the ability to judge the cardiologist's competence or convey one's specific needs to the cardiologist (Caldwell et al., 2007). In a sample of 378 Finnish patients who had undergone coronary arteriography, Heikkilä et al. (1998) found that post-procedurally, there was an increase in socially-related fears including fear of not receiving adequate social support, fear of being away from relatives or fear of being away from home. Heikkilä et al. (1998) postulate that the higher reporting of fears in women may be due to a higher awareness of feelings in women, social mores related to emotional expression, or the fact that most of the nurses who interacted with study participants were also women, which might have fostered a more emotionally-open environment.

Aside from fear of the unknown, individuals often express concern over the potential to lose control over one's own bodily functioning or emotional reactions during cardiac catheterization (Caldwell et al., 2007; Lundén et al., 2006). Loss of control over bodily functioning may relate to the required placement of urinary catheters prior to the procedure and the need to rely on the competency of medical staff throughout the procedure (Beckerman et al., 1995).

Various factors impact how much fear one experiences prior to undergoing cardiac catheterization. Caldwell et al. (2007) used grounded theory to explore the fears and beliefs of individuals undergoing elective cardiac catheterization for the first time. Surprisingly, patients generally viewed the procedure as "routine" after informally seeking opinions or reading more about the procedure. In a sample of 10 men and 10 women, men were more likely to feel reassured about the cardiac catheterization due to a belief in the strong reputation of the cardiologist and the catheterization lab personnel, while women were more likely to perceive the catheterization lab personnel as being competent if they were able to meet such personnel prior to the procedure and deemed them to be friendly (Caldwell et al., 2007). Aside from the previously mentioned gender differences in fear, patient age is also related to levels of fear prior to cardiac catheterization. Patients younger than 45 years of age reported more frequent and more intense fear regarding the angiography, and these individuals feared pain and death more intensely than older patients and had more intense fear of not receiving adequate social support (Heikkilä et al., 1998; Heikkilä et al., 1999).

Experienced patients, those who have undergone prior cardiac catheterization procedures, may have different fears than first time patients. Heikkilä et al. (1999) found that experienced patients reported higher anxiety and depression levels, and concluded that patients with prior experience had more intense fears. The requisite period of lying flat on one's back for a prolonged period following the procedure (for femoral line placement), often leads to pain and discomfort (Lundén et al., 2007) and may contribute to experienced patients' fears related to catheterization procedures.

Understanding Anxiety

Fear and anxiety are related concepts as they both involve physiological and psychological responses to perceived threats. Fear may be considered an adaptive response to a danger, threat, or aversive situation, which serves to prompt the individual to act to decrease the negative affective experience (Rosen & Schulkin, 1998). Darwin described the fear response as consisting of rapid heart beating, pupil dilation, increased perspiration, dry mouth, erection of the hair, and changes in vocal quality and facial expression (Spielberger, 1985). Within his theory of evolution, Darwin viewed fear as a trigger to arouse and mobilize an individual to deal with external dangers (Spielberger, 1985). Walter Cannon (1914) is credited with originally describing the *fight-or-flight* response to stressors, in which the emotions of fear and rage are accompanied by physiological changes that prepare the individual for flight or conflict, as necessary to face a threat. Cannon (1914) described sympathetic nervous system responses to fear and rage that are similar to those proposed by Darwin, as well as "inhibition of gastric peristalsis and secretion, and contraction of arterioles" (p.262).

In addition to tracing the sympathetic nervous system responses related to fear and anxiety, authors have also attempted to explain such emotional states from within the context of psychological theory. Freud is considered the first theorist to describe anxiety from within a psychological framework as he viewed anxiety as playing a key role in the development of neuroses (Spielberger, 1985). Freud considered anxiety to be an undesirable emotional state consisting of affective, behavioral and physiological components; which he believed arose in response to danger signals from the external environment or from internal thoughts and feelings (Spielberger, 1985). Further, Freud envisioned anxiety responses that were proportional to a potential threat in the external world as *objective anxiety*, a concept akin to *fear* (Spielberger,

1985, p.174). By contrast, anxiety responses that arose from internal, forbidden impulses were viewed as distinct, and labeled *neurotic anxiety* (Spielberger, 1985, p.174).

Freud's conceptualizations of objective anxiety and neurotic anxiety have likely influenced subsequent psychological theorists. Fear and anxiety are frequently distinguished in the literature by defining fear as resulting from the presentation of a specific threat, whereas anxiety would also involve a fear response, but may arise from a non-specific threat (Rosen & Schulkin, 1998). Many authors do not differentiate between normal fear responses and state anxiety, but do differentiate the two from pathological anxiety, a condition that may be considered akin to Freud's concept of neurotic anxiety. Pathological anxiety may be viewed as a dysfunctional state in which the individual habitually responds with exaggerated fear to a variety of specific and non-specific stimuli and these responses interfere with daily functioning (Rosen & Schulkin, 1998). Thus, pathological anxiety may manifest in the various types of anxiety disorders, and marks a consistent response to perceived threats over time.

When considering the impact of anxiety on mental and physical well-being, it is important to distinguish between trait anxiety and state anxiety. Spielberger (1985) defines state anxiety as consisting of "subjective, consciously perceived, feelings of tension, apprehension, nervousness, and worry, accompanied by or associated with activation and arousal of the autonomic nervous system" (p.176). State anxiety marks a highly unpleasant emotional state that serves to motivate the individual to make attempts to reduce or eliminate such feelings through thoughts or behaviors (Spielberger, 1985). Self-report affective scales or changes in physiological parameters may be used to measure state anxiety, and levels of state anxiety may vary over time in response to various stressors (Spielberger, 1985). While state anxiety represents a transitory emotional state, trait anxiety is viewed as relatively stable patterns of

anxiety proneness and response over time (Spielberger, 1985). Thus, trait anxiety may capture an individual's tendency to habitually experience high levels of state anxiety in response to potential stressors. Interestingly, individuals scoring high versus low in trait anxiety, do not necessarily differ in the level of state anxiety they experience when presented with perceived physical dangers, such as imminent surgery (Spielberger, Auerbach, Wadsworth, Dunn, & Taulbee, 1973).

A critical aspect of Spielberger's state-trait-process model of anxiety is that an individual will experience an anxiety reaction that is proportionate in intensity and duration to the level of perceived threat from a situation and the extent of persistence of the triggering stimuli (Spielberger, 1985). Thus, Spielberger attributes significant importance to the process of appraising a situation for the level of threat it poses to the individual. Cognitive appraisal of the level of threat posed by a situation is also the linchpin of Lazarus and Folkman's (1984) transactional model of stress. Lazarus and Folkman (1984) define psychological stress as "a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (p.19). Stress, as defined by Lazarus and Folkman (1984), differs from anxiety in that stress functions as a rubric of multiple variables and processes, and does not exist as a single variable. The concepts of cognitive appraisal and coping are integral components of the stress rubric, and will be discussed in more detail later in this review.

Anxiety related to cardiac catheterization. Individuals undergoing cardiac catheterization procedures experience elevated state anxiety periprocedurally (Bally, Campbell, Chesnick, & Tranmer, 2003; de Jong et al., 1994; De Jong-Watt & Arthur, 2004; Gallagher et al., 2010; Hamel, 2001; Heikkilä et al., 1998; McCaffrey & Taylor, 2005; Mikosch et al., 2010;

Ulvik et al., 2008; Uzun et al., 2008). Anxiety is highest during the waiting time immediately prior to cardiac catheterization (Chan & Cheung, 2003; Davis, Maguire, Haraphongse, & Schaumberger, 1994b; Heikkilä et al., 1998; Peterson, 1991), and naturally decreases after the procedure regardless of the presence or absence of supportive interventions (Argstatter, Haberbosch, & Bolay, 2006; Bally et al., 2003; Chan & Cheung, 2003; Mikosch et al., 2010; Moradipanah, Mohammadi, & Mohammadil, 2009). Several factors contribute to elevated periprocedural anxiety in this population. Gallagher et al. (2010) found that patients awaiting coronary angiography with or without PCI were most anxious if they were: 1) previously taking medication for anxiety or depression, 2) experiencing anginal symptoms, or 3) they reported a major concern related to the uncertainty of the outcome of their procedure.

Trait anxiety may be related to state anxiety responses in individuals awaiting coronary angiography. Contrary to Spielberger et al.'s (1973) study that suggested no relationship between trait anxiety levels and state anxiety prior to surgery, Uzun et al. (2008) found that trait anxiety levels above 48 on the STAI moderately predicted higher state anxiety levels on the day of coronary angiography. In the Uzun et al. (2008) study of 88 adults awaiting elective coronary angiography, length of days waiting for the procedure also predicted higher state anxiety on the day of the procedure, with patients who had waited more than seven days exhibiting the most state anxiety.

Physical symptoms themselves may contribute to anxiety during the waiting period prior to cardiac catheterization procedures. Patients who experience symptoms of angina during the waiting period report higher anxiety, as they may conceive of such symptoms as indicating an impending heart attack (De Jong-Watt & Arthur, 2004). Fear of disfigurement may also

contribute to anxiety experienced prior to cardiac catheterization, and such fear may be reinforced by cultural beliefs (Chan & Cheung, 2003).

The ethically-required process of informed consent for invasive medical procedures may unintentionally contribute to increased anxiety in pre-procedural cardiac catheterization patients (Goldberger et al., 1997). In a study by Caldwell et al. (2007), patients feared various medical complications (such as MI, CVA, hemorrhage, and reactions to the contrast dye) that were listed in an information brochure sent to them at home, including death during cardiac catheterization. Thus, the authors warned that if the informational booklet is sent too far in advance of any face-to-face pre-cardiac catheterization clinic appointment, it may inadvertently serve to increase anxiety. Individuals who received a full-disclosure consent process prior to cardiac electrophysiologic studies reported significantly more anxiety prior to the procedure and required more anxiolytics during the procedure, than individuals who received an abridged consent process (Goldberger et al., 1997).

Certain population groups demonstrate higher levels of state anxiety prior to cardiac catheterization procedures than other groups. Women tend to report higher pre-procedural state anxiety than males (Davis et al., 1994a; de Jong et al., 1994; Hamel, 2001; Heikkilä et al., 1998; Nilsson, Lindell, Eriksson, & Kellerth, 2009; Schocken et al., 1987), and younger patients (generally 45 years of age or younger) tend to report higher state anxiety than older patients (de Jong et al., 1994; Heikkilä et al., 1998; Schocken et al., 1987). Even when their trait anxiety scores do not significantly differ from that of males, females report higher state anxiety prior to cardiac catheterization (Davis et al., 1994a).

There has been some interest in whether specific coping tendencies predict one's level of state anxiety prior to cardiac catheterization procedures. De Jong and Erdman (1994) measured

anxiety, avoidant coping and use of repression defense mechanisms, and found that the habitual use of avoidant coping strategies and repression of emotions as reported in a home setting did *not* predict an individual's level of state anxiety prior to cardiac catheterization. Likewise, Davis et al. (1994b) found that self-report periprocedural anxiety was not associated with pre-existing coping styles.

Impact of Anxiety on Health in Cardiac Care

Elevated anxiety experienced prior to cardiac catheterization may negatively impact the course of the procedure and related cardiac functioning. Individuals with elevated state anxiety prior to cardiac catheterization procedures may demonstrate increased need for anxiolytic medication during the procedure (Goldberger et al., 1997). Procedures involving cardiac catheterization may require a patient to hold his or her breath during injection of the coronary arteries; and to alter physical positions, breathe deeply, and cough when indicated (Finesilver, 1980; Tremko, 1997). When in a state of high distress, individuals may become behaviorally non-adherent, and may refuse to undergo necessary procedures (Goldberger et al., 1997). Subsequently, individuals who become distressed and non-adherent during the procedure may experience increased procedure length and inaccurate intracardiac pressure measurements and oxygen saturation readings (Finesilver, 1978, 1980).

Elevated anxiety impacts the sympathetic nervous system and the hypothalamic-pituitary-adrenal axis, which may lead to increases in blood pressure, heart rate, force of heart contraction, cardiac output, and arrhythmias (Bally et al., 2003; Watkins et al., 2002; Watkins et al., 2006). In addition, high levels of anxiety may provoke myocardial ischemia in individuals with coronary artery disease (Rozanski et al., 1988). Emotional distress experienced prior to and during cardiac catheterization may lead to the release of catecholamines, which in turn may increase platelet

reactivity and contribute to the development of thrombosis and atherosclerosis (Gordon et al., 1973). The degree of physiological reactivity to stressors depends upon the level of perceived stress, and in individuals with compromised cardiovascular functioning, this physiological stress response can place further strain on the cardiovascular system (Bally et al., 2003). Individuals with elevated anxiety prior to coronary angiography may experience decreased quality of life during the waiting period for the procedure, and may have higher complication rates during and after the procedure (Mikosch et al., 2010).

Anxiety also impacts long-term outcomes for cardiac patients. Individuals who self-reported high levels of anxiety one month after myocardial infarction (MI), were more than twice as likely to experience recurrent MI or sudden cardiac death, after controlling for age and severity of coronary heart disease (Strik et al., 2003). Anxiety serves as an independent predictor of future cardiac events and increased health care consumption, and is a better predictor of these long-term cardiac outcomes than depression (Strik et al., 2003).

Interventions to Reduce Periprocedural Anxiety in Cardiac Care

Pharmacological intervention. Due to elevations in state anxiety prior to cardiac catheterization procedures, targeted interventions are warranted to help decrease this anxiety (Davis et al., 1994a; de Jong et al., 1994; McCaffrey & Taylor, 2005). One approach to managing elevated anxiety prior to cardiac catheterization is through the use of pharmacologic intervention. Pre-medication, in the form of anxiolytics, may be administered prior to cardiac catheterization procedures to reduce emotional distress. In a large-scale randomized, controlled study, Woodhead et al. (2007) found that pre-medication with oral diazepam did not increase the likelihood of adverse periprocedural cardiac complications, but it also did not significantly decrease anxiety. Similarly, one non-controlled study found that pre-medication with oral

diazepam or lorazepam during the waiting time prior to cardiac catheterization did not adversely impact oxygen saturation levels, however, 23% of those that received pre-meds did not experience significant anxiety relief (Bergeron et al., 1995). The low dosages of pre-medication offered in the Bergeron et al. (1995) study may have been low enough to avoid impacting oxygen saturation levels, but may have also been low enough to have no clinically meaningful impact on perceived anxiety. Pre-medication dosages that are high enough to assure relief from anxiety may subsequently decrease patient alertness in a way that interferes with the subsequent procedure. Thus, the use of anxiolytics during the waiting period prior to cardiac catheterization is titrated based on the need for the patient to remain alert and cooperative during the procedure (Peterson, 1991), and pre-medication alone may fail to provide adequate anxiety relief (Bergeron et al., 1995).

Psychoeducational interventions. Several researchers recommend the development of non-pharmacological interventions to reduce patient anxiety prior to and after cardiac catheterization procedures (Gallagher et al., 2010; Uzun et al., 2008). In an attempt to reduce fears prior to cardiac catheterization, medical personnel have implemented preparatory information support programs for patients to use prior to cardiac catheterization. The purpose of these educational sessions is to prepare patients for the sensory and procedural elements that will be experienced during all phases of the procedure. Interventions that provide sensory and procedural information as well as answer patient questions have led to decreased pre-procedural anxiety (Moline, 2000; Peterson, 1991), though general social support interventions (talking about patient's life, interests, or any other topic desired and answering questions) may decrease pre-procedural anxiety just as effectively (Peterson, 1991). Interventions that include videotaped modeling of cardiac catheterization-related information led to greater decreases in anxiety than

psychoeducational intervention consisting of an informational booklet (Davis et al., 1994b). An integrative review of the use of procedural, sensory-perceptual, and cognitive-behavioral education on the pre-procedural anxiety of individuals undergoing invasive procedures, including cardiac catheterization and coronary angioplasty, found that thirteen of fourteen studies reviewed reported statistically significant reductions in anxiety after the intervention, while three reported a reduction in the amount of sedatives required periprocedurally (Moline, 2000).

Relaxation-based interventions. Apart from psychoeducational approaches to reduce pre-procedural anxiety, several relaxation-based interventions have demonstrated an impact in reducing anxiety; including massage, relaxation training via biofeedback, and guided imagery. Wentworth et al. (2009) found that a twenty-minute massage therapy session led to significant decreases in pain, muscle tension, and anxiety as compared to uninterrupted rest time with standard care for individuals awaiting invasive cardiovascular procedures, including cardiac catheterization. Conversely, a twenty-minute back massage session led to reduced systolic blood pressure for individuals awaiting cardiac catheterization procedures as compared to standard care, but did not significantly impact other physiological measures related to anxiety or mood (McNamara, Burnham, Smith, & Carroll, 2003). Mikosch et al. (2010) used a form of biofeedback training to improve coordination between respiratory rates and heart rates to facilitate relaxation in adults awaiting coronary angiography. Though both the biofeedback relaxation training group and the control group experienced reduced state anxiety from pre- to post-procedure, only the biofeedback group achieved *low* to *no* anxiety post-procedure (Mikosch et al., 2010). Relaxation-based interventions may offer some benefit to individuals awaiting cardiac catheterization procedures, but the psychological and physiological outcomes of such approaches remain inconsistent across studies.

Music-based interventions. Music listening and music therapy have been used periprocedurally and perioperatively with a variety of medical populations. Several meta-analyses of the music-based intervention literature vary in regard to their results. Rudin, Kiss, Wetz, and Sottile (2007) found that music listening during gastrointestinal endoscopy reduced anxiety levels, or lowered analgesia requirements and procedure times in six randomized, controlled trials. Similarly, Tam, Wong, and Twinn (2008) conducted a meta-analysis of eight studies and found significant decreases in length of procedure and amount of sedation required for patients listening to music during colonoscopies, though they did not examine reduction in anxiety among the included studies. Nilsson (2008) completed a systematic review of 42 studies using "music interventions" perioperatively, and found that approximately half of the included studies demonstrated significant reduction in anxiety and pain. In addition to impacting pain and anxiety, Nilsson (2008) concluded that music interventions could reduce the amount of sedatives and analgesics required. In contrast to these results, Evans (2002) completed a meta-analysis of 19 studies of adult hospitalized patients and found that music listening helped reduce anxiety during periods of normal care delivery in the hospital, but that it had no impact on anxiety for patients undergoing procedures such as sigmoidoscopy, bronchoscopy, or surgery involving spinal anesthesia.

Music to address pre-procedural anxiety. One systematic review focused specifically on the use of music listening interventions to address pre-procedural anxiety in a variety of medical populations. Gillen, Biley, and Allen (2008) reviewed 12 randomized, controlled trials (RCTs) and quasi-experimental studies of patients awaiting various kinds of minimally-invasive medical procedures. All studies included in the review involved pre-recorded music listening interventions, and pre-procedural implementation of the music intervention with adults.

Consistent with the literature on cardiac catheterization, Gillen et al. (2008) found that patients experience high levels of anxiety prior to procedures, and that this anxiety is highest during the waiting period immediately prior to the procedure. Overall, music listening interventions using a variety of styles of music led to reductions in self-reported state anxiety pre-procedurally, though physiological indicators of anxiety did not demonstrate consistent variation (Gillen et al., 2008).

Music within cardiac care. Similar reports of music-based interventions moderately impacting anxiety are found within the specific domain of cardiac care. Bradt and Dileo (2009) completed a Cochrane review of music listening (n = 21) and music therapy (n = 2) RCT studies for patients with coronary heart disease, and found that music listening has a moderate effect on anxiety, but results are not consistent across studies. Eleven of the 23 RCTs included in the Bradt and Dileo (2009) review focused on cardiac procedures including cardiac catheterization, coronary angiography, and CABG. Data from these eleven studies failed to demonstrate a significant impact of music on the reduction of periprocedural anxiety, as compared to standard care. However, this lack of significant difference between music and standard care groups was most likely due to the fact that in most of these studies, anxiety was measured after completion of the cardiac procedure—a point at which anxiety tends to decrease to low levels regardless of presence or lack of intervention. Bradt and Dileo (2009) did find improved physiological measures during cardiac procedures for those receiving music-based interventions, and thus they recommend the use of music-based intervention to help alleviate anxiety prior to and during cardiac procedures.

When considering all cardiac populations involved in the Bradt and Dileo (2009) systematic review, music-based interventions led to a decrease in heart rate, systolic and diastolic blood pressure, and myocardial oxygen demand, with patient-selected music leading to larger

effect sizes, though effect sizes were inconsistent between studies. As only two out of the 23 reviewed studies related to music therapy interventions implemented by a trained music therapist, Bradt and Dileo (2009) conclude that there is insufficient evidence at present to compare music listening interventions implemented by medical personnel with interventions implemented by music therapists. Furthermore, only one of the studies involved the patient in an active process of music making, and thus Bradt and Dileo (2009) encourage music therapists to create flexible protocols to test the effectiveness of specific music therapy interventions to reduce anxiety for cardiac patients.

Music for cardiac catheterization procedures. Several studies report mixed results when using music-based interventions during the cardiac catheterization procedure itself to impact patient outcomes. Nilsson et al. (2009) used specially-composed relaxation music listening throughout the course of coronary angiography and/or PCI, and found that the music was viewed favorably by patients and staff, but that music listening did not significantly impact self-report of anxiety, insertion site pain, amount of anxiolytic and analgesic medication required, or length of procedure. As noted in previous studies, the lack of differences between music and control groups in the Nilsson et al. (2009) study may be due to the impact of music being evaluated at the conclusion of the cardiac procedure, a time point when most individuals report low to no anxiety and minimal discomfort. Bally et al. (2003) report similar results, in that listening to "self-selected" audiotapes of music via headphones before, during and after first time diagnostic coronary angiography or PCI did not lead to greater decreases in state anxiety post-procedure than standard care alone. As in Nilsson et al. (2009), state anxiety decreased post-procedurally for both groups, and music listening did not significantly impact heart rate, blood pressure, or amount of anxiolytic and analgesic medication required during the procedure (Bally et al., 2003).

During their discussion of study results, Bally et al. (2003) stated regret over not measuring perceived anxiety during the procedure itself. In contrast to the aforementioned studies, Tague (2000) found that in a sample of 18 male cardiac catheterization and pacemaker implantation patients, individuals who listened to a patient-preferred genre of sedative music via headphones during the procedure reported significantly less state anxiety on the STAI. The music therapist cued participants in the music condition to breathe slowly along with the sedative music, letting go of tension on the exhalation. Tague (2000) measured state anxiety prior to the cardiac procedure and again post-procedurally once all post-operative nursing procedures were completed in the operating suite.

Thorgaard, Henriksen, Pedersbaek, and Thomsen (2004) also used "soft" music specially-composed to create a "relaxing atmosphere" along with sedative classical music during cardiac catheterization and PCI procedures, but played the music free-field within the catheterization lab room. A majority (69%) of the patients who received the investigator-selected music reported that the presence of the music had a major positive influence on their sense of well-being during the procedure, though 24% had no opinion as to the impact of the music on their well-being (Thorgaard et al., 2004). Interestingly, none of the patients in the non-music standard care group found the sound environment to be unpleasant, whereas one patient in the music group did rate the sound environment as unpleasant (Thorgaard et al., 2004). Thorgaard et al. (2004) also found that more than half of the patients in the non-music group responded that they would *not* have liked to listen to music during the procedure, if the option were available. Since 91% of those who were randomized to the music condition perceived it as a pleasant sound environment, Thorgaard et al. (2004) concluded that as long as the music is "appropriate,"

patients may find it pleasing despite a lack of positive expectation regarding its use during cardiac procedures.

Other researchers have aimed to assess the impact of a music therapist's presence as part of the music support offered during cardiac catheterization. Argstatter, Haberbosch, and Bolay (2006) compared standard care during cardiac catheterization to a music exposition group that received investigator-selected relaxation music via headphones throughout the procedure with a music therapist accompanying during the procedure to assure patient comfort with music and ability to receive verbal instructions from medical staff. The control group and music exposition groups were compared with a third coaching group, who received a 50-minute music therapeutic coaching session on the day prior to the cardiac catheterization to provide procedural-based preparation information, music therapeutic relaxation training, and advice on stress management. On the day of the procedure, the therapist provided a brief music relaxation review, provided the same relaxation music via headphones, and provided reassurance during the entire cardiac catheterization procedure. Both music interventions led to a greater decrease in state anxiety levels from pre- to post-procedure than the control group, with the music exposition group demonstrating the greater decline. Both music interventions also led to decreases in blood pressure, with music exposition demonstrating larger decreases in blood pressure, but did not differentially impact other physiological parameters. The authors speculated that the music coaching group might have had less optimal outcomes as compared to the music exposition group, as the coaching aspect may have directed patients' attention to their symptoms or may have led to a more serious appraisal of the procedure (Argstatter et al., 2006). Neither music intervention group impacted the amount of medication received during the procedure. Argstatter et al. (2006) concluded that the music exposition group was most beneficial for reducing the state

anxiety in individuals with high levels of trait anxiety, state anxiety, and depression at baseline; whereas individuals scoring low on these measures at baseline might fare just as well with standard care.

Music used prior to cardiac catheterization may be an effective means to reduce elevated pre-procedural anxiety. Moradipanah et al. (2009) found that listening to 20-minutes of investigator-selected relaxation music via headphones led to significant decreases in anxiety, depression, and stress scores as measured by the short-form of the Depression Anxiety Stress Scales (DASS-21) when compared to 20-minutes of scheduled bed rest. Conversely, when the music intervention was repeated during the recovery period post-angiography, the music group did not differ from the non-music group. Results from Moradipanah et al. (2009) justify the specific targeting of intervention to manage pre-procedural anxiety instead of post-procedural anxiety, though other researchers counter Moradipanah et al.'s conclusions by successfully using music listening protocols to reduce heart rate, respiratory rate, and pain post-PCI procedure (Chan, 2007; Chan et al., 2006).

Consistent with results from Moradipanah et al. (2009), Hamel (2001) found that 20-minutes of investigator-selected relaxation music via headphones during the waiting period immediately prior to cardiac catheterization led to decreased state anxiety, with accompanying trends in physiological measures toward reduced physiological reactivity. In particular, Hamel (2001) found a non-significant trend toward decreased heart rate and blood pressure in the music group, while the standard care control group demonstrated a statistically significant increase in systolic blood pressure and heart rate from pre- to post-test measures. A treatment protocol combining music listening, guided imagery, and therapeutic touch from a practitioner certified in healing touch, led to significant decreases in a visual analog scale of self-reported distress, when

used immediately prior to cardiac catheterization and PCI (Krucoff et al., 2005). Krucoff et al. (2005) admitted that they were unable to discern if the demonstrated reduction in pre-procedural distress was due to any particular treatment strategy (the music, imagery, or healing touch), or if it was simply due to the presence of a caring human providing focused attention on the well-being of the patient prior to the procedure.

Importance of humanizing the periprocedural experience. Interventions that help to humanize the experience of waiting prior to cardiac catheterizations may be well-suited for addressing elevated pre-procedural anxiety. Uzun et al. (2008) concluded their correlational study of pre-procedural anxiety in coronary angiography by recommending that any intervention aimed at reducing periprocedural anxiety should include the use of active listening and supportive presence from the person offering the intervention. Other authors also recommend that patients receive an opportunity to share feelings and express concerns as well as receive psychoeducational information prior to cardiac catheterization (Chan & Cheung, 2003). The presence of a caring and concerned person to interact with and answer questions prior to the procedure appears to be a key element to providing effective anxiety-reducing intervention (Peterson, 1991).

Caldwell et al.'s (2007) grounded theory study offers some evidence that aspects of a human nature were of significance to women during the waiting period, most prominently that positive interaction with medical staff (not educational info alone) was of value in decreasing anxiety in women. The authors speculate that women may benefit from assuring planned interpersonal support, while men may fare better by focusing on technological aspects of the procedure, and that these processes can occur during the pre-catheterization clinical visit. Caldwell et al. (2007) also speculate that "Women's observed and expressed tendencies to feel

better as a result of emotional expression may reflect a preference for emotion-focused coping. It is possible that coping skills are gender mediated and may influence perceptions of risk and personal candidacy" (p. 1047).

Results from a phenomenological study of ten men who had undergone cardiac catheterization suggested that patients felt more safe when they felt they were cared for by staff, and when their personhood was acknowledged (Beckerman, Grossman, & Marquez, 1995; Lundén, Bengtson & Lundgren, 2006). The authors concluded that support and comfort from others (either staff or pre-existing social supports) before and after the procedure helped reduce stress for these individuals. Perceiving the staff to be competent and professional also helps to increase feelings of security and safety during cardiac catheterization (Lundén et al., 2006).

Coping with Stressors

Not all individuals undergoing cardiac catheterization will perceive the procedure in the same way. Various personal and contextual factors will impact the level of threat an individual perceives from the potential stressor of the cardiac catheterization procedure. *Cognitive appraisal* is the evaluative process that determines if and to what extent a person-environment transaction is judged to be a threat to the individual (Lazarus & Folkman, 1984). Thus, the appraisal process plays a key role in determining the amount of stress an individual will experience. Lazarus and Folkman (1984) also view *coping* as a process, and define it as "constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (p.141). Coping represents efforts toward an outcome, regardless of whether the outcome is ultimately beneficial for the individual or not.

Though many researchers tend to view coping as a trait, Lazarus (1999) takes opposition with this view, and instead espouses that the most effective approach to coping involves flexibility, and the ability to respond to the specific demands of a stressor. Individuals have many coping resources at their disposal, and may draw upon a constellation of coping approaches depending on the nature of the stressor and the context. Lazarus and Folkman (1980) identify two main functions of coping: efforts toward regulating emotional responses to a stressor (*emotion-focused coping*) or efforts toward altering the problematic situation itself (*problem-focused coping*). These two major categories of coping functions do not equate with actual outcomes of coping efforts themselves, and individuals commonly make use of both functions in any given stressful situation (Lazarus, 1999). Within problem-focused forms of coping, the individual may attempt to alter his or her actions or aspects of the environment to modify the problem. When using emotion-focused approaches, the individual may attempt to avoid thinking about the problem, or conversely, may attempt to reappraise the situation to facilitate adjustment (Lazarus, 1999). There may be particular situations in which individuals are more likely to use emotion-focused coping strategies, such as when the situation is appraised as being unchangeable or uncontrollable (Lazarus, 1999; Stanton & Franz, 1999; Stanton, Sullivan, & Austenfeld, 2009). Thus, when individuals are facing uncontrollable invasive medical procedures, such as cardiac catheterization, they may be more likely to use emotion-focused coping strategies.

Emotion-focused coping strategies are often assumed to be maladaptive, as they have frequently been linked with dysfunctional outcomes in the research literature. In actuality, the linking of emotion-focused coping to maladaptive functioning may be an artifact of the way the construct has been operationally defined and measured (Austenfeld & Stanton, 2004; Stanton &

Franz, 1999; Stanton et al., 2009). Emotion-focused coping is an umbrella category that encompasses a variety of efforts to approach or avoid a stressor and the emotions related to it (Stanton et al., 2009). In the research literature, the use of emotion-focused coping strategies has often become linked to depressive or anxious symptoms and neuroticism upon measurement, as the measurement tools themselves use items that are worded to contain expressions of distress or self-deprecation (Austenfeld & Stanton, 2004; Stanton et al., 2009). Researchers have subsequently attempted to create psychometrically sound measurement tools for assessing emotion-focused coping, and in particular the strategy of approaching emotions related to a stressor, that are not confounded with maladjustment outcomes (Stanton et al., 2009).

Lazarus and Folkman (1984) conceived of emotion-focused coping as including a variety of strategies aimed at avoiding distressing emotions, approaching those emotions, or re-appraising the meaning of the situation. Emotion-focused coping includes strategies such as avoidance, minimization, self-blame, re-appraisal, finding value in negative situations, selective attention, meditation, venting anger, and seeking emotional support (Lazarus & Folkman, 1984). Subsequent researchers have found it imperative to separately address the efficacy of using emotional processing and emotional expression as a means of coping, as these processes reflect particular *approach*-oriented forms of emotion-focused coping. In so doing, theorists emphasize that emotion-focused coping can be sub-divided into approach-oriented strategies or avoidance-oriented strategies, and that research involving the un-confounded measurement of emotional-approach coping supports the benefits of such a coping approach (Stanton & Franz, 1999).

Emotional-approach coping. Emotional-approach coping (EAC) may be defined as the expression, awareness, acknowledgment, and understanding of emotions as a means to cope with stress (Austenfeld & Stanton, 2004). Stanton, Kirk, Cameron, and Danoff-Burg (2000) used

factor analyses to demonstrate that coping through emotional processing and through emotional expression are distinct from factors such as problem-focused coping, avoidance, and seeking social support. Further, emotional processing and emotional expression are highly correlated with approach-oriented coping strategies rather than avoidance-oriented strategies (Stanton et al., 2000).

Being able to approach one's emotional experiences can play an important role in healthy intrapersonal and interpersonal functioning (Stanton & Franz, 1999). The extent to which EAC is adaptive for the individual depends on characteristics of the individual, attributes of the stressor itself, and aspects of the environmental context (Austenfeld & Stanton, 2004). In particular, EAC may be most effective when the stressor is perceived as being mostly uncontrollable, when the social context is emotionally receptive, and when the stressor involves interpersonal content (Austenfeld & Stanton, 2004). Emotional-approach coping may function to: 1) promote habituation to the stressor; 2) signal the individual that there is a discrepancy between goals and progress toward those goals; 3) promote cognitive reappraisal of a situation; 4) serve as an impetus for direct action; and 5) cue others in the social environment to respond (Stanton & Franz, 1999). If individuals are able to approach their challenging feelings relating to an uncontrollable stressor, such as an impending invasive medical procedure, they may undergo a process of exposure in which anxiety surrounding the situation and the level of accompanying physiological arousal gradually diminishes (Austenfeld & Stanton, 2004). As their level of distress decreases, individuals may be able to positively reappraise the situation, better tolerate the demands of the situation, and engage identified resources to cope more adaptively with the stressor (Austenfeld & Stanton, 2004). The ability to reappraise a challenging situation remains one of the most effective ways to cope with a stressful situation (Lazarus, 1999).

Impact of positive and negative affective states. Emotional processing and emotional expression are one form of approach-oriented coping that individuals may use to manage stressors. Emotional experience itself plays an important role in behavioral and physiological reactions to stress. The terms emotion, mood, and affect are used inconsistently in the literature (Pressman & Cohen, 2005). Lazarus (1999) views emotion as a superordinate system of interdependent components including motivation, appraisal, stress, emotional experience, and coping. *Affect* is generally considered to be the feelingful experience of an emotion, and may be reduced to the dimensions of positive affect and negative affect. Traditional bipolar conceptualizations of affect view positive and negative affect as mutually-exclusive, polar opposites. Recent research suggests that positive and negative affect may indeed function as polar opposites under situations of extremely high levels of either affective state, but otherwise the two co-occur at moderate levels of affect (Larsen, McGraw, & Cacioppo, 2001). Thus, it is possible for people to feel positive and negative affective states simultaneously, and this co-occurrence may be more frequent during emotionally complex situations (Larsen et al., 2001).

Research tends to focus almost exclusively on the impact of negative affect on health and well-being, while failing to adequately examine the unique role of positive affect (Fredrickson & Levenson, 1998; Versteeg et al., 2009). There is increasing evidence that positive affect impacts health independently of, and perhaps more robustly than, negative affect (Versteeg et al., 2009). This differential impact may be due in part to the fact that the neural processes underlying positive and negative affect are partially distinct (Larsen et al., 2001). For example, the left frontal cortex is activated in approach-oriented emotional behaviors, while the right frontal cortex is activated in avoidance-oriented emotional behaviors (Davidson, 1998). When discussing the literature on affective states and health, Pressman and Cohen (2005) have found it

helpful to distinguish between *trait* positive affect (a more stable part of one's disposition) and *state* positive affect (a briefly experienced emotional state).

Using multivariate regression analysis, Denollet et al. (2008) found that trait positive affect, older age, and male sex all independently predicted adverse clinical events in individuals with CAD two years post PCI, whereas negative affect did not significantly add to the predictive power of the model. Versteeg et al. (2009) evaluated adults with coronary artery disease, post-PCI and found that at 12 months after baseline measures, high trait negative affect had the strongest significant association with problems in domains of mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Low trait positive affect had a weaker, but statistically significant association with problems with self-care and usual activities, and positive affect moderated the effect of negative affect on overall health status and protected against problems with anxiety/depression (Versteeg et al., 2009). Thus, individuals with high negative and high positive affect had better overall health status than those reporting high negative affect and low positive affect, which indicates that positive affect may play a protective role for health status when negative affect is also present (Versteeg et al., 2009). High trait positive affect has a beneficial impact on various medical conditions including cardiac care, stroke, and susceptibility to cold viruses (Pressman & Cohen, 2005).

Negative affective states, when experienced in small amounts, can help prompt mobilization and action at behavioral and physiological levels to help individuals face stressors. However, prolonged or frequent activation of the cardiovascular system in response to stress can ultimately impact health, especially for those with compromised cardiovascular functioning. Research in non-human primates suggests that repeated activation of the sympathetic nervous system speeds atherosclerosis and impedes vascular responsiveness, which in turn contribute to

the development of cardiovascular disease (Fredrickson & Levenson, 1998). Conversely, state positive affect may function in-the-moment to reduce the cardiovascular reactivity associated with stress responses. Individuals who experienced or expressed state positive affect following induced negative affective states such as fear and sadness, demonstrated quicker recovery from cardiovascular activation than individuals who did not experience positive affect (Fredrickson & Levenson, 1998). Positive emotions may play a complementary role, helping the body to return to a state of homeostasis, as well as psychologically expanding the scope of responses available to the individual and promoting creative problem solving (Fredrickson, 2004; Fredrickson & Levenson, 1998).

There are several paths whereby trait or state positive affect may impact health: 1) impacting health-related behaviors and decision making; 2) impacting the autonomic nervous system, in particular the sympathetic nervous system and decreasing heart rate and blood pressure; 3) impacting the hypothalamic-pituitary-adrenal axis, with induction of positive affect leading to reduction in cortisol levels, which may subsequently impact immune functioning; or 4) impacting inflammation (Denollet et al., 2008). Optimal coping with a severe stressor may require the experiencing of positive emotions as well as the experiencing and confronting of negative emotions associated with that stressor (Larsen et al., 2001).

Summary of the Literature and Purpose Statement

Individuals facing cardiac catheterization experience elevated anxiety periprocedurally, and that anxiety is highest during the waiting time prior to the procedure. A variety of pharmacological, psychoeducational, and relaxation-based interventions have been implemented to address pre-procedural anxiety, but demonstrate varying results and do not consistently reduce perceived anxiety. Researchers recommend that supportive pre-procedural interventions should

improve patients' ability to cope with the stress of the procedure by positively impacting both physiological responses as well as cognitive-behavioral coping efforts (Bally et al., 2003). Non-pharmacological interventions aimed at reducing pre-procedural anxiety should include the presence of a supportive individual who offers active listening and an outlet for patients to express concerns (Uzun et al., 2008).

Music therapy is one non-pharmacological intervention that may promote the reduction of physiological arousal, while also offering humanizing interpersonal support. What remains to be seen is whether the combination of music engagement and therapist presence within the context of music therapy is more effective at reducing pre-procedural anxiety than focused interpersonal support alone. As Krucoff et al. (2005) indicated, researchers need to assess whether or not particular treatment strategies (such as music therapy) are required for optimally reducing pre-procedural anxiety, or whether focused social support alone is sufficient to achieve such changes.

Individuals experience increased cardiovascular reactivity in response to high levels of stress. There is rudimentary evidence that positive affective states can serve to buffer against the negative impacts of stress responses on cardiovascular functioning (Fredrickson & Levenson, 1998). Thus, individuals with compromised cardiovascular functioning can benefit from behavioral interventions that focus on enhancing positive affect, besides reducing negative affect (Denollet et al., 2008; Versteeg et al., 2009). In a pilot study of adults status-post organ transplant surgery, a single session of music therapy that promoted emotional-approach coping led to increases in positive affect and decreases in negative affect, while a session of music therapy involving active engagement in music without EAC reduced negative affect, but did not impact positive affect (Ghetti, in press). If a single session of music therapy that promotes EAC

may improve positive affect and decrease negative affect post-surgically, it may also function in a similar manner pre-procedurally. There are currently no published studies that involve the use of music therapy with EAC in cardiac populations, and none that use music therapy with EAC to address pre-procedural anxiety in any medical population.

Bradt and Dileo (2009) identified a dearth of music therapy studies involving active forms of music engagement on part of the cardiac patient, and encouraged the development of flexible research protocols for evaluating the efficacy of these approaches to reduce anxiety for cardiac patients. The purpose of this study was to examine the impact of a single-session of music therapy with emotional-approach coping immediately prior to cardiac catheterization or electrophysiological testing on selected physiological (heart rate, respiratory rate, oxygen saturation, and blood pressure) and psychological parameters (positive and negative affective states, pain, coping self-efficacy, and satisfaction with hospitalization) related to anxiety, and subsequent procedure-related outcomes (procedure length, and amount of anxiolytics and analgesics required during the procedure), as compared to emotional-approach coping without music therapy or to standard care.

Chapter 3

Method

Participants

All participants ($N = 37$) were out-patients on the cardiovascular treatment and recovery unit of a large, Midwestern teaching hospital. Twenty-four participants were male and 13 female, with ages ranging from 36 to 88 years of age; mean age was 63.6 years and median age was 67 years. Thirty-two participants were awaiting cardiac catheterization procedures while five were scheduled for electrophysiological studies. Eight participants reported previous experience of either cardiac catheterization or electrophysiological study, though this question was not posed uniformly to all participants. All participants were scheduled for heart procedures on an out-patient basis, as inpatients were excluded from the study in an attempt to reduce heterogeneity in the sample. Cardiac catheterization procedures included right and/or left heart catheterization, with or without percutaneous coronary intervention, and saphenous vein graft with left internal mammary artery. Electrophysiological studies included implants of dual-chamber implantable cardioverter-defibrillators, and various forms of radiofrequency ablation (i.e., for atrial fibrillation, for atrial flutter, or for atrial tachycardia). Procedures were either a combination of diagnostic and interventional in nature (e.g., left heart catheterization with percutaneous coronary intervention), interventional, or strictly diagnostic.

All participants signed informed consent forms following hospital policy, prior to beginning the study. Participants met inclusion criteria if they were: currently awaiting elective cardiac catheterization or electrophysiological study; able to speak and read English; cognitively oriented to person, place, and time; free from major auditory deficit; hemodynamically stable, and 18 years of age or older. The nurse Unit Coordinator confirmed that potential participants

met inclusion criteria. Regarding sampling, all individuals who met inclusion criteria and were projected to have at least a 45-minute waiting time before their heart procedure were approached to participate in this study. Of the 90 individuals who were approached for consent interviews, 59% consented to participate in the study. Figure 1 provides a flow chart of participants through all aspects of the study.

Design

This study used a randomized, pre-test/post-test control group design with two experimental groups and one standard care control group. Consented participants were randomly assigned to one of the three groups, the Music Therapy with Emotional-Approach Coping group (n = 13), the Emotional-Approach Coping group (n = 14), or the Standard Care control group (n = 10) using a computer-generated random number list. Random assignment to experimental groups was concealed from the participant and the pre/post-procedure medical staff until the commencement of treatment condition for the participant, or the conclusion of treatment condition for the pre/post-procedure unit staff. Due to the participants' awareness of receiving music or not receiving music intervention, it was not possible to fully blind the participants as to their treatment group assignment, which is a common issue in music intervention research (Bradt & Dileo, 2009; Gillen et al., 2008). However, interventional cardiologists and nurses (including those who would administer medication during the cardiac procedure) were blinded as to patient participation in the study, as well as group assignment for those enrolled in the study.

The two experimental groups were administered by the same researcher, a board-certified music therapist with several years of clinical experience within a hospital setting. Each participant received a single treatment or control session delivered in his or her private room on the cardiovascular treatment and recovery unit, during the period immediately prior to elective

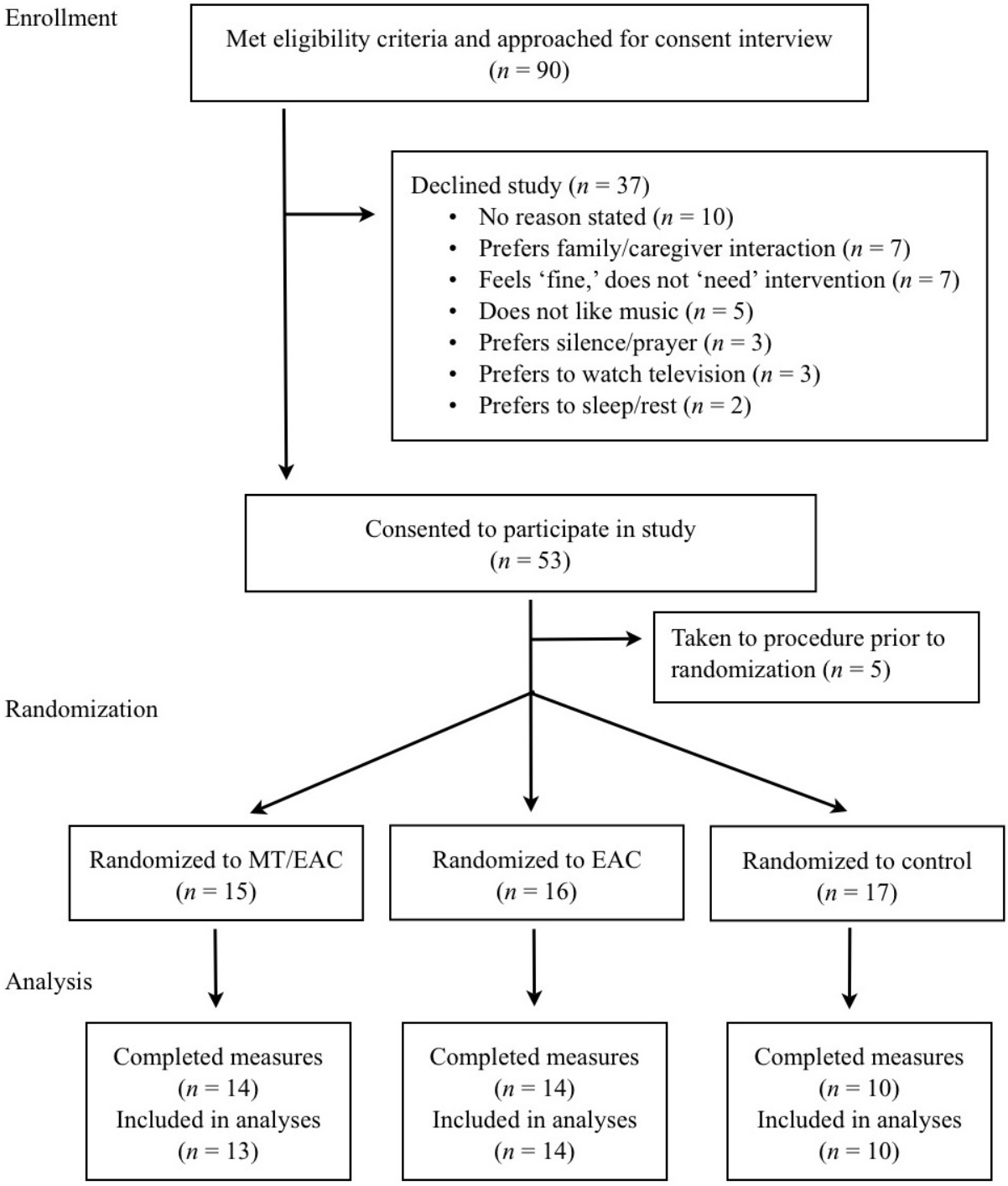

Figure 1. Flow of participants through all aspects of the study. MT/EAC = Music Therapy with Emotional-Approach Coping treatment group, EAC = Emotional-Approach Coping treatment group.

cardiac catheterization or electrophysiological study. The entire study was conducted twice-weekly, from 8:00am to 2:00pm, over a period of two months.

Procedure

After receiving approval from the hospital's Internal Review Board to commence the study, the researcher began receiving referrals from the unit coordinator for potential participants. The researcher approached potential participants to complete the informed consent interview (see Appendix A for the consent form). After consenting, participants were randomly assigned to one of the three groups using computer-generated lists of random numbers. Study participants' vitals signs (heart rate, respiratory rate, oxygen saturation, systolic blood pressure and diastolic blood pressure) were captured via continuous monitoring at 15-minute increments. The periodic sampling of vital signs before, during, and after the experimental interventions is desirable and allows for more sophisticated analytic procedures such as time series analysis (Argstatter et al., 2006). The researcher entered each participant's room immediately after the pre-test vital sign measurement was captured, to administer the pre-test psychological measures (PANAS, pain, coping self-efficacy, and patient satisfaction). Following the pre-test measures, one of the three treatment groups was administered as follows.

Music therapy with emotional-approach coping (MT/EAC). The researcher provided a single session of music therapy of approximately 30 minutes, to promote active engagement through music making with emotional-approach coping prompted through lyric/thematic discussion. Participants were encouraged to engage as actively as possible in the session, both musically and verbally, and to discuss their emotions and experiences as they were triggered by musical content or song lyric content. If the participant desired it, family caregivers present in the room were encouraged to actively engage in the session with the participant. The researcher

validated musical and verbal participant responses and prompted discussion of attitudes toward the upcoming procedure, levels of stress, coping, and coping resources.

The researcher initially engaged the participant by inquiring about his/her current mood and attitudes toward the upcoming procedure. During this preliminary verbal engagement, the researcher assessed the participant's verbalizations and behaviors to determine any potential areas of need to target during the session. The researcher assessed the participant's music preferences. The researcher then demonstrated a variety of basic rhythm instruments (paddle drum, frame drum, tambourine, ocean drum, wind chimes, cabasa, maracas, and claves) and encouraged the participant and/or caregiver to play the instruments to whatever degree they felt comfortable. The researcher used a songbook consisting of a broad range of musical styles and eras. The songbook consisted of approximately seven genres or eras of music (e.g., spiritual/religious; standards from 1930s-1940s; Broadway/musicals; traditional country; and a variety of popular, rock, and R&B songs from 1950s, 1960s, 1970s, 1980s, and 1990s to the present) with approximately 15 to 50 songs per section. The researcher offered the participant a choice of 2-3 songs from his/her preferred genre, attempting to thematically link those song choices to any issues that the participant had identified during the initial verbal interaction. Appendix D includes a list of songs included in the songbook, along with potential themes for discussion.

If the participant actively engaged (as evidenced by singing, moving to music, playing instruments, or smiling or crying in response to the music) during the first song, the researcher encouraged verbal processing related to song themes and emotional responses afterward. If the participant did not respond to the initial song, the researcher modified the options for music making, provided encouragement, and offered a new selection of songs. The researcher followed

the same process for 2-3 songs, encouraging the participant to discuss emotions and thoughts that were triggered by the music, as well as feelings related to the upcoming procedure and coping tendencies. If the participant reported minimal healthy coping strategies, the researcher drew attention to the participant's engagement in music therapy within the session and how aspects of this engagement promote healthy coping (increasing energy, shifting mood, emotional expression, social support). Any participant questions regarding the procedure itself, risks, or hospital policies were re-directed to the participant's nurse or physician.

The researcher then prompted the participant to choose from 2-3 concluding song options chosen by the researcher to reflect one of the themes discussed during the session while also providing closure. The researcher again promoted active engagement in music making. At the conclusion of the closing song, the researcher wished the participant well with the procedure, administered the post-test psychological measures, left the room, and disinfected the musical instruments.

Emotional-approach coping (EAC). The researcher provided a single session of focused social support of approximately 30 minutes, to promote emotional-approach coping via emotional processing and emotional expression. Participants were encouraged to verbally engage as much as was comfortable and to discuss their current mood, levels of stress, attitudes toward the upcoming procedure, coping tendencies, and coping resources. The researcher validated participants' verbal responses and provided supportive listening.

The researcher initially engaged a participant by inquiring about his/her current mood and attitudes toward the upcoming procedure. During this preliminary verbal engagement, the researcher assessed the participant's verbalizations and behaviors to determine any potential areas of need to discuss and support during the session. The researcher assessed the participant's

desire for caregivers to join in discussion in the session. The researcher provided supportive listening and encouraged the participant to discuss emotions, thoughts and concerns as they came to mind, as well as feelings related to the upcoming procedure and history of coping tendencies. If the participant reported minimal healthy coping strategies, the researcher drew attention to the participant's engagement in emotional expression and processing within the session and how aspects of this engagement promote healthy coping. Any participant questions regarding the procedure itself, risks, or hospital policies were re-directed to the participant's nurse or physician.

To conclude the session, the researcher summarized and validated themes and coping strategies the participant had discussed during the session and wished the participant well with the procedure. The researcher then administered the post-test psychological measures and left the room.

Participants in either the MT/EAC group or the EAC group may have experienced a brief visit from the interventional cardiologist during the course of their treatment session with the researcher. The cardiologists on the unit typically meet with patients for a few minutes prior to their procedure to answer any remaining questions. In the rare instances when this visit occurred during a study treatment session, the researcher stepped out of the room temporarily to assure patient confidentiality, and then re-commenced the treatment session immediately upon the cardiologist's departure.

Control group. The same pre-test and post-test study procedures as well as periodic vital sign monitoring applied to the control group. In place of a music therapy or verbal emotional support session, the control group participants received standard care for a 30-minute period. The researcher encouraged control group participants to continue watching television, reading, or

talking with caregivers that were present at bedside, according to participants' preferences. Standard care also consisted of any interactions with staff that happen as part of routine pre-procedural care on the unit, such as meeting briefly with the interventional cardiologist who checks in on patients prior to the procedure to answer questions. Patients might receive short visits from interventional nurses, dieticians, or various specialists during the waiting period prior to their procedure. Interactions with staff were typically a few minutes in duration, and may or may not have occurred during the 30-minute period for the control group members. Participants had no contact with the researcher during the 30-minute period of standard care.

Outcome Variables and Instrumentation

Psychological variables. Psychological variables related to anxiety and well-being included self-report of positive and negative affective states, coping self-efficacy, and patient satisfaction. Positive and negative affective states were measured by the 20-item *Positive and Negative Affect Schedule* (PANAS) (Watson, Clark, & Tellegen, 1988). The PANAS deliberately measures positive affect and negative affect independently (following the bivariate model of affect versus the bipolar model), which allows for adequate measurement of each dimension. Each of the 20 adjective mood descriptors is rated on a 5-pt Likert-type scale to indicate the way the participant feels "right now, at the present moment" from *very slightly or not at all* to *extremely*. Both scales of the PANAS have demonstrated adequate reliability, with Cronbach's α of .89 (95% CI = .88 - .90) for the positive affect scale, and .85 (95% CI = .84 - .87) for the negative affect scale (Crawford & Henry, 2004). Furthermore, the PANAS may be used with different time instructions ranging from "at the present moment" (as used in this study), to within the past year or "in general," and internal reliability of the scales is consistent across all sets of time instructions (Watson, Clark, & Tellegen, 1988). High scores on the negative affect scale of

the PANAS are an indicator of perceived distress/anxiety, whereas high positive affect indicates "pleasurable engagement with the environment" (Watson, Clark, & Carey, 1988, p. 347). Furthermore, in conjunction with other valid measures of depression, both negative affect and positive affect predict variance unique to depression, but positive affect accounts for a greater portion of the variance unique to depression than negative affect (Crawford & Henry, 2004). Recent analyses of the psychometric properties of the PANAS suggest that positive and negative affect as measured by the PANAS represent two separate, relatively independent factors (Crawford & Henry, 2004). Appendix B includes an example of the formatting of the PANAS used in this study.

Due to the lack of validated, brief short-term measures of secondary cognitive appraisal (i.e., the appraisal of one's ability to cope with a stressor) (Monroe & Kelley, 1997), a single-item Visual Analog Scale (VAS) of coping self-efficacy was used for this study. The Coping Self-Efficacy VAS consisted of a 100mm horizontal line with the question: "At present, how capable are you of successfully coping with your current level of stress? Place a vertical mark on the line below to indicate how capable you are of successfully coping with your current level of stress" and the anchors, *Not at all capable* and *Extremely capable*.

Satisfaction with hospitalization was also measured by a VAS that consisted of the question: "Overall, how satisfied are you with the care you are receiving prior to your procedure? Place a vertical mark on the line below to indicate how satisfied you are with the care you are receiving prior to your procedure" and the anchors, *Not at all satisfied* and *Very satisfied*. Appendix C includes examples of the Coping Self-Efficacy and Satisfaction with Hospitalization VAS scales used in this study.

Physiological variables. Heart rate, respiratory rate, oxygen saturation, and blood pressure (systolic and diastolic) were obtained and uploaded at 15-minute increments from vital sign monitors. Heart rate was recorded as beats per minute, and respiratory rate as breaths per minute. The researcher noted the exact time of pre-test administration, the time of treatment group initiation and termination, and the time of post-test administration; and therefore was able to discern and label consecutive vital sign data points. Data points were labeled Time 1 *pre-test* (vital sign measurement occurring immediately prior to the administration of psychological pre-tests), Time 2 *mid-treatment* (vital sign measurement occurring approximately 15 minutes into treatment), Time 3 *treatment conclusion* (vital sign measurement occurring near the end of the 30-minute treatment session), and Time 4 *post-test* (vital sign measurement occurring approximately 15 minutes after psychological post-tests).

Procedural variables. Three variables related to each participant's heart procedure were also measured: length of heart procedure in minutes, amount of a benzodiazepine (Versed®) required for conscious sedation measured in *mg*, and amount of analgesic (Fentanyl) required for conscious sedation measured in *mcg*. If participants required alternate forms of sedation (such as general anesthesia, or the use of morphine), the use of such medication was noted.

Data Analysis

Data were analyzed using PASW 18.0 statistical software package. The level of significance was set at $\alpha = .05$, consistent with the music therapy literature. To compare demographic data and pre-tests among the three groups at baseline, an analysis of variance was completed for each continuous variable, and a chi-square test for each categorical variable. Repeated measures ANOVA was used to determine the effect of time and intervention group on PANAS scores, self-report of pain, coping self-efficacy, and satisfaction with hospitalization.

Similarly, repeated measures ANOVA was used to determine the effect of time and intervention group on physiological parameters. A one-way ANOVA was used to ascertain the impact of treatment group on length of heart procedure and amount of Versed® and Fentanyl administered during the procedure.

Chapter 4

Results

Of the participants who met inclusion criteria for the study and signed informed consent forms, 72% completed all phases of the study. All fifteen of the individuals who were not able to complete all phases of the study were taken to their heart procedure prior to completing study measures. Figure 1 illustrates the flow of participants through each stage of the study. One participant was excluded from analysis in the study due to receiving a benzodiazepine prior to the conclusion of the study procedures, which thereafter rendered him ineligible for the study (due to compromised ability to complete study measures). A second individual completed all aspects of the treatment conditions and pre/post-test measures, though ultimately his heart procedure was canceled due to lab results. All available study data for this second participant were used in the analyses.

There were occasional occurrences of missing data for physiological parameters across all three treatment groups. Such missing data were most often the result of a temporary malfunction in vital sign monitoring equipment, or were due to the patient getting out of bed to use the toilet (e.g., during the post-test period). Results of Little's MCAR (missing completely at random) test suggest that data were missing completely at random, χ^2 (144) = 153.20, p = .284, and listwise deletion of missing values was appropriate[1]. Thus, the occurrences of missing data in physiological parameters were treated with listwise deletion during repeated measures analysis of variance, which resulted in smaller sample sizes for these analyses.

Groups were evaluated for differences in continuous and categorical variables at pre-test. A series of one-way ANOVAs was used to assess differences between treatment groups at pre-

[1] Alternatively, data that are MCAR may be treated with single EM imputation of missing values. Repeated measures ANOVAs were run with a dataset that underwent single EM imputation, and results did not differ substantially from results of the analyses using unimputed data.

test on all five psychological variables and all five physiological variables. Table 1 includes results from the pre-test analysis of psychological and physiological variables. There were no statistically significant differences between groups on any of the psychological or physiological variables at pre-test. Groups were evaluated for differences in distribution of gender, as the MT/EAC group had three women, the control group had two and the EAC group had a similar level of male and female participants. Group differences for gender were evaluated, with groups displaying no significant differences in gender, Pearson χ^2 (2, N = 37) = 4.81, p = .090. As the literature suggests that younger patients may experience higher anxiety pre-procedurally, group differences for mean age were evaluated, with groups displaying no significant differences in age, F(2, 34) = 2.19, p = .127.

Table 1

Differences Between Groups at Pre-test for Psychological and Physiological Variables

	df	*F*	*p*	η^2
Positive PANAS	(2, 34)	.77	.471	.04
Negative PANAS	(2, 34)	2.59	.089	.13
Pain	(2, 34)	2.77	.077	.14
Coping Self-Efficacy	(2, 34)	.44	.648	.03
Hospital Satisfaction	(2, 34)	.09	.912	.00
Heart Rate	(2, 34)	.29	.746	.02
Respiratory Rate	(2, 32)	1.61	.216	.09
Oxygen Saturation	(2, 33)	.29	.753	.02
Systolic Blood Pressure	(2, 34)	.15	.865	.01
Diastolic Blood Pressure	(2, 34)	.16	.856	.01

Psychological Variables

A one-way repeated measures ANOVA with time as the within-subjects factor (time 1 = pre-test; time 2 = post-test) and treatment group as the between-subjects factor, was conducted for each of the psychological variables. Means and standard deviations for each of the pre-test/post-test psychological variables are included in Table 2. The age variable was significantly correlated with the pain and negative PANAS variables as well as the pre-test of the coping self-efficacy variable, thus it was initially included as a covariate in the repeated measures ANOVAs. However, as the covariate of age was non-significant when added to the model, it was subsequently removed. The dichotomous variable of gender was then treated as a covariate, but as it failed to achieve significance when added to the model, it was removed and the results for all psychological variables below reflect a model without covariates.

Table 2

Means and Standard Deviations for Pre-test/Post-test Psychological Variables

	MT/EAC		EAC		CONTROL	
	Pre	Post	Pre	Post	Pre	Post
Variable	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*
Positive Affect	28.54 (6.42)	33.46 (7.39)	31.43 (6.37)	32.29 (7.26)	30.60 (5.48)	30.50 (7.85)
Negative Affect	15.62 (5.89)	12.69 (4.25)	19.93 (8.33)	17.86 (7.85)	14.30 (3.43)	14.30 (3.62)
Pain	.69 (1.32)	.54 (1.13)	2.14 (2.54)	1.93 (2.64)	.60 (1.26)	1.15 (1.89)
Coping Self-Efficacy	86.31 (19.69)	88.08 (18.65)	79.86 (21.49)	87.29 (12.55)	84.70 (10.79)	83.10 (13.51)
Hospital Satisfaction	91.38 (14.71)	93.00 (13.04)	88.93 (22.59)	89.29 (25.47)	91.60 (11.94)	93.90 (7.42)

Note. MT/EAC = Music Therapy with Emotional-Approach Coping treatment group; EAC = Emotional-Approach Coping treatment group.

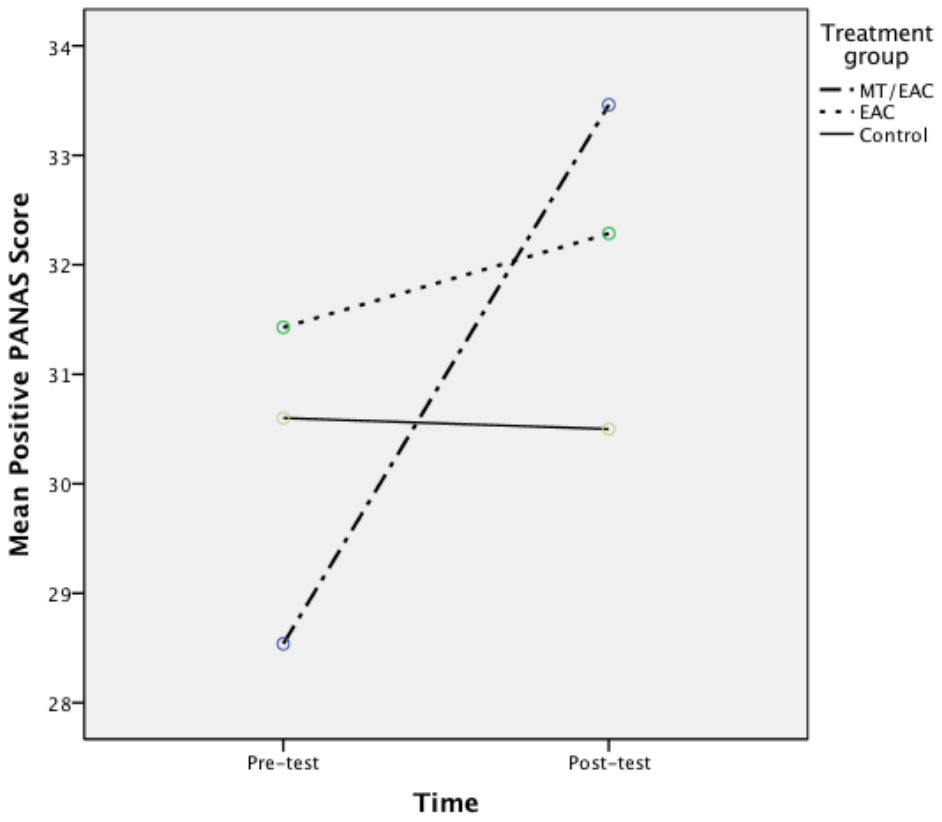

Figure 2. Means for the Positive Affect Scale of the PANAS at Pre-test and at Post-test. MT/EAC = Music Therapy with Emotional-Approach Coping treatment group, EAC = Emotional-Approach Coping treatment group.

A repeated measures ANOVA for the positive affect scale of the PANAS indicated a statistically significant effect for time, Wilks's $\Lambda = .82$, $F(1, 34) = 7.37$, $p = .010$, multivariate $\eta^2 = .18$; and a statistically significant effect for group, Wilks's $\Lambda = .78$, $F(2, 34) = 4.92$, $p = .013$, multivariate $\eta^2 = .22$. Means for the positive affect scale of the PANAS are included in Figure 2. Follow-up comparisons using paired samples *t*-tests indicated that the MT/EAC treatment group demonstrated a statistically significant increase in positive affect from pre- to post-test, $t(12) = -3.26$, $p = .007$, with a 95% confidence interval for the mean difference from pre- to post-tests of -8.21 to -1.64. The EAC group, $t(13) = -1.01$, $p = .328$, and control group, $t(9) = .09$, $p = .931$,

did not differ significantly in positive affect from pre- to post-test. Thus, participants receiving music therapy demonstrated a significant increase in positive affect from pre- to post-test, whereas participants in the EAC and control groups did not.

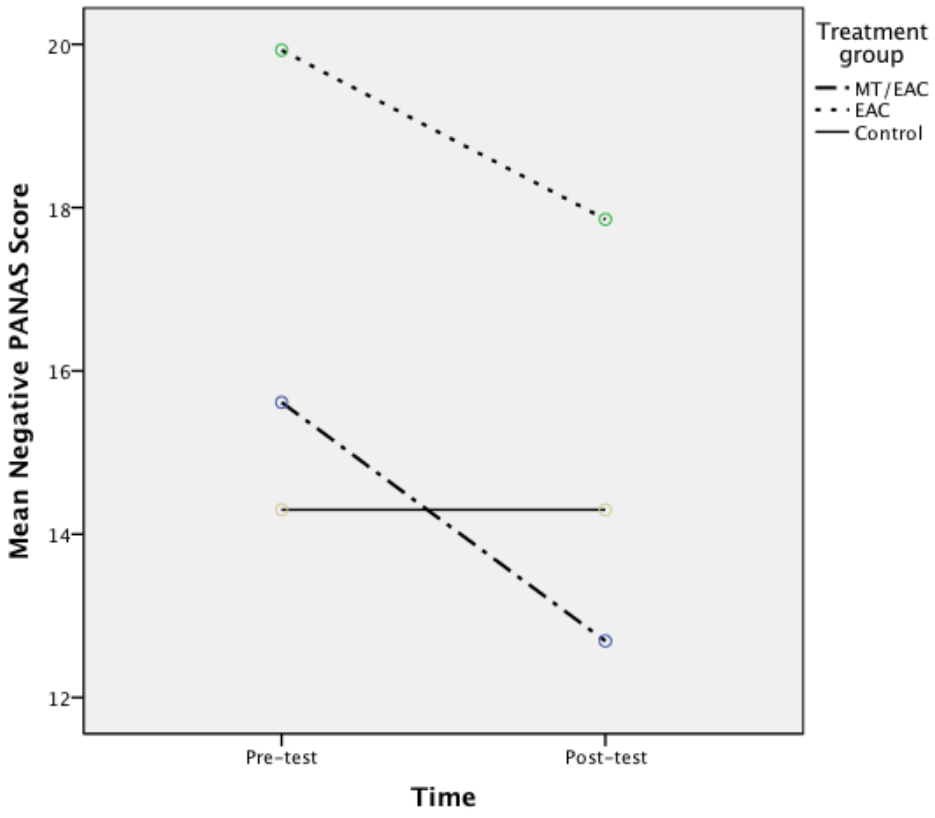

Figure 3. Means for the Negative Affect Scale of the PANAS at Pre-test and at Post-test. MT/EAC = Music Therapy with Emotional-Approach Coping treatment group, EAC = Emotional-Approach Coping treatment group.

A repeated measures ANOVA for the negative affect scale of the PANAS indicated a statistically significant time effect, Wilks's $\Lambda = .88$, $F(1, 34) = 4.63$, $p = .039$, multivariate $\eta^2 = .12$; but a non-significant group effect, Wilks's $\Lambda = .94$, $F(2, 34) = 1.15$, $p = .329$, multivariate $\eta^2 = .06$. The statistically significant effect for time suggests a general decrease in negative affect for participants from pre- to post-test. Figure 3 displays means for the negative affect scale of the

PANAS. Follow-up comparisons using paired samples *t*-tests indicated that although the MT/EAC and EAC groups demonstrated a trend toward decreased negative affect from pre- to post-test, these decreases were not statistically significant for the MT/EAC group, $t(12) = 1.79$, $p = .099$; the EAC group, $t(13) = 1.93$, $p = .075$; or the control group, $t(9) = .00$, $p = 1.00$.

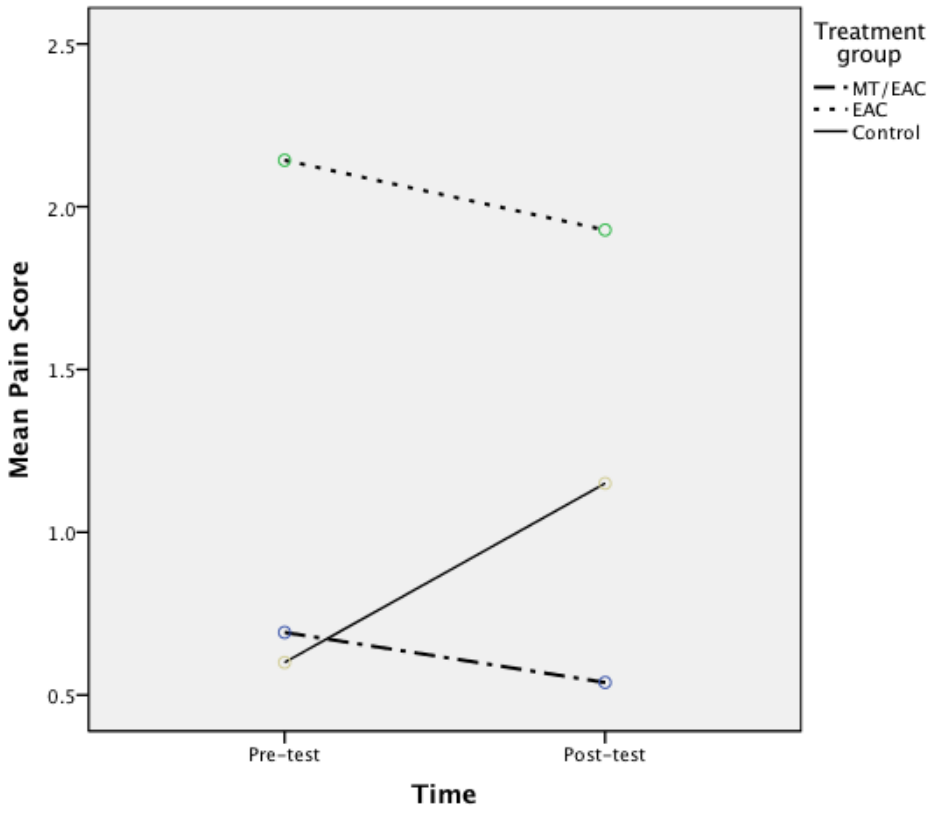

Figure 4. Means for Self-Report of Pain at Pre-test and at Post-test. MT/EAC = Music Therapy with Emotional-Approach Coping treatment group, EAC = Emotional-Approach Coping treatment group.

A repeated measures ANOVA for self-report of pain indicated no effect for time, Wilks's $\Lambda = .99$, $F(1, 34) = .18$, $p = .675$, multivariate $\eta^2 = .005$; and no effect for group, Wilks's $\Lambda = .86$, $F(2, 34) = 2.67$, $p = .084$, multivariate $\eta^2 = .14$. Means for self-report of pain are included in Figure 4. Similarly, a repeated measures ANOVA for coping self-efficacy indicated no effect for

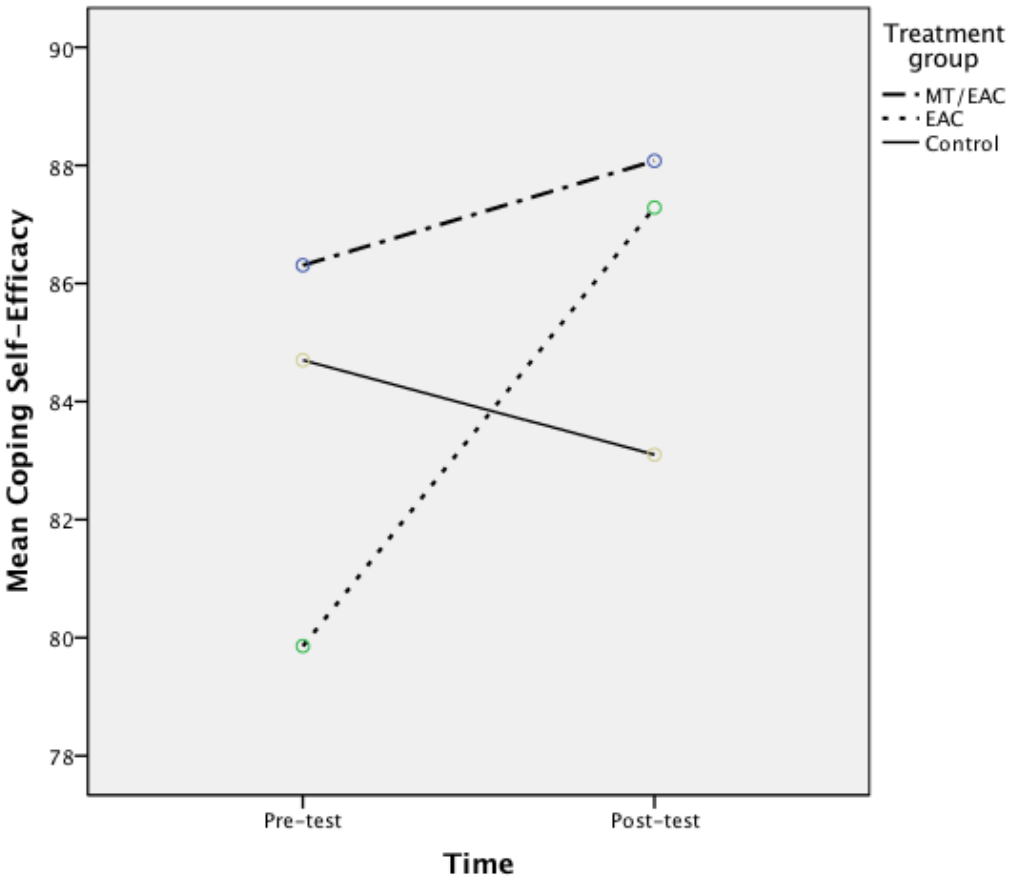

Figure 5. Means for Coping Self-Efficacy at Pre-test and at Post-test. MT/EAC = Music Therapy with Emotional-Approach Coping treatment group, EAC = Emotional-Approach Coping treatment group.

time, Wilks's $\Lambda = .94$, $F(1, 34) = 2.19$, $p = .148$, multivariate $\eta^2 = .06$; and no effect for group, Wilks's $\Lambda = .88$, $F(2, 34) = 2.39$, $p = .107$, multivariate $\eta^2 = .12$. Means for coping self-efficacy are included in Figure 5. A repeated measures ANOVA for satisfaction with care during current hospitalization indicated no effect for time, Wilks's $\Lambda = .92$, $F(1, 34) = 2.79$, $p = .104$, multivariate $\eta^2 = .08$; and no effect for group, Wilks's $\Lambda = .97$, $F(2, 34) = .45$, $p = .642$, multivariate $\eta^2 = .03$. Means for satisfaction with care received during current hospitalization are included in Figure 6.

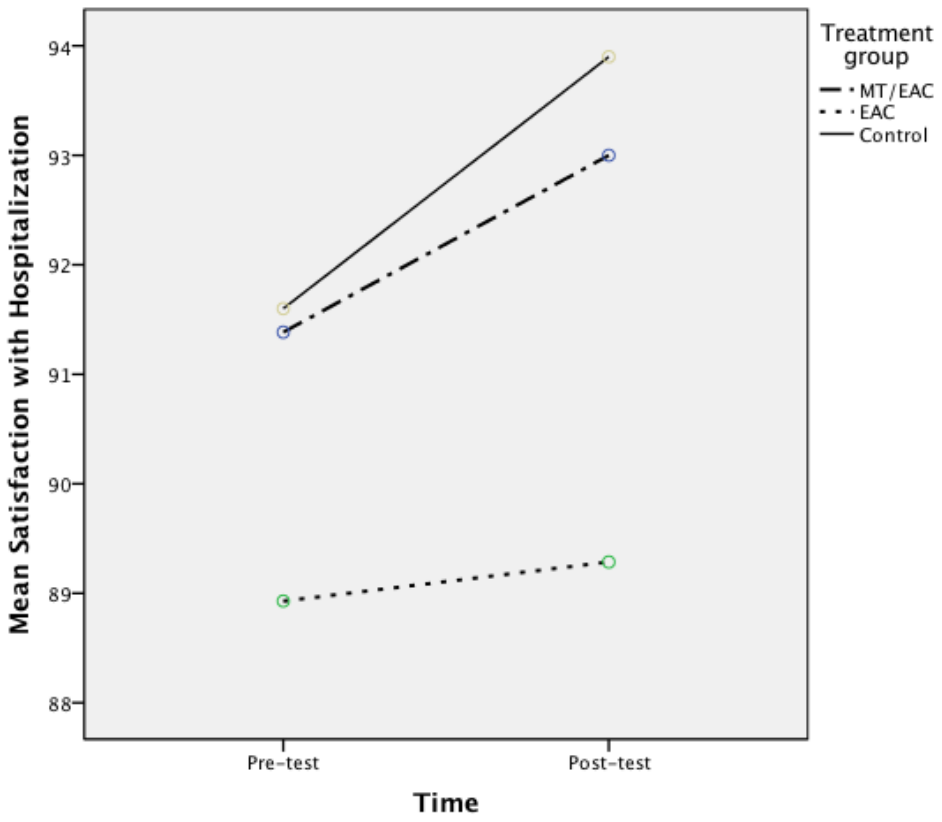

Figure 6. Means for Satisfaction with Care During Hospitalization at Pre-test and at Post-test. MT/EAC = Music Therapy with Emotional-Approach Coping treatment group, EAC = Emotional-Approach Coping treatment group.

Physiological Variables

A one-way repeated measures ANOVA with time as the within-subjects factor (with four levels) and treatment group as the between-subjects factor, was conducted for each of the physiological variables. Means and standard deviations for each of the four time points per physiological variable are included in Table 3. A repeated measures ANOVA for heart rate indicated no effect for time, Wilks's $\Lambda = .93$, $F(3, 30) = .72$, $p = .549$, multivariate $\eta^2 = .07$; and no effect for group, Wilks's $\Lambda = .89$, $F(6, 60) = .59$, $p = .737$, multivariate $\eta^2 = .06$. Figure 7 depicts means for heart rate across all four time points. Similarly, a repeated measures ANOVA

Table 3

Means and Standard Deviations for Physiological Variables

	MT/EAC			EAC			Control		
Variable	*N*	*M (SD)*	95% CI	*N*	*M (SD)*	95% CI	*N*	*M (SD)*	95% CI
Heart Rate									
Time 1	12	64.75 (15.74)	[54.82, 74.69]	13	69.77 (12.09)	[60.22, 79.31]	10	69.70 (22.74)	[58.82, 80.58]
Time 2	12	65.58 (17.62)	[55.83, 75.34]	13	70.54 (12.77)	[61.16, 79.91]	10	68.50 (19.55)	[57.81, 79.19]
Time 3	12	67.42 (16.52)	[57.88, 76.95]	13	71.54 (12.51)	[62.38, 80.69]	10	68.90 (19.82)	[58.46, 79.34]
Time 4	12	66.92 (19.46)	[57.07, 76.77]	13	69.77 (12.34)	[60.31, 79.23]	10	69.50 (18.22)	[58.71, 80.29]
Respiratory Rate									
Time 1	9	19.89 (3.33)	[17.18, 22.59]	13	17.46 (4.59)	[15.21, 19.71]	10	19.10 (3.57)	[16.53, 21.67]
Time 2	9	18.56 (4.88)	[15.90, 21.21]	13	17.54 (2.85)	[15.33, 19.75]	10	17.60 (4.12)	[15.08, 20.12]
Time 3	9	19.67 (3.67)	[16.96, 22.37]	13	17.00 (4.34)	[14.75, 19.25]	10	17.30 (3.68)	[14.74, 19.86]
Time 4	9	18.89 (4.01)	[16.36, 21.42]	13	16.69 (3.68)	[14.59, 18.79]	10	16.60 (3.44)	[14.20, 18.99]
Oxygen Saturation									
Time 1	11	96.91 (2.07)	[95.54, 98.28]	13	96.69 (2.63)	[95.43, 97.95]	10	97.50 (1.78)	[96.06, 98.94]
Time 2	11	96.27 (3.13)	[94.80, 97.75]	13	97.46 (2.22)	[96.12, 98.82]	10	97.50 (1.51)	[95.95, 99.05]
Time 3	11	96.45 (3.86)	[94.83, 98.08]	13	97.62 (1.89)	[96.12, 99.12]	10	97.80 (1.62)	[96.10, 99.50]
Time 4	11	96.27 (3.58)	[94.67, 97.88]	13	97.08 (2.33)	[95.59, 98.56]	10	97.90 (1.45)	[96.21, 99.59]
Systolic BP									
Time 1	11	121.91 (15.99)	[111.15, 132.67]	12	122.08 (16.95)	[111.78, 132.39]	9	122.00 (19.72)	[110.10, 133.89]
Time 2	11	129.00 (17.16)	[116.02, 141.98]	12	125.75 (16.13)	[113.32, 138.18]	9	125.56 (29.69)	[111.20, 139.91]
Time 3	11	132.91 (14.95)	[121.53, 144.28]	12	127.75 (15.20)	[116.86, 138.64]	9	128.22 (25.23)	[115.65, 140.79]
Time 4	11	129.36 (17.01)	[117.74, 140.98]	12	124.42 (16.79)	[113.29, 135.54]	9	128.67 (23.21)	[115.82, 141.52]
Diastolic BP									
Time 1	11	63.82 (14.67)	[55.36, 72.28]	12	62.58 (15.40)	[54.48, 70.69]	9	63.78 (9.35)	[54.42, 73.13]
Time 2	11	65.55 (12.93)	[55.18, 75.91]	12	71.50 (20.24)	[61.57, 81.43]	9	67.22 (15.89)	[55.76, 78.68]
Time 3	11	66.09 (11.61)	[58.40, 73.78]	12	69.50 (15.30)	[62.14, 76.86]	9	60.33 (8.57)	[51.83, 68.84]
Time 4	11	68.55 (16.87)	[58.71, 78.38]	12	71.50 (15.01)	[62.08, 80.92]	9	65.56 (16.04)	[54.68, 76.43]

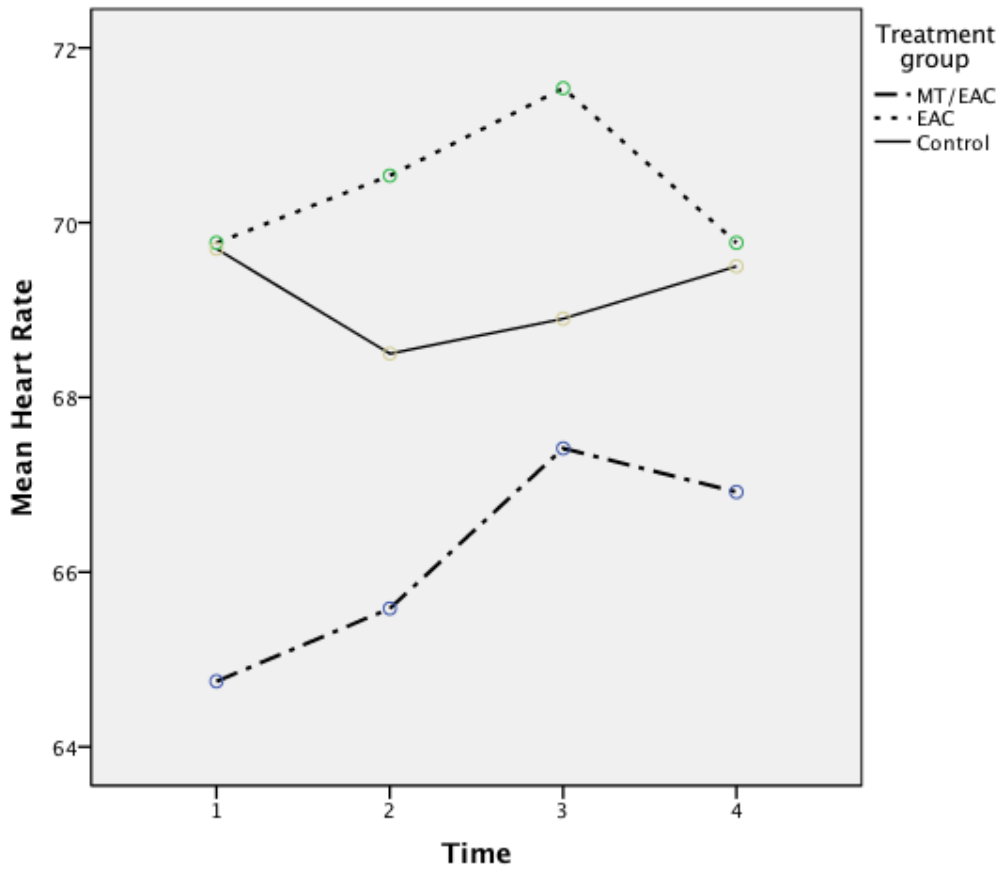

Figure 7. Means for Heart Rate measurements at Time 1 (pre-test), Time 2 (15 minutes into treatment period), Time 3 (conclusion of 30 minute treatment period), and Time 4 (post-test). All time points are 15 minutes apart. MT/EAC = Music Therapy with Emotional-Approach Coping treatment group, EAC = Emotional-Approach Coping treatment group.

for respiratory rate indicated no effect for time, Wilks's $\Lambda = .93$, $F(3, 27) = .73$, $p = .544$, multivariate $\eta^2 = .08$; and no effect for group, Wilks's $\Lambda = .95$, $F(6, 54) = .25$, $p = .957$, multivariate $\eta^2 = .03$. Mean respiratory rate across all four time points is illustrated in Figure 8.

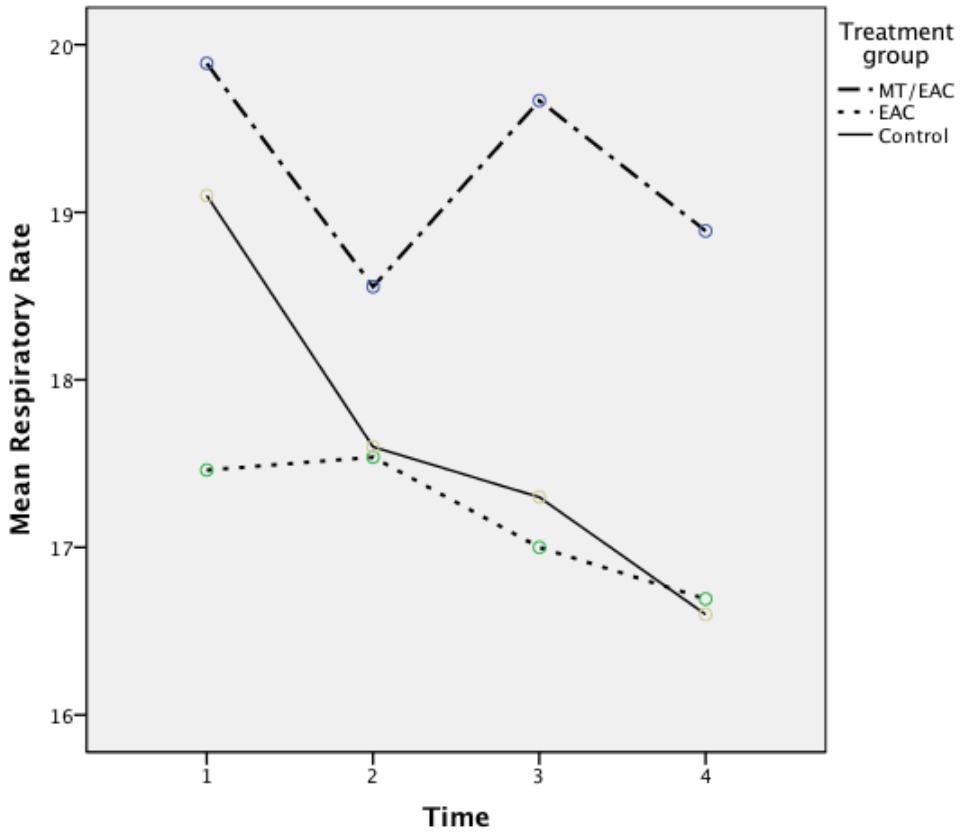

Figure 8. Mean Respiratory Rate measurements at Time 1 (pre-test), Time 2 (15 minutes into treatment period), Time 3 (conclusion of 30 minute treatment period), and Time 4 (post-test). All time points are 15 minutes apart. MT/EAC = Music Therapy with Emotional-Approach Coping treatment group, EAC = Emotional-Approach Coping treatment group.

The assumption of sphericity was not met for oxygen saturation, as Mauchly's Test of Sphericity was statistically significant, χ^2 (5) = 16.23, p = .006. Thus, there were significant differences between variances and it was necessary to correct degrees of freedom using Huynh-Feldt estimates of sphericity (ε = .84). Oxygen saturation did not differ significantly across time, F(2.51, 77.72) = .279, p = .805, partial η^2 = .009; or by group, F(5.01, 77.72) = .974, p = .439, partial η^2 = .059. Figure 9 depicts mean oxygen saturation across all four time points.

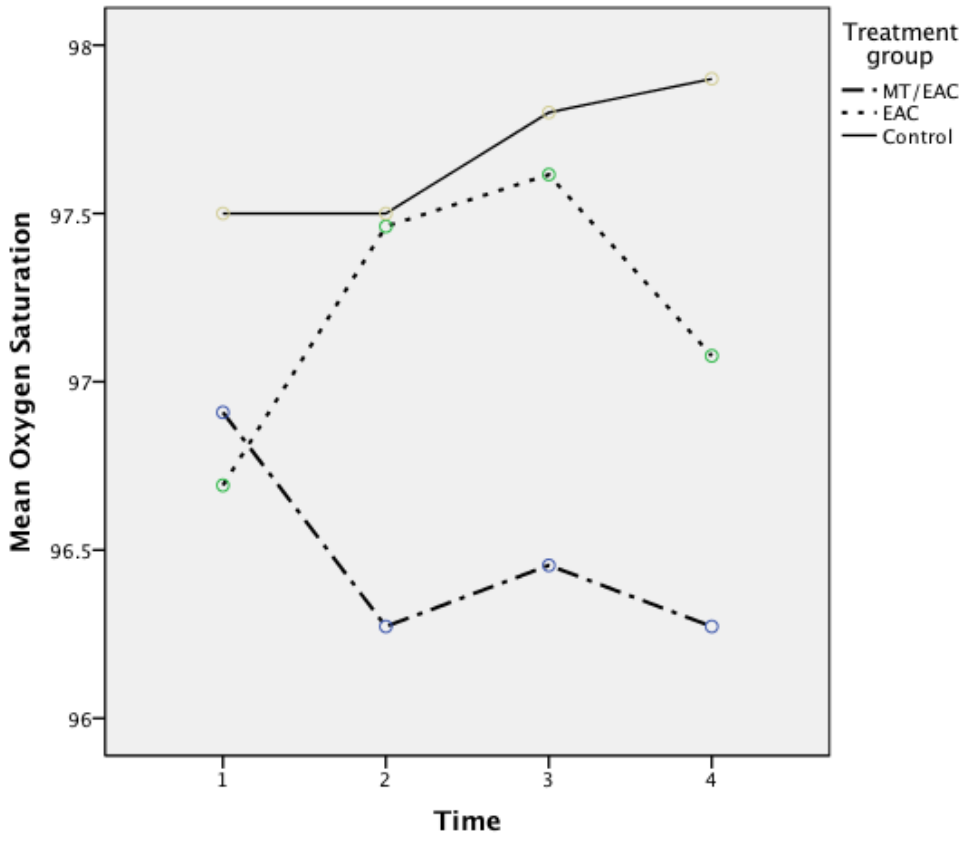

Figure 9. Mean Oxygen Saturation measurements at Time 1 (pre-test), Time 2 (15 minutes into treatment period), Time 3 (conclusion of 30 minute treatment period), and Time 4 (post-test). All time points are 15 minutes apart. MT/EAC = Music Therapy with Emotional-Approach Coping treatment group, EAC = Emotional-Approach Coping treatment group.

Mauchly's test indicated a violation of the assumption of sphericity for systolic blood pressure, χ^2 (5) = 12.02, p = .03, and degrees of freedom were adjusted using Huynh-Feldt estimates of sphericity (ε = .92). Systolic blood pressure varied significantly across time points for the entire sample, F(2.77, 80.27) = 5.47, p = .002, partial η^2 = .16; but not by group, F(5.54, 80.27) = .468, p = .817, partial η^2 = .03. Figure 10 illustrates mean systolic blood pressure across all four time points. Follow-up polynomial contrasts indicated a significant quadratic effect for time, F(1, 29) = 4.61, p = .040, partial η^2 = .14, suggesting that there was an initial increase in

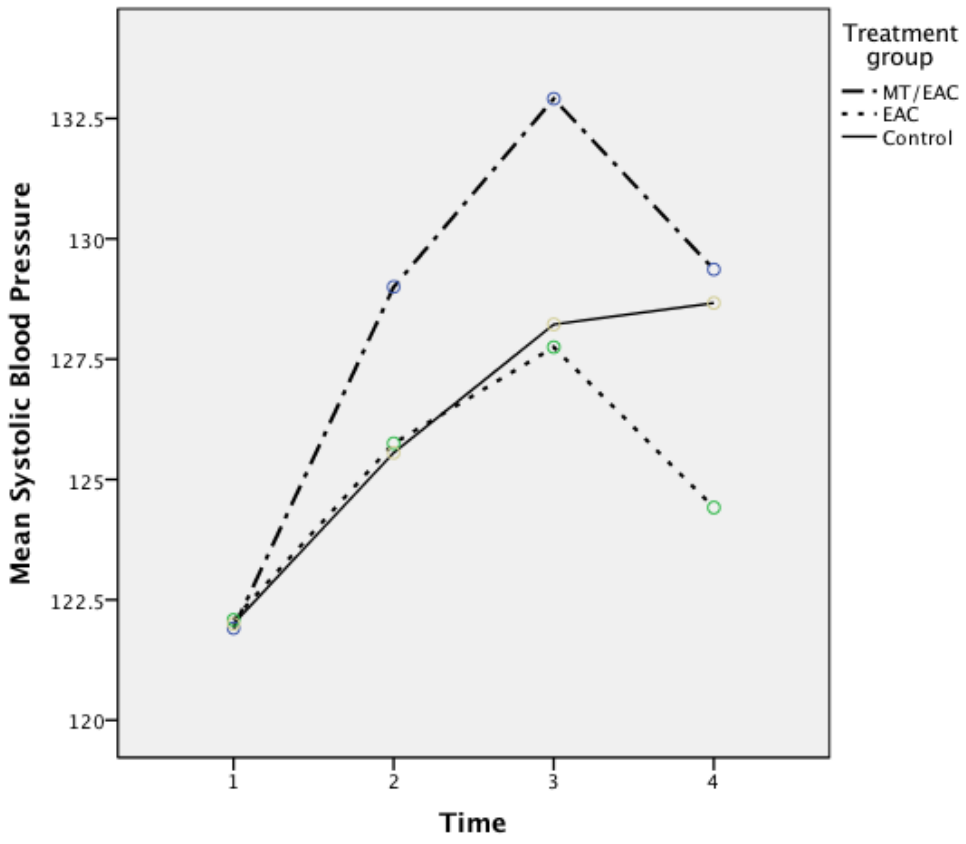

Figure 10. Mean Systolic Blood Pressure measurements at Time 1 (pre-test), Time 2 (15 minutes into treatment period), Time 3 (conclusion of 30 minute treatment period), and Time 4 (post-test). All time points are 15 minutes apart. MT/EAC = Music Therapy with Emotional-Approach Coping treatment group, EAC = Emotional-Approach Coping treatment group.

systolic BP across time points, which fell or stabilized after the third time point. Follow-up paired samples *t*-tests indicated statistically significant increases in systolic BP for the MT/EAC group from Time 1 to Time 3, $t(12) = -2.95$, $p = .012$, as well as from Time 1 to Time 4, $t(12) = -2.31$, $p = .040$. Using a Bonferroni correction for two comparisons (Time 1 to Time 3, and Time 1 to Time 4), with $\alpha = .025$, the increase in systolic BP from Time 1 to Time 3 for the MT/EAC group retains statistical significance ($p = .012$), while the increase from Time 1 to Time 4 does not ($p = .040$). The EAC and control groups did not demonstrate any statistically significant changes between any of the four time points.

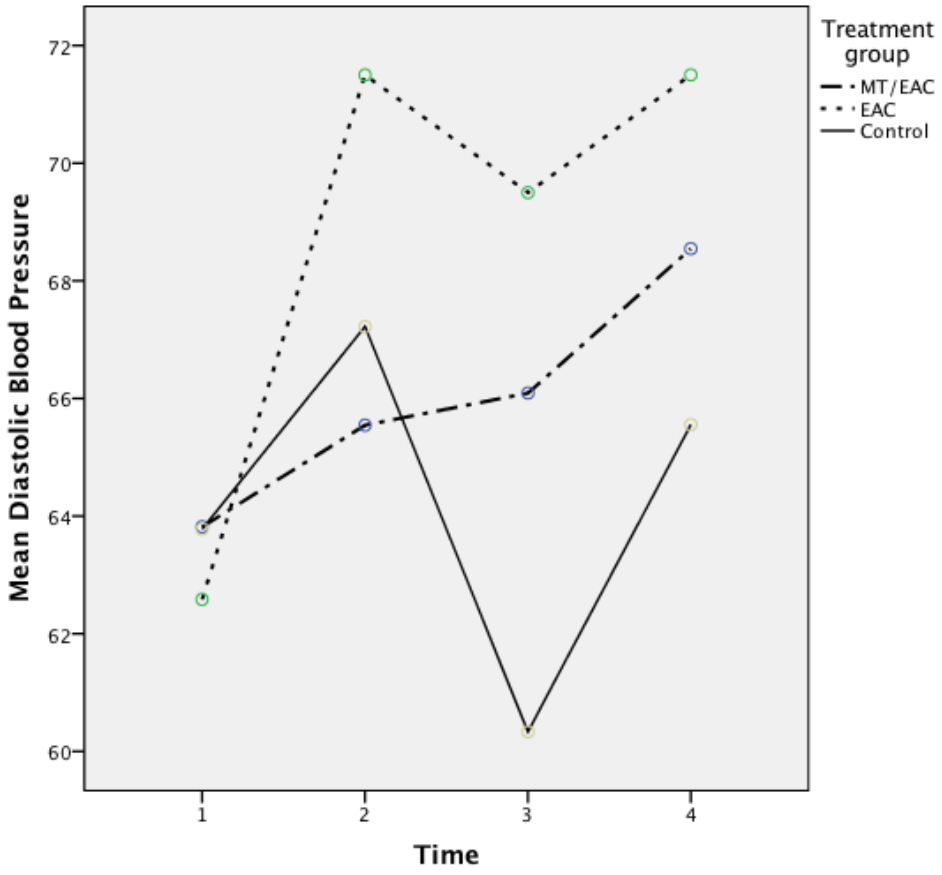

Figure 11. Mean Diastolic Blood Pressure measurements at Time 1 (pre-test), Time 2 (15 minutes into treatment period), Time 3 (conclusion of 30 minute treatment period), and Time 4 (post-test). All time points are 15 minutes apart. MT/EAC = Music Therapy with Emotional-Approach Coping treatment group, EAC = Emotional-Approach Coping treatment group.

Diastolic blood pressure also varied significantly across time points for the entire sample, Wilks's $\Lambda = .66$, $F(3, 27) = 4.74$, $p = .009$, multivariate $\eta^2 = .35$; but not by group, Wilks's $\Lambda = .72$, $F(6, 54) = 1.61$, $p = .164$, multivariate $\eta^2 = .15$. Follow-up polynomial contrasts indicated a significant cubic effect for time, $F(1, 29) = 5.69$, $p = .024$, partial $\eta^2 = .16$; though neither linear, $F(1, 29) = 3.96$, $p = .056$, partial $\eta^2 = .12$, nor quadratic effect was significant, $F(1, 29) = .44$, $p = .511$, partial $\eta^2 = .02$. The lack of significant linear or quadratic effects casts into doubt a possible cubic effect. Figure 11 depicts mean diastolic blood pressure across all four time points.

Follow-up paired samples *t*-tests indicated a statistically significant increase in diastolic BP for the EAC group from Time 1 to Time 4, $t(11) = -4.75$, $p = .001$. Using a Bonferroni correction for two comparisons (Time 1 to Time 3, and Time 1 to Time 4), with $\alpha = .025$, the increase in diastolic BP from Time 1 to Time 4 for the EAC group retains statistical significance ($p = .001$). The MT/EAC and control groups did not demonstrate any statistically significant changes between any of the four time points.

Procedural Variables

Means and standard deviations for procedural variables (length of procedure and amount of benzodiazepine [Versed®] and analgesic [Fentanyl] required for conscious sedation) are provided in Table 4. Though the means display a trend toward a shorter procedure length for the

Table 4

Means and Standard Deviations for Procedural Variables

	MT/EAC			EAC			Control		
	n	*M (SD)*	95% CI	*n*	*MD (SD)*	95% CI	*n*	*M (SD)*	95% CI
Procedure length	12	63.00 (41.61)	[36.56, 89.44]	14	89.21 (82.79)	[41.41, 137.02]	10	109.30 (68.69)	[60.16, 158.44]
Versed (mg)	11	2.41 (1.07)	[1.69, 3.13]	9	2.89 (1.54)	[1.71, 4.07]	9	2.83 (1.00)	[2.06, 3.60]
Fentanyl (mcg)	11	79.54 (65.02)	[35.87, 123.22]	9	75.00 (54.49)	[33.12, 116.88]	9	80.55 (34.86)	[53.76, 107.35]

MT/EAC group, differences among means were non-significant, $F(2, 33) = 1.31$, $p = .285$, partial $\eta^2 = .07$. Participants who received anxiolytic and analgesic medication other than the typical standard protocol of Versed® plus Fentanyl ($n = 8$) were removed from the analysis of amount of sedation medication administered. Though the MT/EAC group received slightly less Versed® during the procedure, the differences between groups were not statistically significant,

$F(2, 26) = .478$, $p = .625$, $\eta^2 = .04$. Similarly, the EAC group received less analgesic (Fentanyl) during their procedure, but this difference was not statistically significant, $F(2, 26) = .03$, $p = .973$, $\eta^2 = .002$.

Additional Analyses

Several statistical analyses were conducted to compare the data from this study with results from previous studies of individuals undergoing cardiac catheterization. As previous research suggests that women demonstrate higher anxiety and fear prior to cardiac catheterization procedures than men, pre-test negative affect levels were compared by gender for participants in the current study. An independent samples *t*-test suggested no difference in pre-test negative PANAS between genders, $t(35) = -.474$, $p = .638$. Thus, women in the current study did *not* demonstrate higher levels of negative affect than males at pre-test. Previous literature also suggests that individuals with higher levels of anxiety may require higher levels of anxiolytics during the procedure. However, individuals in the current study reported rather low levels of negative affect on the PANAS, with a pre-test mean score of 16.89 ($SD = 6.75$) across participants roughly indicating the presence of "a little" negative affect in the sample. In fact, all but three participants demonstrated pre-test scores in the range of "a little" to no negative affect. As there were only three participants who scored in the "moderate" range of negative affect at pre-test, a statistical analysis of the impact of high negative affect on anxiolytic consumption was not appropriate. When comparing current study results to a normative sample based on 1,003 adults from the general population, mean level of pre-test negative affect (16.89) in the current study ranks at the 69th percentile of the normative sample (Crawford & Henry, 2004). Such a percentile rank suggests that pre-test negative affect levels were slightly higher than the mean of a normative sample, but this rank would not be considered highly elevated.

Chapter 5

Discussion

This study supports the use of music therapy with an emphasis on emotional-approach coping to improve positive affect in adults awaiting elective cardiac catheterization and electrophysiological study. Statistically significant improvements in positive affect were seen after a single session of music therapy lasting 30-minutes in length. Conversely, participants who received a talk-based emphasis on emotional-approach coping or standard care did not demonstrate significant improvements in positive affect. There was a significant overall decrease in negative affect for all participants in the study, regardless of group membership. Thus, neither the MT/EAC nor the EAC group achieved a significantly greater decrease in negative affect than the control group. There was no systematic alteration in physiological parameters for participants in the study, and procedural outcomes were not significantly different among groups.

Psychological Variables

The results regarding positive affect are consistent with previous research. The same flexible protocol of music therapy with an emphasis on emotional-approach coping used in the current study was also used with adults status-post solid organ transplant. Ghetti (in press) found that a single session of music therapy with an emphasis on emotional-approach coping increased positive affect in liver and kidney transplant recipients more than music therapy without such an emphasis, and more than standard care alone. The observed differential impact of certain music therapy approaches on positive affect is intriguing, and warrants further study.

Furthermore, the results of the current study suggest that the process of emotional-approach coping when couched in a talk-based interaction may not be sufficient to cause a shift in positive affect. Participants in the EAC group were prompted to speak about their emotions

relating to the procedure or related concerns, as well as discuss typical coping strategies. In response to general prompts, participants discussed a variety of emotional experiences including: feeling anxious about the upcoming procedure, fear of "not waking up" after the procedure if intervention is required, distress over possible outcomes of the procedure, desire to "get the procedure over with," current life stressors including other health stressors and sources of family stress, guilt over inconveniencing family members, positive feelings related to preferred coping strategies, excitement and anticipation regarding test results, humor, discomfort from lack of food and water, frustration related to previous hospitalizations, impatience regarding waiting time, and reassurance from family and/or spiritual support.

Several participants discussed current emotions related to the procedure and then identified a preference for "taking their minds off" of the impending procedure as a way to cope, and subsequently did so within the EAC session by discussing favorite modes of relaxation and stress relief. Despite approaching challenging procedure-related emotions verbally, and then exploring positive emotions related to preferred modes of stress relief (e.g., preferred creative and leisure outlets), and despite demonstrating positive facial affect during the course of the verbal interaction, the EAC participants did not report significant improvement in positive affect from pre- to post-test.

Individuals in the MT/EAC group also demonstrated some evidence of approaching a variety of emotions. At the conclusion of her MT/EAC session in which she cried while singing along to songs that reminded her of friends who had died, one participant described her experience of the music therapy session, "You know, some tears come down, but then there are a lot of happy memories that come back when you hear the music. This really helped a lot—I didn't think it would help that much, but I feel a lot better. I wasn't thinking about the procedure

at all!" This participant's report of simultaneously feeling both "happy" and "sad" feelings within the music experience supports the rationale for measuring and considering both positive and negative affect dimensions. Other participants in the MT/EAC group requested songs that would be "relaxing" and discussed corresponding emotions in response to the music.

The ability to induce positive affect through a non-pharmacological intervention has implications for health and well-being. The research literature supports the importance of trait positive affect for buffering against the negative effects of stress. In fact, trait positive affect has been found to moderate the relationship between negative affect and long-term health status (Versteeg et al., 2009). State positive affect, as was measured in the current study, may also have a beneficial impact on health outcomes. State positive affect may lead to quicker recovery from the cardiovascular activation that occurs in response to stressors (Fredrickson & Levenson, 1998), and it may expand the scope of coping responses one chooses when faced with stressors (Fredrickson, 2004). For individuals who had never conceived of active music making as a means to alleviate stress prior to a medical procedure, participation in the MT/EAC group may have given them first-hand experience of a new method of adaptive coping. Similarly, some individuals may not typically use emotional awareness and expression as a means to cope, but having successfully done so through the music therapy interaction in this study, may now feel equipped with a new method for coping with stress.

Results regarding decreases in negative affect were not as conclusive as those for positive affect. Both the MT/EAC and EAC groups demonstrated a trend toward decreased negative affect in this study, whereas mean negative affect in the control group did not change from pre- to post-test. The resulting *p*-value ($p = 1.00$) for negative affect in the control group likely contributed to the statistically significant overall time effect for the negative affect variable. Lack

of a statistically significant decrease in negative affect for the MT/EAC group was inconsistent with the results of Ghetti (in press) who found that a single session of either MT/EAC, or music therapy without a specific emphasis on EAC, significantly decreased negative affect in adults status-post solid organ transplant. Similarly, the current study results are inconsistent with Hamel (2001) and Moradipanah (2009) who both found significant decreases in the related construct of state anxiety for participants who received music intervention (relaxation music via headphones) prior to cardiac catheterization. However, since both MT/EAC and EAC groups in the current study trended toward decreased negative affect, it is possible that the small sample size in each group masked any potential treatment effect for negative affect.

An additional factor that might have contributed to the lack of a statistically significant decrease in negative affect for either of the treatment groups in the current study is that overall, participants in the study reported low levels of negative affect at pre-test. Unlike the research literature, which consistently reports elevated levels of state anxiety in individuals awaiting cardiac catheterization, individuals in the current study reported the presence of only "a little" negative affect. Only three participants rated their pre-test level of negative affect within the "moderate" range, while all others had scores in the range of "a little" to no negative affect. With low levels of reported negative affect, the margin for improvement (in this case, represented by a decrease in score) was quite small.

Though negative affect and anxiety are not equivalent constructs, negative affect correlates with state anxiety as measured by the STAI (Watson, Clark, & Tellegen, 1988), and thus changes in negative affect may be indicative of variations in state anxiety. Data from the current study counter gender-based differences in anxiety described in the research literature for cardiac catheterization. Women in the current study did not demonstrate higher levels of negative

affect, an indicator of perceived distress/anxiety, than men. This result stands in contrast to several studies that found higher levels of anxiety in women awaiting cardiac catheterization than in men (Caldwell et al., 2007; de Jong et al., 1994; Hamel, 2001; Heikkilä et al., 1998; Heikkilä et al., 1999; Schocken et al., 1987). This contrasting finding may be partly due to the fact that interventional cardiologists on the study unit make every attempt to meet with patients prior to the procedure to answer questions and allay fears. Caldwell et al. (2007) found that women in particular expressed more fear when they were not able to meet with cardiologists prior to the procedure, and thus could not judge the cardiologist's competence or have their concerns heard. It is possible that for the cardiac unit used in this study, the standard care practice of meeting with the cardiologist and other nurse educators prior to the procedure helped to allay female participants' fears.

Regarding self-report of pain, means trended toward a decrease in pain for the MT/EAC and EAC groups, while the control group trended toward increased pain, but these differences were non-significant. Using a 0-10 numeric rating scale, participants reported relatively low levels of pain at pre-test ($M = 1.22$, $SD = 1.96$) and post-test ($M = 1.23$, $SD = 2.05$). When participants did report pain, it was typically due to the starting of the intravenous line required for the procedure or was due to mild chronic pain. With such low levels of pain, it is not surprising that the study interventions failed to significantly impact pain. Of note, two participants reported pain arising from the blood pressure cuff upon inflation. Thus, it is possible that some participants might have experienced some mild discomfort from blood pressure monitoring.

Though coping-self efficacy measures trended toward a decrease for the control group, they trended toward an increase in coping self-efficacy for the EAC and MT/EAC groups. The

mean increase was greatest for the EAC group, though differences were not statistically-significant for any group. Some participants appeared to complete this VAS measure in a haphazard way, making comments such as "well I don't know, maybe about here." The reliability and validity of the VAS for coping self-efficacy used in the current study should be established. It is possible that expanding the scale to have more than a single item, and then testing its reliability and validity, could result in a more useful measure of how well one feels one can successfully cope with current stressors. The trends exhibited for the coping self-efficacy variable lend modest support to the use of emotional-approach and self-expression as a means to improve coping self-efficacy, whether this is accomplished through music therapy or through purely verbal means.

Means for satisfaction with care received during hospitalization demonstrated slight increases from pre-test to post-test for all groups, though these increases were not statistically significant. This trend is interesting, as the MT/EAC and EAC group participants received intervention beyond standard care, whereas the control group did not. It is possible that the psychological measures included in the pre-test (questions inquiring about the participant's current emotional state, pain level, and hospitalization satisfaction levels), contributed to participants feeling that their well-being was important to staff. Thus, control group participants might have felt an improvement in satisfaction from being "tended to" during the study. Ghetti (in press) reported a similar occurrence of control group participants expressing gratitude for the human interaction they received from the research assistant, despite only receiving standard care during the course of the study.

Conversely, hospital satisfaction may have trended upward for all participants because of excellent overall medical care on the unit, with the passing of time (from pre- to post-test)

representing more opportunities for study participants to interact with medical and support staff, as well as the researcher. For example, as part of standard care on the unit, the intervening cardiologist attempts to visit with each patient prior to the procedure to answer any lingering questions. Furthermore, the Executive Director of the overall cardiac service makes a regular practice of checking in with patients. One participant in the control group received such a visit during his 30-minute period of "standard care" and while completing post-test measures commented, "Well the director of the heart center spent time with me so I've got to say *very* satisfied!" Such visits are considered part of standard care on the unit, and thus were not controlled for in this study.

Physiological Variables

Heart rate, respiratory rate, and oxygen saturation levels did not vary significantly throughout any phase of the study. Furthermore, heart rate and respiratory rate did not vary congruently during the four measurements included in the study. Heart rate trended toward an increase from pre-test time (T1) to treatment conclusion time (T3) for the MT/EAC and EAC groups, while all three groups trended toward a slight *decrease* in respiratory rate from Time 1 to Time 4. Variations in oxygen saturation were very slight and were not consistent among groups.

Systolic blood pressure trended in a similar way to heart rate—increasing somewhat from pre-test (T1) to treatment conclusion (T3) in all groups, before stabilizing or falling slightly for the post-test measure (T4). Similarly, diastolic blood pressure trended upward for the EAC and MT/EAC groups from pre-test (T1) to post-test (T4) measures. The overall minimal variation in physiological measures, and the significant increase in systolic blood pressure in the MT/EAC group observed in the current study are not consistent with the Bradt and Dileo (2009) systematic review of music interventions with coronary heart disease patients. Bradt and Dileo (2009) found

improved physiological measures (such as decreased heart rate, and decreased systolic and diastolic blood pressure) during cardiac procedures for individuals who received music-based interventions.

The statistically significant increase in systolic blood pressure for the MT/EAC group is likely an indicator of mild sympathetic nervous system arousal. As the mean increase in systolic blood pressure was less than 10% over baseline and the highest mean values remained well below 160 mmHg, this level of arousal did not reach the level of a detrimental stress response (A. Ramaley, personal communication, June 16, 2011). Thus, MT/EAC participants did not demonstrate a relaxation response like that found in previous music listening pre-procedural studies, but instead demonstrated a mild increase in arousal that was most likely linked to their engagement in active music making.

The act of physically playing rhythm instruments and singing, as many participants did in the current study's MT/EAC group, may lead to short-term increases in heart rate, respiratory rate, and blood pressure due to variations in arousal. Furthermore, the act of playing a rhythm instrument can temporarily interfere with the accuracy of vital sign monitoring readings (such as when the pulse oximeter taped to a forefinger cannot accurately read oxygen saturation when a participant is actively using that same finger to tap on a drum). As only one of the studies reviewed by Bradt and Dileo (2009) involved cardiac participants in active music making, the short-term impact of engaging in instrument playing and singing on physiological parameters requires further study.

Despite the statistically significant increase in positive affect in the MT/EAC group, participants in this group did not demonstrate the decreases in heart rate and blood pressure that one might expect if positive affect was truly contributing to decreasing sympathetic nervous

system activation and promoting homeostasis following stress response. Denollet et al. (2008) postulate that positive affect may beneficially impact health by decreasing sympathetic nervous system activation resulting in decreased heart rate and blood pressure, as well as impacting the hypothalamic-pituitary-adrenal axis, with induction of positive affect leading to reduction in cortisol levels and a subsequent improvement in immune functioning. As the MT/EAC condition successfully induced positive affect in the current study, it is possible that such changes in affect might have impacted other physiological parameters, such as cortisol levels, that were not measured in the study. However, the failure to demonstrate decreased heart rate and blood pressure in the MT/EAC group requires further exploration to determine whether the induction of positive affect is independent of these physiological responses, or whether logistical considerations (such as the activity level, shifting arousal, and physical manipulation required for active music making) contributed to the absence of the anticipated lowering of heart rate and blood pressure.

Furthermore, it will be important to determine whether active versus passive induction of positive affect has a differential impact on sympathetic nervous system arousal. For example, studies that induce positive affect often do so by exposing participants to amusing or entertaining videos (Fredrickson & Levenson, 1998). In the current study, MT/EAC participants were actively engaged in a creative process that contributed to increases in positive affect. It may be that active engagement in a creative process leads to positive affect, but also to slight increases in sympathetic nervous system arousal.

Limitations

Some of the statistical analyses used in the current study were underpowered due to limited sample size. A series of power analyses was conducted to determine adequate sample

size using G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007). For the pre/post-test psychological variables used in this study, power analysis indicated the need to have at least 14 participants in each group to detect a moderate effect size (.25) for a power of .80 when $\alpha = .05$. Physiological variables with four measurements would require a sample size of at least 10 participants per group to detect a moderate effect size (.25) for a power of .80 when $\alpha = .05$. The measures that were particularly underpowered were procedural variables, which would require a sample size of 53 participants per group to detect a medium effect size (.25) for a power of .80 when $\alpha = .05$. It is possible that trends such as the decrease in negative affect in both MT/EAC and EAC groups, shorter procedure length in the MT/EAC group, or increased coping self-efficacy for the EAC group, might reach significance given a larger sample size that assures adequate power.

Forty-one percent of individuals approached for the study declined to participate. This fairly high rejection rate may reflect a trend that Thorgaard et al. (2004) identified; that patients may lack a positive expectation regarding the utility of music used prior to a health procedure. In the current study, seven individuals felt that they did not need any type of intervention, while five stated a dislike for music, and ten gave no reason for declining participation. Similarly to Thorgaard et al.'s postulation, some of these individuals may have doubted that music would impact them in a beneficial manner, despite having never experienced its use in this capacity. Though Thorgaard et al. (2004) reported a lack of positive expectation of effectiveness for music used periprocedurally for cardiac catheterization, 91% of those who did receive relaxing recorded music during the procedure found it to be a pleasant and helpful experience.

An additional issue related to low consent rate was a reported patient preference for interacting with caregivers instead of participating in the study. The cardiac treatment and

recovery unit used for this study has liberal visitation policies, and multiple caregivers are permitted at bedside prior to the procedure. Nineteen percent of those that declined participation in the study stated a preference for spending time with their caregivers, despite being assured that caregivers were welcomed and encouraged to participate in the study along with the patient. Of the patients who had four or more caregivers at bedside, eight such patients declined the study while five of them consented to study participation. However, being alone without caregivers did not seem to influence consent rates, as the same amount of individuals who were alone consented to the study as declined. Other individuals preferred silence in order to pray or meditate, wanted to watch television, or wished to try to sleep as a preferred way to cope.

In addition to limited power, the current study was not able to control for type of recorded music participants heard once they entered the intervention suite for their heart procedure. Standard care on the unit includes free field music listening in the operating suite during the cardiac procedure itself. Such recorded music is typically staff-selected, with a rationale that patients receive a level of conscious sedation that makes them minimally aware of their surroundings. There was no attempt to standardize the type of music playing free field during cardiac procedures for study patients, as the several cardiologists could not reach a consensus on genre of music to play[2]. Thus, the genres of music used during the heart procedure were randomly selected by cardiologists, whose preferences ranged from classical to 1970's rock n' roll. As interventional staff (cardiologists and nurses) were blinded as to which patients were involved in the study as well as to which group they were assigned, it was estimated that type of music heard during the cardiac procedure would not have a systematic impact on procedural outcomes.

[2] Electrophysiological studies may take several hours, and thus it is more appropriate to standardize genre of music versus standardize specific pieces of music, for music played free field during such procedures.

Future Recommendations

The concept of emotional-approach coping has only recently been extended to music therapy research. The research protocol used in this study does not include a means for evaluating the extent to which the MT/EAC or EAC treatment protocols actually enabled emotional-approach coping. Future research on the concept should attempt to assure that all participants are achieving a consistent level of emotional-approach coping, and if music therapy and non-music therapy conditions are compared, that both conditions are facilitating emotional-approach coping to comparable levels.

Since coping self-efficacy may be considered one way to assess if interventions are promoting a shift in overall cognitive appraisal of ability to cope with current stressors, valid brief measures of coping self-efficacy should be developed. The clinical relevance of physiological variables may be improved by focusing on variability, such as heart rate variability, and more sophisticated measures related to cardiac functioning such as myocardiac oxygen demand.

There were several logistical challenges in the current study related to uncertainty regarding length of waiting time prior to heart procedure. The medical staff on the unit maintained a very efficient practice, which helped decrease wait times for many of the patients that were scheduled early in the day. Cardiac catheterization procedures were often quite short, lasting approximately 20 minutes if no additional intervention was required. Patients were given appointment times at various intervals to assure that they would be prepped in time for the procedure, but would experience minimized wait time. A brief treatment protocol (music therapy or talk-based support) lasting approximately 25-minutes is estimated to be about the longest that would be realistic for research conducted in this setting. Thus, longer sessions, which may be

more clinically indicated for some individuals with higher levels of distress, would probably *not* be consistently feasible for future research on this particular unit. It is possible that decreases in negative affect could have been greater with a longer treatment intervention period (e.g., 45-minutes of music therapy), and that longer sessions might be feasible on a clinical, instead of research, basis. Since patients awaiting electrophysiological studies often had much longer wait periods, it would be advisable to target this population for clinical intervention.

As many of the participants in the current study reported low levels of perceived distress/anxiety prior to cardiac catheterization or electrophysiological study, clinical support interventions such as music therapy could be offered on a referral basis to patients who report or demonstrate high levels of negative affect during the waiting period prior to cardiac procedures. On a few occasions during the study, unit nurses informed the researcher of specific in-patients with high anxiety who might have benefitted from music therapy intervention if in-patients had been eligible for the study. Thus, clinical music therapy services could target both in-patients and out-patients who demonstrate high levels of perceived distress/anxiety or low levels of positive affect prior to cardiac procedures.

Participants in the current study who received music therapy with a specific emphasis on emotional-approach coping demonstrated significant increases in positive affect prior to cardiac catheterization or electrophysiological study. Elevations in positive affect were accompanied by mild increases in systolic blood pressure, which may have indicated a benign increase in sympathetic nervous system arousal due to engagement in active music making. Future refinement to the research protocol and replication with larger samples will help to support the preliminary benefits discussed herein.

References

American Heart Association. (2008). Invasive tests and procedures at-a-glance. Retrieved from http://www.heart.org/HEARTORG/Conditions/HeartAttack/SymptomsDiagnosisofHeartAttack/Invasive-Tests-and-Procedures_UCM_303931_Article.jsp

Argstatter, H., Haberbosch, W., & Bolay, H. V. (2006). Study of the effectiveness of musical stimulation during intracardiac catheterization. *Clinical Research in Cardiology, 95*(10), 514-522. doi: 10.1007/s00392-006-0425-4

Austenfeld, J. L., & Stanton, A. L. (2004). Coping through emotional approach: A new look at emotion, coping, and health-related outcomes. *Journal of Personality, 72*(6), 1335-1363. doi: 10.1111/j.1467-6494.2004.00299.x

Bally, K., Campbell, D., Chesnick, K., & Tranmer, J. E. (2003). Effects of patient-controlled music therapy during coronary angiography on procedural pain and anxiety distress syndrome. *Critical Care Nurse, 23*(2), 50-58.

Beckerman, A., Grossman, D., & Marquez, L. (1995). Cardiac catheterization: The patients' perspective. *Heart Lung, 24*(3), 213-219.

Bergeron, P., Enns, J., Delima, L., Dupuis, J. Y., & Wynands, J. E. (1995). Effects of routine premedication for cardiac catheterization on sedation, level of anxiety and arterial oxygen saturation. *The Canadian of Journal of Cardiology, 11*(3), 201-205.

Bradt, J., & Dileo, C. (2009). Music for stress and anxiety reduction in coronary heart disease patients. *The Cochrane Database of Systematic Reviews*(2), CD006577. doi: 10.1002/14651858.CD006577.pub2

Caldwell, P. H., Arthur, H. M., Natarajan, M., & Anand, S. S. (2007). Fears and beliefs of patients regarding cardiac catheterization. *Social Science & Medicine, 65*(5), 1038-1048. doi: 10.1016/j.socscimed.2007.04.010

Cannon, W. B. (1914). The interrelations of emotions as suggested by recent physiological researches. *The American Journal of Psychology, 25*(2), 256-282.

Chan, D. S., & Cheung, H. W. (2003). The effects of education on anxiety among Chinese patients with heart disease undergoing cardiac catheterization in Hong Kong. *Contemporary Nurse, 15*(3), 310-320.

Chan, M. F. (2007). Effects of music on patients undergoing a c-clamp procedure after percutaneous coronary interventions: A randomized controlled trial. *Heart Lung, 36*(6), 431-439. doi: 10.1016/j.hrtlng.2007.05.003

Chan, M. F., Wong, O. C., Chan, H. L., Fong, M. C., Lai, S. Y., Lo, C. W., …Leung, S. K. (2006). Effects of music on patients undergoing a c-clamp procedure after percutaneous coronary interventions. *Journal of Advanced Nursing, 53*(6), 669-679. doi: 10.1111/j.1365-2648.2006.03773.x

Crawford, J. R., & Henry, J. D. (2004). The Positive and Negative Affect Schedule (PANAS): Construct validity, measurement properties and normative data in a large non-clinical sample. *The British Journal of Clinical Psychology, 43*(Pt 3), 245-265. doi: 10.1348/0144665031752934

Davidson, C. J., & Bonow, R. O. (2008). Cardiac catheterization. In P. Libby, E. Braunwald & et al. (Eds.), *Braunwald's heart disease: A textbook of cardiovascular medicine.* (8th ed. ed., pp. 439-464). Philadelphia: Saunders/Elsevier.

Davidson, R. J. (1998). Affective style and affective disorders: Perspectives from affective neuroscience. *Cognition and Emotion, 12*(3), 307 - 330. doi: 10.1080/026999398379628

Davis, T. M., Maguire, T. O., Haraphongse, M., & Schaumberger, M. R. (1994a). Preparing adult patients for cardiac catheterization: Informational treatment and coping style interactions. *Heart Lung, 23*(2), 130-139.

Davis, T. M., Maguire, T. O., Haraphongse, M., & Schaumberger, M. R. (1994b). Undergoing cardiac catheterization: The effects of informational preparation and coping style on patient anxiety during the procedure. *Heart Lung, 23*(2), 140-150.

de Jong, M., Erdman, R. A., van den Brand, M. J., Verhage, F., & Passchier, J. (1994). Home measures of anxiety, avoidant coping and defence as predictors of anxiety, heart rate and skin conductance level just before invasive cardiovascular procedures. *Journal of Psychosomatic Research, 38*(4), 315-322.

De Jong-Watt, W. J., & Arthur, H. M. (2004). Anxiety and health-related quality of life in patients awaiting elective coronary angiography. *Heart Lung, 33*(4), 237-248.

Denollet, J., Pedersen, S. S., Daemen, J., de Jaegere, P., Serruys, P. W., & van Domburg, R. T. (2008). Reduced positive affect (anhedonia) predicts major clinical events following implantation of coronary-artery stents. *Journal of Internal Medicine, 263*(2), 203-211. doi: 10.1111/j.1365-2796.2007.01870.x

Evans, D. (2002). The effectiveness of music as an intervention for hospital patients: A systematic review. *Journal of Advanced Nursing, 37*(1), 8-18.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175-191.

Finesilver, C. (1978). Preparation of adult patients for cardiac catheterization and coronary cineangiography. *International Journal of Nursing Studies, 15*(4), 211-221.

Finesilver, C. (1980). Reducing stress in patients having cardiac catheterization. *The American Journal of Nursing, 80*(10), 1805-1807.

Fredrickson, B. L. (2004). The broaden-and-build theory of positive emotions. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences, 359*(1449), 1367-1378. doi: 10.1098/rstb.2004.1512

Fredrickson, B. L., & Levenson, R. W. (1998). Positive emotions speed recovery from the cardiovascular sequelae of negative emotions. *Cognition and Emotion, 12*(2), 191-220. doi: 10.1080/026999398379718

Gallagher, R., Trotter, R., & Donoghue, J. (2010). Preprocedural concerns and anxiety assessment in patients undergoing coronary angiography and percutaneous coronary interventions. *European Journal of Cardiovascular Nursing, 9*(1), 38-44. doi: 10.1016/j.ejcnurse.2009.09.001

Ghetti, C. M. (in press). Active music engagement with emotional-approach coping to improve well-being in liver and kidney transplant recipients. *Journal of Music Therapy*.

Gillen, E., Biley, F., & Allen, D. (2008). Effects of music listening on adult patients' pre-procedural state anxiety in hospital. *International Journal of Evidence Based Healthcare, 6*(1), 24-49. doi: 10.1111/j.1744-1609.2007.00097.x

Goldberger, J. J., Kruse, J., Parker, M. A., & Kadish, A. H. (1997). Effect of informed consent on anxiety in patients undergoing diagnostic electrophysiology studies. *American Heart Journal, 134*(1), 119-126.

Gordon, J. L., Bowyer, D. E., Evans, D. W., & Mitchinson, M. J. (1973). Human platelet reactivity during stressful diagnostic procedures. *Journal of Clinical Pathology, 26*(12), 958-962.

Hamel, W. J. (2001). The effects of music intervention on anxiety in the patient waiting for cardiac catheterization. *Intensive & Critical Care Nursing, 17*(5), 279-285. doi: 10.1054/iccn.2001.1594

Heikkilä, J., Paunonen, M., Laippala, P., & Virtanen, V. (1998). Patients' fears in coronary arteriography. *Scandinavian Journal of Caring Sciences, 13*(1), 3-10.

Heikkilä, J., Paunonen, M., Virtanen, V., & Laippala, P. (1999). Gender differences in fears related to coronary arteriography. *Heart Lung, 28*(1), 20-30.

Krucoff, M. W., Crater, S. W., Gallup, D., Blankenship, J. C., Cuffe, M., Guarneri, M., …Lee, K. L. (2005). Music, imagery, touch, and prayer as adjuncts to interventional cardiac care: The Monitoring and Actualisation of Noetic Trainings (MANTRA) II randomised study. *Lancet, 366*(9481), 211-217. doi: 10.1016/S0140-6736(05)66910-3

Larsen, J. T., McGraw, A. P., & Cacioppo, J. T. (2001). Can people feel happy and sad at the same time? *Journal of Personality and Social Psychology, 81*(4), 684-696.

Lazarus, R. S. (1999). *Stress and emotion: A new synthesis*. New York, NY: Springer Publishing Company.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York, NY: Springer Publishing Company.

Lloyd-Jones, D., Adams, R. J., Brown, T. M., Carnethon, M., Dai, S., De Simone, G., …Wylie-Rosett, J. (2010). Heart disease and stroke statistics--2010 update: A report from the

American Heart Association. *Circulation, 121*(7), e46-e215. doi: 10.1161/CIRCULATIONAHA.109.192667

Lundén, M. H., Bengtson, A., & Lundgren, S. M. (2006). Hours during and after coronary intervention and angiography. *Clinical Nursing Research, 15*(4), 274-289. doi: 10.1177/1054773806291855

McCaffrey, R., & Taylor, N. (2005). Effective anxiety treatment prior to diagnostic cardiac catheterization. *Holistic Nursing Practice, 19*(2), 70-73.

McNamara, M. E., Burnham, D. C., Smith, C., & Carroll, D. L. (2003). The effects of back massage before diagnostic cardiac catheterization. *Alternative Therapies in Health and Medicine, 9*(1), 50-57.

Mikosch, P., Hadrawa, T., Laubreiter, K., Brandl, J., Pilz, J., Stettner, H., & Grimm, G. (2010). Effectiveness of respiratory-sinus-arrhythmia biofeedback on state-anxiety in patients undergoing coronary angiography. *Journal of Advanced Nursing, 66*(5), 1101-1110. doi: 10.1111/j.1365-2648.2010.05277.x

Moline, L. R. (2000). Patient psychologic preparation for invasive procedures: An integrative review. *Journal of Vascular Nursing, 18*(4), 117-122. doi: 10.1067/mvn.2000.111640

Monroe, S. M., & Kelley, J. M. (1997). Measurement of stress appraisal. In S. Cohen, R. C. Kessler & L. U. Gordon (Eds.), *Measuring stress* (pp. 122-147). New York: Oxford University Press.

Moradipanah, F., Mohammadi, E., & Mohammadil, A. Z. (2009). Effect of music on anxiety, stress, and depression levels in patients undergoing coronary angiography. *Eastern Mediterranean Health Journal, 15*(3), 639-647.

Nilsson, U. (2008). The anxiety- and pain-reducing effects of music interventions: A systematic review. *AORN Journal, 87*(4), 780-807. doi: 10.1016/j.aorn.2007.09.013

Nilsson, U., Lindell, L., Eriksson, A., & Kellerth, T. (2009). The effect of music intervention in relation to gender during coronary angiographic procedures: A randomized clinical trial. *European Journal of Cardiovascular Nursing, 8*(3), 200-206. doi: 10.1016/j.ejcnurse.2009.01.001

Peterson, M. (1991). Patient anxiety before cardiac catheterization: An intervention study. *Heart Lung, 20*(6), 643-647.

Pressman, S. D., & Cohen, S. (2005). Does positive affect influence health? *Psychological Bulletin, 131*(6), 925-971. doi: 10.1037/0033-2909.131.6.925

Roger, V. L., Go, A. S., Lloyd-Jones, D. M., Adams, R. J., Berry, J. D., Brown, T. M., et al. (2011). Heart disease and stroke statistics--2011 update: A report from the American Heart Association. *Circulation, 123*(4), e18-e209. doi: 10.1161/CIR.0b013e3182009701

Rosen, J. B., & Schulkin, J. (1998). From normal fear to pathological anxiety. *Psychological Review, 105*(2), 325-350. doi: 10.1037/0033-295x.105.2.325

Rozanski, A., Bairey, C. N., Krantz, D. S., Friedman, J., Resser, K. J., Morell, M., …Berman, D. S. (1988). Mental stress and the induction of silent myocardial ischemia in patients with coronary artery disease. *New England Journal of Medicine, 318*(16), 1005-1012. doi: 10.1056/NEJM198804213181601

Rudin, D., Kiss, A., Wetz, R. V., & Sottile, V. M. (2007). Music in the endoscopy suite: A meta-analysis of randomized controlled studies. *Endoscopy, 39*(6), 507-510. doi: 10.1055/s-2007-966362

Schocken, D. D., Greene, A. F., Worden, T. J., Harrison, E. E., & Spielberger, C. D. (1987). Effects of age and gender on the relationship between anxiety and coronary artery disease. *Psychosomatic Medicine, 49*(2), 118-126.

Spielberger, C. D. (1985). Anxiety, cognition and affect: A state-trait perspective. In A. H. Tuma & J. Maser (Eds.), *Anxiety and the anxiety disorders* (pp. 171-182). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Spielberger, C. D., Auerbach, S. M., Wadsworth, A. P., Dunn, T. M., & Taulbee, E. S. (1973). Emotional reactions to surgery. *Journal of Consulting and Clinical Psychology, 40*(1), 33-38. doi: 10.1037/h0033982

Stanton, A. L., & Franz, R. (1999). Focusing on emotions: An adaptive coping strategy? In C. R. Snyder (Ed.), *Coping: The psychology of what works* (pp. 90-118). New York: Oxford University Press.

Stanton, A. L., Kirk, S. B., Cameron, C. L., & Danoff-Burg, S. (2000). Coping through emotional approach: Scale construction and validation. *Journal of Personality and Social Psychology, 78*(6), 1150-1169.

Stanton, A. L., Sullivan, S. J., & Austenfeld, J. L. (2009). Coping through emotional approach: Emerging evidence for the utility of processing and expressing emotions in responding to stressors. In C. R. Snyder & S. J. Lopez (Eds.), *Oxford handbook of positive psychology* (2nd ed., pp. 225-235). New York, NY: Oxford University Press, USA.

Strik, J. J., Denollet, J., Lousberg, R., & Honig, A. (2003). Comparing symptoms of depression and anxiety as predictors of cardiac events and increased health care consumption after myocardial infarction. *Journal of the American College of Cardiology, 42*(10), 1801-1807.

Tague, D. B. (2000). *The effect of preferred sedative music on the anxiety of patients during pacemaker implant surgery and heart catheterization* (Unpublished master's thesis). The University of Kansas, Lawrence, KS.

Tam, W. W., Wong, E. L., & Twinn, S. F. (2008). Effect of music on procedure time and sedation during colonoscopy: A meta-analysis. *World Journal of Gastroenterology, 14*(34), 5336-5343.

Thorgaard, B., Henriksen, B. B., Pedersbaek, G., & Thomsen, I. (2004). Specially selected music in the cardiac laboratory-an important tool for improvement of the wellbeing of patients. *European Journal of Cardiovascular Nursing, 3*(1), 21-26. doi: 10.1016/j.ejcnurse.2003.10.001

Tremko, L. A. (1997). Understanding diagnostic cardiac catheterization. *The American Journal of Nursing, 97*(2), 16K - 16R.

Ulvik, B., Bjelland, I., Hanestad, B. R., Omenaas, E., Wentzel-Larsen, T., & Nygard, O. (2008). Comparison of the Short Form 36 and the Hospital Anxiety and Depression Scale measuring emotional distress in patients admitted for elective coronary angiography. *Heart Lung, 37*(4), 286-295. doi: 10.1016/j.hrtlng.2007.08.001

Uzun, S., Vural, H., Uzun, M., & Yokusoglu, M. (2008). State and trait anxiety levels before coronary angiography. *Journal of Clinical Nursing, 17*(5), 602-607. doi: 10.1111/j.1365-2702.2007.02018.x

Versteeg, H., Pedersen, S. S., Erdman, R. A., van Nierop, J. W., de Jaegere, P., & van Domburg, R. T. (2009). Negative and positive affect are independently associated with patient-reported health status following percutaneous coronary intervention. *Quality of Life Research, 18*(8), 953-960. doi: 10.1007/s11136-009-9511-1

Watkins, L. L., Blumenthal, J. A., & Carney, R. M. (2002). Association of anxiety with reduced baroreflex cardiac control in patients after acute myocardial infarction. *American Heart Journal, 143*(3), 460-466.

Watkins, L. L., Blumenthal, J. A., Davidson, J. R., Babyak, M. A., McCants, C. B., Jr., & Sketch, M. H., Jr. (2006). Phobic anxiety, depression, and risk of ventricular arrhythmias in patients with coronary heart disease. *Psychosomatic Medicine, 68*(5), 651-656. doi: 10.1097/01.psy.0000228342.53606.b3

Watson, D., Clark, L. A., & Carey, G. (1988). Positive and negative affectivity and their relation to anxiety and depressive disorders. *Journal of Abnormal Psychology, 97*(3), 346-353.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063-1070.

Wentworth, L. J., Briese, L. J., Timimi, F. K., Sanvick, C. L., Bartel, D. C., Cutshall, S. M., …Bauer, B. A. (2009). Massage therapy reduces tension, anxiety, and pain in patients awaiting invasive cardiovascular procedures. *Progress in Cardiovascular Nursing, 24*(4), 155-161. doi: 10.1111/j.1751-7117.2009.00054.x

Woodhead, J., Harding, S. A., Simmonds, M., Dee, S., & McBride-Henry, K. (2007). Premedication for cardiac catheterization and percutaneous coronary intervention: Does it increase vascular access site complications? *The Journal of Cardiovascular Nursing, 22*(6), 466-471. doi: 10.1097/01.JCN.0000297386.14002.f2

Appendix A – Consent Form

RESEARCH CONSENT FORM
Effect of Music Therapy with Emotional-Approach Coping on Pre-Procedural Anxiety in Cardiac Catheterization
Protocol # 12479

You are being asked to join a research study. You are being asked to take part in this study as someone who is awaiting a heart procedure. You do not have to participate in this research study. The main purpose of research is to create new knowledge for the benefit of future patients and society in general. Research studies may or may not benefit the people who participate.

Research is voluntary, and you may change your mind at any time. There will be no penalty to you if you decide not to participate, or if you start the study and decide to stop early. Either way, you can still get medical care and services at the University of Kansas Medical Center (KUMC).

This consent form explains what you have to do if you are in the study. It also describes the possible risks and benefits. Please read the form carefully and ask as many questions as you need to, before deciding about this research.

You can ask questions now or anytime during the study. The researchers will tell you if they receive any new information that might cause you to change your mind about participating. This research study will take place at the University of Kansas Medical Center (KUMC) with Dr. Cynthia Colwell as the principal investigator and Claire Ghetti as the student researcher. About 90 people will be in the study at KUMC.

BACKGROUND
People sometimes feel stressed while awaiting medical procedures. Researchers want to learn if music therapy improves an individual's well-being prior to heart procedures. Music therapy is a form of therapy that uses music making to reduce stress and improve health. Research has shown that participation in music therapy sessions helped people feel more positive and less stressed after organ transplant surgery. Though recorded music has been used to help reduce stress prior to heart procedures, there is very little research examining the use of live music therapy prior to heart procedures.

PURPOSE
By doing this study, researchers hope to learn how music therapy affects the mood and coping of people who are awaiting heart procedures.

PROCEDURES
If you are eligible and decide to participate in this study, your participation will last approximately 30 minutes or less, and will occur within the privacy of your room. You will be randomly assigned to Music with Discussion, Discussion Only, or Control. Assignments are random, like flipping a coin. Depending upon your assignment, your participation will involve:

HSC #: 12479
Approval Date: 03/07/11 to 12/13/11
Assurance #: FWA00003411

Music with Discussion

1. Participating in an individual music therapy session to whatever degree you are comfortable. Participation may include choosing songs, listening to music, singing, playing instruments, or discussing song themes.
2. Completing a questionnaire about your current mood states, coping ability, and satisfaction with care, twice. The questionnaire should take approximately 5 minutes to complete.

Discussion Only

1. Participating in an individual discussion session to whatever degree you are comfortable. Participation may include discussing your current mood, feelings you have related to the procedure and the ways you prefer to cope with stress.
2. Completing a questionnaire about your current mood states, coping ability, and satisfaction with care, twice. The questionnaire should take approximately 5 minutes to complete.

Control

1. Completing a questionnaire about your current mood states, coping ability, and satisfaction with care twice, with a 30-minute break in-between.

RISKS

There are no anticipated risks of this study, though there may be other risks that are not yet known.

BENEFITS

You may or may not benefit from this study. The researchers hope that the information gained will help them learn more about ways to improve the well-being of people who are awaiting heart procedures.

ALTERNATIVES

Participation in this study is voluntary; deciding not to participate will have no effect on the care or services you receive at the University of Kansas Medical Center.

COSTS

There is no cost for being in the study.

PAYMENT TO SUBJECTS

There is no payment for this study.

IN THE EVENT OF INJURY

No risks are anticipated in this study. If you believe you have been harmed or experience any other problem during this study, you should immediately contact the Unit Nurse Manager. A member of the research team will decide what type of treatment, if any, is best for you at that time.

HSC #: 12479
Approval Date: 03/07/11 to 2/13/11
Assurance #: FWA00003411

INSTITUTIONAL DISCLAIMER STATEMENT

If you think you have been harmed as a result of participating in research at the University of Kansas Medical Center (KUMC), you should contact the Director, Human Research Protection Program, Mail Stop #1032, University of Kansas Medical Center, 3901 Rainbow Blvd., Kansas City, KS 66160. Under certain conditions, Kansas state law or the Kansas Tort Claims Act may allow for payment to persons who are injured in research at KUMC.

CONFIDENTIALITY AND PRIVACY AUTHORIZATION

The researchers will protect your information, as required by law. Absolute confidentiality cannot be guaranteed because persons outside the study team may need to look at your study records. The researchers may publish the results of the study, but if they do, they will only discuss group results. Your name will not be used in any publication or presentation about the study.

Your health information is protected by a federal privacy law called HIPAA. By signing this consent form, you are giving permission for KUMC to use and share your health information. If you decide not to sign the form, you cannot be in the study.

The researchers will only use and share information that is needed for the study. Facts about you (your name, age, and type of heart procedure) will be used to identify you as a candidate for the study. If you participate, we will use these facts, along with information about how long your heart procedure took, the drugs used during the procedure, and any problems that occurred. People who have access to this information will include members of the research team, officials at KUMC who oversee research, including members of the KUMC Human Subjects Committee and other committees and offices that review and monitor research studies.

By signing this form, you are giving KUMC permission to share information about you with persons or groups at The University of Kansas-Lawrence campus. Your information will be shared with Dr. Cynthia Colwell, members of the research team and U.S. agencies that oversee human research (if a study audit is performed). These persons or groups may make copies of study records for audit purposes. The purpose for using and sharing your information is to make sure the study is done properly.

The HIPAA privacy law may not apply to everyone who receives your health information, such as the KU-Lawrence campus. Your information might not be protected by HIPAA if persons outside KUMC disclose it; however, there are other confidentiality rules that must be followed when people volunteer for research studies.

Your permission to use and share your health information remains in effect until the study is complete and the results are analyzed. After that time, researchers will remove personal information from study records.

HSC #: 12479
Approval Date: 03/07/11 to 12/13/11
Assurance #: FWA00003411

QUESTIONS

Before you sign this form, Claire Ghetti, Co-Investigator, or other members of the study team should answer all your questions. You can talk to the researchers if you have any more questions, suggestions, concerns or complaints after signing this form. If you have any questions about your rights as a research subject, or if you want to talk with someone who is not involved in the study, you may call the Human Subjects Committee at (913) 588-1240. You may also write the Human Subjects Committee at Mail Stop #1032, University of Kansas Medical Center, 3901 Rainbow Blvd., Kansas City, KS 66160.

SUBJECT RIGHTS AND WITHDRAWAL FROM THE STUDY

You may stop being in the study at any time. Your decision to stop will not prevent you from getting treatment or services at KUMC. The entire study may be discontinued for any reason without your consent by the investigator conducting the study.

You have the right to cancel your permission for researchers to use your health information. If you want to cancel your permission, please write to Dr. Cynthia Colwell, Director of Music Therapy, University of Kansas, 1530 Naismith Dr. #448C, Murphy Hall, Lawrence, KS, 66045. If you cancel permission to use your health information, you will be withdrawn from the study. The research team will stop collecting any additional information about you. The research team may use and share information that was gathered before they received your cancellation.

CONSENT

Claire Ghetti or the research team has given you information about this research study. They have explained what will be done and how long it will take. They explained any inconvenience, discomfort or risks that may be experienced during this study.

By signing this form, you say that you freely and voluntarily consent to participate in this research study. You have read the information and had your questions answered.
You will be given a signed copy of the consent form to keep for your records.

_____
Print Participant's Name

_____ _____ _____
Signature of Participant Time Date

_____
Print Name of Person Obtaining Consent

_____ _____
Signature of Person Obtaining Consent Date

HSC #: 12479
Approval Date: 03/07/11 to 12/13/11
Assurance #: FWA00003411

Appendix B – *Positive and Negative Affect Schedule*

PANAS

I will read a list of words that describe different feelings and emotions. After each word, please tell me to what extent you feel this way right now, that is, at the present moment. Use the following rating for your answers [*show the rating scale visual to each participant, and point to each rating level while speaking it*]:

very slightly or not at all [code 1]
a little [code 2]
moderately [code 3]
quite a bit [code 4]
extremely [code 5]

To what extent do you feel this way right now, at the present moment:

_____ interested	_____ hostile	_____ nervous
_____ distressed	_____ enthusiastic	_____ determined
_____ excited	_____ proud	_____ attentive
_____ upset	_____ irritable	_____ jittery
_____ strong	_____ alert	_____ active
_____ guilty	_____ ashamed	_____ afraid
_____ scared	_____ inspired	

Adapted from: Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS Scales. *Journal of Personality and Social Psychology, 54*(6), 1063-1070.

Appendix C – Visual Analog Scales for Coping Self-Efficacy and Hospital Satisfaction

1. At present, how capable are you of successfully coping with your current level of stress? Place a vertical mark on the line below to indicate how capable you are of successfully coping with your current level of stress.

Not at all capable Extremely capable

2. Overall, how satisfied are you with the care you are receiving prior to your procedure? Place a vertical mark on the line below to indicate how satisfied you are with the care you are receiving prior to your procedure.

Not at all satisfied Very satisfied

Appendix D – List of Songs (within genres) with Potential Themes for Discussion

Religious/Spiritual Songs	Composer or Artist	Potential Themes
Abide With Me	Lyte & Monk	Support, companionship
A Change is Gonna Come	Sam Cooke	Life struggles, determination, change
Alas ("Wings")	Katherine Dines	Desire to alleviate suffering
Amazing Grace	Newton & Excell	Gratitude, determination, faith
Awesome God	Rich Mullins	Awe, faith
Down by the Riverside	Traditional (1927)	Relief of suffering/burden
His Eye is on the Sparrow	Martin & Gabriel (1950)	Support, encouragement, faith
How Great Thou Art	Stuart Hine (1941)	Awe, praise
I'll Fly Away	Albert Brumley (1929)	Afterlife, faith, freedom
I Need Thee Every Hour	Hawks & Lowry	Desire for support, faith
In the Garden	C. Austin Miles (1912)	Companionship, faith, gratitude
It is Well with My Soul	Spafford & Bliss	Peace, closure, faith
Just a Closer Walk with Thee	Unknown	Faith, support, coping with struggles
Leaning on the Everlasting Arms	Johnson Showalter (1988)	Faith, support
Nearer My God to Thee	Adams & Mason	Faith, trust
O God, Our Help in Ages Past	Watts & Croft	Support, faith
The Old Rugged Cross	George Bennard (1913)	Faith, gratitude, closure
Peace in the Valley	Thomas Dorsey (1939)	Feeling weary, support, end of suffering, transition
Rock of Ages	Toplady & Hastings	Faith, strength, support
Swing Low Sweet Chariot	Traditional	Support, faith, companionship
Take My Hand, Precious Lord	Thomas Dorsey	Needing support, faith, closure
This Train	Traditional	Determination, faith
Wade in the Water	Traditional	Faith, warning
What a Friend We Have in Jesus	Scriven & Converse (1868)	Gratitude, faith
Will the Circle be Unbroken	Habershon & Gabriel (1907)	Circle of life, closure

Patriotic	Composer or Artist	Potential Themes
America (My Country 'Tis of Thee)	Samuel Francis Smith (1831)	Patriotic sacrifice
America the Beautiful	Lee Bates & Ward (1895)	Home, pride, natural beauty
God Bless America	Irving Berlin (1918)	Pride, perseverance
This Land is Your Land	Woodie Guthrie (1940)	Community, pride
Star Spangled Banner	Scott Key & Smith (1814)	Pride, determination, strength
Jazz Standards	Composer or Artist	Potential Themes
Bewitched, Bothered & Bewildered	Hart & Rodgers (1941)	Love, relationships, mixed feelings
Blue Skies	Irving Berlin (1927)	Optimism
Fly Me to the Moon	Bart Howard (1964)	Love, relationships
Girl from Ipanema	De Moraes & Jobim (Gimbel) (1963)	Love, relationships, unrequited love
It Had to Be You	Jones & Kahn (1924)	Love, relationships
L-O-V-E	Kaempfert & Gabler (1965)	Love, relationships, gratitude
My Way	Frank Sinatra (1969)	Life review, determination, free will
Sentimental Journey	Brown, Homer & Green (1944)	Life review, memories
Summertime	Heyward & Gershwin (1935)	Memories, family
They Can't Take That Away from Me	Gershwin & Gershwin (1937)	Love, relationships
Unforgettable	Nat King Cole (1951)	Love, relationships, gratitude
What a Wonderful World	Weiss & Thiele (1967)	Gratitude, natural beauty, perspective
When You're Smiling	Louis Armstrong, Frank Sinatra, Dean M.	Emotions, relationships, coping
Showtunes	Musical	Potential Themes
Accentuate the Positive	"Here Come the Waves" (1944)	Attitudes, coping
Climb Every Mountain	"The Sound of Music" (1959)	Determination, faith
Edelweiss	"The Sound of Music" (1959)	Memories, pride
Getting to Know You	"The King and I" (1956)	Relationships, sharing

Moon River	"Andy" Williams (1961)	Travel, memories, relationships
My Favorite Things	"The Sound of Music" (1959)	Coping, favorite things
Oh What a Beautiful Morning	"Oklahoma" (1943)	Gratitude, natural beauty
Over the Rainbow	"The Wizard of Oz" (1939)	Coping with challenges, mixed feelings
Singin' in the Rain	"Singin' in the Rain" (1952)	Coping with challenges, optimism
Some Enchanted Evening	"South Pacific" (1949)	Love, relationships, memories
Someone to Watch Over Me	"Oh, Kay!" (1926)	Support, relationships, co-dependency
Till There Was You	"Music Man" (1957)	Love, relationships, gratitude, perspective
Try to Remember	"The Fantasticks" (1960)	Memories, life changes, coping
You'll Never Walk Alone	"Carousel" (1945) Hammerstein & Rodgers	Support, determination, mixed feelings
30s-40s & Traditional	Composer or Artist	Potential Themes
Anniversary Song	Al Jolson & Chaplin (1946)	Memories, love, relationships
Beautiful Dreamer	Steven Foster (1864)	Love, relationships
Bei Mir Bist Du Schön	Jacobs & Secunda (1932)	Love, relationships
Danny Boy	Frederick Weatherly (1913)	Loss, anticipatory loss, grief, love
The Glory of Love	Billy Hill (1936)	Coping, love, relationships
Goodnight Irene	Lead Belly (1932)	Parting, loss, memories, coping
Home on the Range	Higley & Kelley (1873)	Home, memories
How About You?	Freed & Lane (1941)	Favorite things, relationships
I'll See You in My Dreams	Gus Kahn & Isham Jones (1924)	Memories, separation, loss, coping
Let Me Call You Sweetheart	Whitson & Friedman (1910)	Love, support
My Wild Irish Rose	Chauncey Olcott (1899)	Love, relationships
On the Sunny Side of the Street	Fields & McHugh (1930)	Optimism, determination, coping
Pretty Baby	Tony Jackson (1916)	Love, relationships
Yankee Doodle Boy	George M. Cohan (1904)	Pride, patriotism

Old Country	Composer or Artist	Potential Themes
Always on My Mind	Brenda Lee (1972)	Regret, love, relationships
Back in the Saddle Again	Ray Whitley/Gene Autry (1939)	Freedom, familiarity
Coal Miner's Daughter	Loretta Lynn (1969)	Memories, family, coping
Could I Have This Dance	Anne Murray (1980)	Love, relationships, commitment
Crazy	Patsy Cline (1961)	Relationships, co-dependency, mixed feelings, loneliness
The Gambler	Kenny Rogers (1978)	Risk taking, coping, transitions
Hey Good Lookin'	Hank Williams (1951)	Love, relationships, identity
I Fall to Pieces	Patsy Cline (1961)	Loss, relationships, loneliness
I'm So Lonesome I Could Cry	H. Williams/Ch. Pride/J. Cash (1949)	Loneliness, coping
I Walk the Line	Johnny Cash (1956)	Love, relationships, commitment
Jambalaya (On the Bayou)	Hank Williams (1952)	Family, relationships, traditions
On the Road Again	Willie Nelson (1980)	Transitions, change, identity
Ring of Fire	Johnny Cash (1963)	Love, relationships, mixed feelings
San Antonio Rose	Bob Wills/Bing Crosby (1940)	Love, relationships, loss
Sixteen Tons	Merle Travis (1947)	Struggle, pessimism
Stand By Your Man	Tammy Wynette (1968)	Love, relationships
Tennessee Waltz	Roy Acuff (1946)	Love, relationships, loss, betrayal
Walkin' After Midnight	Patsy Cline (1957)	Loneliness, love
You Needed Me	Anne Murray (1978)	Support, gratitude
New Country	Composer or Artist	Potential Themes
Achy Breaky Heart	Billy Ray Cyrus (1992)	End of relationship, humor
Bless the Broken Road	Rascal Flatts (2004)	Challenge, fate, relationships, gratitude
Breathe	Faith Hill (1999)	Love, relationships
Friends in Low Places	Garth Brooks (1990)	Friendship, coping, drinking, identity
From this Moment On	Shania Twain	Love, relationships

I Hope You Dance	Lee Ann Womack	Coping with challenges, determination
I'll Take Care of You	Dixie Chicks	Love, relationships, support
I'm a Survivor	Reba McEntire	Coping with challenges, determination, inner strength
My Best Friend	Tim McGraw	Love, relationships, gratitude
The River	Garth Brooks	Determination, identity, changes
When You Say Nothing at All	Alison Krauss	Love, relationships
Wide Open Spaces	Dixie Chicks	Identity, freedom, choices
You'll Think of Me	Keith Urban	End of relationship, coping
1950s	Composer or Artist	Potential Themes
All Shook Up	Elvis Presley (1957)	Relationships, feelings
All I Have to do is Dream	Everly Brothers (1958)	Love, relationships, dreams
Blue Moon	ShaNaNas/Mel Torme (Hart & Rodgers)	Love, relationships
Blue Suede Shoes	Elvis Presley (1956)	Possessions, pride, boundaries
Can't Help Falling in Love	Elvis Presley (1961)	Love, mixed feelings
Chantilly Lace	Big Bopper (1958)	Love, relationships
Don't	Elvis Presley (1958)	Love, commitment, communication
Don't Be Cruel	Elvis Presley (1956)	Love, relationships, commitment
Earth Angel	The Penguins / The Crew-Cuts (1955)	Love, relationships
Great Balls of Fire	Jerry Lee Lewis (1957)	Love, feelings, excitement
Hound Dog	Elvis Presley (1956)	Relationships, disappointment
Jailhouse Rock	Elvis Presley (1957)	Dancing, community, excitement
Kansas City	Leiber & Stroller (1952)	Home, identity, traveling
La Bamba	Ritchie Valens (1958)	Dancing
Love Me Tender	Elvis Presley (1956)	Love, relationships, commitment
Rock Around the Clock	Bill Haley & his Comets (1954)	Music, dancing, excitement
Rockin' Robin	Bobby Day (1958)	Dancing, excitement

Tutti Frutti	Penniman & La Bostrie (1955)	Dancing, relationships
Unchained Melody	Righteous Brothers (1955)	Love, loss, loneliness, commitment
Yakety Yak	The Coasters (1958)	Obligations, authority
Motown	Composer or Artist	Potential Themes
Baby Love	The Supremes (1964)	Love, co-dependency
Dock of the Bay	Otis Redding (1968)	Loneliness, change, pessimism
I Feel Good	James Brown (1965)	Feelings, gratitude, relationships
I Heard it Through the Grapevine	Marvin Gaye (1968)	Relationships, trust, betrayal
My Girl	The Temptations (1964)	Relationships, gratitude
My Guy	Mary Wells (1964)	Relationships, pride
Stop in the Name of Love	The Supremes (1965)	Love, co-dependency, relationships
Under the Boardwalk	The Drifters (1964)	Coping, memories
1960s	Composer or Artist	Potential Themes
All You Need is Love	Beatles (1967)	Determination, love, optimism
Are You Lonesome Tonight	Elvis Presley (1960)	Loneliness, separation, memories
Blowin' in the Wind	Bob Dylan/Joan Baez (1963)	Questioning, justice
The Boxer	Simon & Garfunkel (1968)	Identity, separation, coping
Brown Eyed Girl	Van Morrison (1967)	Love, relationships, memories
Build Me Up Buttercup	The Foundations (1968)	Love, relationships, co-dependency
California Dreamin'	The Mamas & The Papas (1965)	Change, separation, desire for home
Can't Help Falling in Love	Elvis Presley (UB40 in 1993) (1961)	Love, relationships
Dancin' in the Street	Martha & The Vandellas (1964)	Dancing, excitement, community
Doo Wah Diddy	Manfred Mann (1964)	Memories, relationships
Feel a Whole Lot Better	The Byrds (1965)	End of relationships, coping
Feelin' Groovy	Simon & Garfunkel (1966)	Relaxation, coping
Good Day Sunshine	The Beatles (1966)	Coping, optimism
Good Luck Charm	Elvis Presley (1962)	Love, relationships
Hard Day's Night	The Beatles (1964)	Coping, relationships

Heatwave	Martha & The Vandellas (1963)	Love, relationships
Hello Goodbye	The Beatles (1967)	Relationships, communication
Hey Jude	The Beatles (1968)	Coping with challenges, loss, pain
House of the Rising Sun	The Animals (1964)	Identity, life choices
I Can't Get No Satisfaction	Rolling Stones (1965)	Feelings, desires, aggravations
If I Had a Hammer	Pete Seeger / Peter, Paul & Mary (1962)	Peace, social justice. altruism
I Got You Babe	Sonny & Cher (1965)	Relationships, gratitude
I'm a Believer	Neil Diamond/The Monkees (1966)	Love, relationships
I Saw Her Standing There	The Beatles (1963)	Love, relationships, memories
I Want to Hold Your Hand	The Beatles (1963)	Love, relationships, gratitude
I Will	The Beatles (1968)	Love, commitment
Leaving on a Jet Plane	John Denver / Peter, Paul & Mary (1967)	Parting, separation, relationships
Ob-La-Di Ob-La-Da	The Beatles (1968)	Family, roles, expectations
Raindrops Keep Fallin' on My Head	From Butch Cassidy & Sundance Kid (1969)	Coping with challenges
R-E-S-P-E-C-T	Otis Redding/Aretha Franklin (1965/7)	Self-esteem, relationships
Scarborough Fair	Simon & Garfunkel (1965)	Relationships, memories
Soul Man	Sam & Dave (1967)	Identity
Sound of Silence	Simon & Garfunkel (1966)	Doubt, coping, challenges, priorities
Stand By Me	Ben E. King (1961)	Support, coping
Twist & Shout	Isley Brothers / the Beatles (1963)	Excitement, dancing
Turn, Turn, Turn	The Byrds (1965)	Change, perspective, coping
What the World Needs Now is Love	Jackie DeShannon (1965)	Altruism, peace, relationships
With a Little Help from my Friends	The Beatles (1968)	Support, friendship, coping
Wonderful World (Don't Know Much)	Sam Cooke (1960)	Identity, self-esteem, relationships

Yellow Submarine	The Beatles (1966)	Community, friendship
Yesterday	The Beatles (1965)	Regret, memories, perspective, loss
You Can't Always Get What You Want	Rolling Stones (1969)	Coping, perspective
You've Got to Hide Your Love Away	The Beatles (1965)	End of relationship, coping
1970s	Composer or Artist	Potential Themes
Ain't No Sunshine	Bill Withers (1971)	Loss, relationships, mixed feelings
American Pie	Don McLean (1972)	Memories, community
Annie's Song	John Denver (1974)	Love, gratitude
Bridge Over Troubled Water	Simon & Garfunkel	Support, determination, challenges
Cat's in the Cradle	Harry Chapin	Life changes, family, relationships
Circle Game	Joni Mitchell	Life changes, perspective, coping
Close to You	The Carpenters	Love, relationships
Crocodile Rock	Elton John	Memories, dancing
Desperado	The Eagles	Coping, change, desperation
Don't Stop (Thinking about Tomorrow)	Fleetwood Mac	Optimism, support, coping
Down on the Corner	Creedence Clearwater Revival	Community, relationships
Dust in the Wind	Kansas	Pessimism, desperation, loss
D'yer Mak'er	Led Zeppelin	Love, relationships, mixed feelings
For the Good Times	Kris Kristofferson	Memories, relationships, loss
Free Bird	Lynyrd Skynyrd	Identity, freedom
Gimme 3 Steps	Lynyrd Skynyrd	Relationships, struggles
Help Me Make it Through the Night	Kris Kristofferson & Rita Coolidge	Relationships, support
I Can See Clearly Now	Johnny Nash	Optimism, coping with challenges
Imagine	John Lennon	Community, altruism, change
I Will Survive	Gloria Gaynor	Determination, coping, inner strength
Joy to the World	Three Dog Night	Identity

Killing Me Softly	Roberta Flack	Relationships, mixed feelings
Knock Three Times	Tony Orlando & Dawn	Love, relationships
Landslide	Stevie Nicks	Life changes, identity, relationships
Lay Down Sally	Eric Clapton	Relationships
Lean on Me	Bill Withers	Support, relationships
Let it Be	The Beatles	Acceptance, coping, support
Lonely People	America	Loneliness, determination, support
Margaritaville	Jimmy Buffet	Coping, community
Old Time Rock n Roll	Bob Seger	Coping, music
Operator	Jim Croce	Relationships, loss, change
Peaceful Easy Feeling	The Eagles	Relationships, change
Piano Man	Billy Joel	Identity, coping, community
Stairway to Heaven	Led Zeppelin	Transitions, coping, perspective
Still the Same	Bob Seger & The Silver Bullet Band	Relationships, patterns, identity
Sweet Home Alabama	Lynyrd Skynyrd	Home, identity, community
Take it Easy	The Eagles	Support, identity
Take Me Home, Country Roads	John Denver	Home, identity, community
Tie a Yellow Ribbon Round the Old Oak	Tony Orlando & Dawn	Return, relationships
Tuesday's Gone	Lynyrd Skynyrd	Relationships, freedom, identity
We are the Champions	Queen	Determination, community, identity
We Go Together	from "Grease"	Support, community, excitement
Wonderful Tonight	Eric Clapton	Love, relationships, gratitude
You are So Beautiful	Joe Cocker	Love, relationships, gratitude
You are the Sunshine of My Life	Stevie Wonder	Love, relationships, gratitude
You're the One that I Want	from "Grease" (1971)	Love, relationships, excitement
Your Mama Don't Dance	Loggins & Messina	Family, relationships, dancing
Your Song	Elton John	Support, relationships, gifts

You've Got a Friend	James Taylor / Carole King	Support, relationships, coping
1980s	Composer or Artist	Potential Themes
Against the Wind	Bob Seger (1980)	Relationships, memories, struggles
Alone	Heart	Relationships, separation, coping
Don't Stop Believin'	Journey	Determination, support
Forever Young	Rod Stewart	Relationships, identity, determination
Just the Way You Are	Billy Joel	Love, relationships, acceptance
Open Arms	Journey	Love, relationships, commitment
The Rose	Bette Midler	Love, relationships, challenges
Sara	Jefferson Starship	Love, relationships
She's Always a Woman to Me	Billy Joel	Love, support, relationships
Smooth Operator	Sade	Identity, relationships
Take on Me	A-Ha	Relationships, communication
That's What Friends are For	Dionne Warwick	Friendship, support
These are the Days of Our Lives	Queen	Perspective, community, memories, identity
True Colors	Cyndi Lauper	Identity, self-esteem, support
Walking on Sunshine	Katrina & the Waves	Optimism, love
We Built this City	Jefferson Starship	Community
Where Everybody Knows Your Name	Cheers theme	Community, identity, support
Wind Beneath My Wings	Bette Midler	Relationships, support

1990s	Composer or Artist	Potential Themes
All Star	Smashmouth	Identity
Come to My Window	Melissa Etheridge	Relationships, support
Everybody Hurts	REM	Coping, loneliness, desperation
Hero	Mariah Carey	Support, inner strength, determination
I Believe I Can Fly	R. Kelly	Determination, optimism
If it Makes You Happy	Sheryl Crow	Identity, determination, coping
Free Fallin'	Tom Petty	Relationships, identity
My Heart Will Go On	Celine Dion	Determination, loss, love
Over the Rainbow	Little Iz	Questioning, coping with challenges
River of Dreams	Billy Joel	Dreams, coping, desires
The Show Must Go On	Queen	Determination, change, coping
Strong Enough	Sheryl Crow	Relationships, identity
Tears in Heaven	Eric Clapton	Loss, grief, coping, relationships
You Are Not Alone	Michael Jackson	Support, coping
2000s	Composer or Artist	Potential Themes
Bad Day	Daniel Powter	Coping, support, perspective
Come Away With Me	Norah Jones	Love, relationships
I'm Yours	Jason Mraz	Love, relationships
I Turn to You	Christina Aguilera	Support, relationships
Keep Breathing	Ingrid Michaelson	Coping, challenges
Say	John Mayer	Relationships, communication
Through the Rain	Mariah Carey	Determination, coping
Walk Away	Kelly Clarkson	Inner strength, boundaries

Appendix E – Raw Data

Subject Number	Gender	Age	Type of Procedure	Treatment Group
103	Female	57	CC	EAC
104	Male	65	CC	MT/EAC
105	Female	47	CC	EAC
106	Male	68	CC	MT/EAC
107	Female	67	CC	MT/EAC
108	Male	72	CC	EAC
109	Female	70	CC	EAC
110	Female	67	CC	EAC
112	Male	58	CC	Control
113	Male	51	CC	EAC
114	Female	66	CC	EAC
115	Male	37	EP Study	EAC
120	Female	36	EP Study	EAC
121	Male	70	CC	MT/EAC
123	Female	60	CC	MT/EAC
124	Male	66	EP Study	Control
125	Male	75	CC	MT/EAC
126	Female	74	CC	Control
127	Male	40	CC	MT/EAC
128	Female	69	CC	EAC
130	Male	52	CC	MT/EAC
131	Male	70	CC	MT/EAC
132	Female	78	CC	MT/EAC
133	Male	68	CC	MT/EAC
134	Male	66	CC	MT/EAC
135	Male	43	EP Study	EAC
137	Male	75	CC	Control
140	Male	73	CC	Control
141	Male	79	CC	MT/EAC
142	Female	68	CC	Control
143	Male	72	CC	Control
144	Male	66	CC	EAC
145	Male	88	CC	Control
146	Male	86	CC	EAC
147	Female	46	CC	EAC
148	Male	45	CC	Control
149	Male	62	EP Study	Control

Note. CC = cardiac catheterization, EP Study = electrophysiological study; EAC = Emotional-Approach Coping treatment group; MT/EAC = Music Therapy with Emotional-Approach Coping treatment group

Sub #	prepain	prepnpos	prepnneg	precope	prehosp	postpain	postpnpos	postpnneg	postcope	posthosp
103	3.0	25	23	92	99	3.0	25	19	97	100
104	.0	31	15	98	87	.0	35	15	97	88
105	3.0	29	12	70	88	2.0	34	11	76	86
106	.0	18	10	98	98	.0	19	10	97	98
107	.0	42	10	97	99	.0	46	10	100	100
108	1.0	26	20	78	82	1.0	26	16	80	83
109	1.0	27	14	94	99	.0	23	11	99	99
110	.0	41	10	86	93	.0	46	10	95	90
112	.0	36	14	92	100	.0	34	12	95	100
113	7.0	38	28	26	85	5.0	38	24	69	100
114	.0	33	23	100	97	.0	37	22	100	100
115	.0	32	13	98	98	.0	30	13	98	97
120	.0	24	36	47	100	.0	28	36	61	100
121	3.0	22	15	87	82	3.0	23	18	78	93
123	.0	27	20	76	97	.0	42	10	99	99
124	.0	29	16	100	100	.0	24	14	100	100
125	.0	30	14	87	100	.0	34	10	100	100
126	3.0	20	12	79	94	4.5	16	19	61	90
127	4.0	25	21	25	46	3.0	28	24	35	52
128	2.0	43	16	93	99	2.0	39	19	91	99
130	1.0	30	31	91	97	1.0	35	13	85	95
131	1.0	23	15	98	99	.0	30	14	98	98
132	.0	24	18	92	95	.0	38	10	98	99
133	.0	31	11	92	99	.0	39	10	90	100
134	.0	37	13	99	99	.0	31	11	99	99
135	5.0	29	29	84	13	6.0	28	30	81	3
137	.0	29	10	82	100	.0	27	10	79	100
140	.0	27	15	69	98	.0	29	12	84	95
141	.0	31	10	82	90	.0	35	10	69	88
142	.0	29	21	73	71	.0	32	16	75	77
143	.0	35	16	81	95	.0	37	15	81	98
144	1.0	39	30	84	96	.0	43	16	93	94
145	.0	28	17	78	68	.0	25	21	65	87
146	.0	28	11	100	99	.0	30	11	100	99
147	7.0	26	14	66	97	8.0	25	12	82	100
148	3.0	39	10	97	97	3.0	41	10	97	98
149	.0	34	12	96	93	4.0	40	14	94	94

Note. Prepain = pre-test pain, prepnpos = pre-test PANAS positive affect scale, prepnneg = pre-test PANAS negative affect scale, precope = pre-test coping self-efficacy, prehosp = pre-test hospital satisfaction, postpain = post-test pain, postpnpos = post-test PANAS positive affect scale, postpnneg = post-test PANAS negative affect scale, postcope = post-test coping self-efficacy, posthosp = post-test hospital satisfaction.

Sub #	HR1	HR2	HR3	HR4	RR1	RR2	RR3	RR4	OxSat1	OxSat2
103	62	65	70	63	13	13	13	15	99	98
104	52	54	52	52	0	19	19	15	100	99
105	85	84	84	82	19	20	18	14	96	97
106	59	58	57	56	17	17	19	17	97	98
107	66	68	73	69	23	19	17	27	0	0
108	57	49	63	54	13	18	19	19	95	98
109	56	61	58	61	17	19	12	13	99	98
110	60	60	60	0	16	25	22	0	99	99
112	76	64	63	60	17	14	12	22	100	99
113	69	72	67	68	19	20	19	21	97	97
114	76	78	78	81	16	15	16	16	100	100
115	61	64	65	63	14	16	20	14	97	97
120	72	80	81	77	24	17	18	13	99	99
121	66	63	67	75	14	16	22	17	98	98
123	57	56	57	59	22	28	18	15	98	99
124	127	119	121	113	24	25	24	21	95	94
125	102	109	107	117	25	18	27	23	97	89
126	59	60	66	83	16	16	20	16	97	96
127	84	86	87	83	18	22	0	21	94	93
128	94	97	100	95	20	19	28	19	97	100
130	73	73	73	73	18	16	15	18	100	99
131	67	70	69	69	20	25	18	21	95	95
132	50	48	64	52	21	13	23	15	96	96
133	48	49	49	46	0	0	0	0	97	98
134	68	68	64	0	24	19	15	0	97	97
135	83	78	80	82	12	14	14	23	95	98
137	63	59	53	53	25	16	16	15	98	98
140	62	62	59	63	15	14	20	15	96	98
141	53	53	54	52	19	15	18	17	94	95
142	65	61	63	60	22	16	12	10	95	98
143	61	59	64	61	17	14	16	16	100	97
144	56	59	56	57	16	15	18	20	95	97
145	46	67	59	62	21	23	17	15	98	98
146	64	60	60	60	16	19	12	19	98	97
147	72	70	68	64	28	23	14	11	90	91
148	54	51	59	58	17	16	17	17	98	99
149	84	83	82	82	17	22	19	19	98	98

Note. HR = heart rate, RR = respiratory rate, OxSat = oxygen saturation. Data values of "0" indicate missing data.

Sub #	OxSat3	OxSat4	SysBP1	SysBP2	SysBP3	SysBP4	DiaBP1	DiaBP2	DiaBP3	DiaBP4
103	99	99	126	120	131	128	44	64	63	59
104	100	100	139	138	145	133	55	61	60	62
105	96	98	99	103	110	107	50	54	50	49
106	98	97	133	124	124	115	77	76	72	75
107	0	0	114	126	131	119	70	68	68	62
108	97	95	112	129	125	116	41	50	75	56
109	99	100	140	134	131	135	64	68	60	65
110	100	0	155	162	163	0	119	101	104	0
112	100	100	132	132	130	116	69	70	63	65
113	97	97	122	139	135	135	75	89	83	87
114	100	100	119	115	105	0	66	41	63	0
115	97	98	107	115	109	108	70	75	59	70
120	99	98	107	105	110	117	68	66	66	84
121	98	98	110	106	130	117	51	54	63	98
123	98	98	122	134	140	147	57	68	71	67
124	95	95	140	122	138	145	70	80	77	86
125	87	88	112	0	126	134	78	0	83	87
126	100	100	80	68	87	90	46	44	49	34
127	92	93	144	157	155	146	90	88	86	90
128	99	96	138	138	137	131	55	55	72	71
130	100	100	100	100	106	99	46	48	45	45
131	98	94	132	137	142	149	66	73	74	70
132	97	97	103	117	111	118	54	60	60	60
133	98	99	124	0	123	126	65	0	75	76
134	96	0	138	130	132	149	84	78	76	81
135	98	97	154	148	157	154	98	126	106	104
137	98	98	145	157	145	151	61	54	54	56
140	96	98	117	126	128	131	60	60	60	67
141	95	95	106	150	146	131	52	47	52	44
142	98	98	108	109	115	113	54	57	52	56
143	97	97	135	174	178	168	74	90	57	78
144	96	94	105	114	122	107	61	71	67	66
145	98	98	121	125	123	122	73	88	65	83
146	99	98	135	150	148	149	69	76	80	78
147	93	92	120	114	118	106	56	64	53	69
148	97	98	110	113	114	0	58	74	60	0
149	99	97	120	117	110	122	67	62	66	65

Note. OxSat = oxygen saturation, SysBP = systolic blood pressure, DiaBP = diastolic blood pressure. Data values of "0" indicate missing data.

Subject #	Length of Procedure	*Mg* Versed®	*Mcg* Fentanyl	Additional Meds
103	30.0	2.00	75.00	no
104	.0	.0	.0	yes
105	41.0	1.00	50.00	no
106	96.0	2.00	50.00	no
107	171.0	5.00	250.00	no
108	43.0	2.00	25.00	no
109	41.0	.0	.0	yes
110	27.0	2.00	50.00	no
112	103.0	4.00	100.00	no
113	26.0	4.00	100.00	no
114	50.0	2.00	50.00	no
115	288.0	16.00	600.00	yes
120	130.0	6.00	200.00	no
121	27.0	.0	50.00	yes
123	50.0	2.00	50.00	no
124	262.0	12.00	575.00	yes
125	52.0	1.00	25.00	no
126	82.0	3.00	100.00	no
127	43.0	2.00	75.00	no
128	60.0	4.00	125.00	yes
130	45.0	3.00	75.00	no
131	29.0	1.50	50.00	no
132	101.0	3.00	150.00	no
133	61.0	2.00	50.00	no
134	27.0	3.00	50.00	no
135	240.0	.0	.0	yes
137	48.0	2.00	50.00	no
140	178.0	3.00	50.00	no
141	54.0	2.00	50.00	no
142	50.0	2.00	50.00	no
143	67.0	4.00	100.00	no
144	143.0	3.00	25.00	no
145	152.0	1.50	75.00	no
146	82.0	4.00	100.00	no
147	48.0	.0	.0	yes
148	60.0	2.00	50.00	no
149	91.0	4.00	150.00	no

Note. Data values of "0" indicate missing data. Study participants who received additional medication beyond the standard protocol of Versed® and Fentanyl were removed from the analysis of medications received.