THESIS

# THE EFFECT OF MUSIC THERAPY ON THE ANXIETY LEVELS OF WOMEN AWAITING BREAST CANCER SURGERY

Submitted by

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# ABSTRACT

## THE EFFECT OF MUSIC THERAPY ON THE ANXIETY LEVELS OF WOMEN AWAITING BREAST CANCER SURGERY

Breast cancer is a leading cause of death in females. Women encountering the combination of surgery *and* prospective cancer may be faced with intense anxiety. As a familiar and aesthetic medium, music has the ability to ease anxiety, act as a diversion, and dispel the fear that accompanies the unknown (Stevens, 1990). The purpose of this study was to assess the effects of live and recorded music on the perceived anxiety of women awaiting breast cancer surgery. In this study, 86 women were randomized into a control and two experimental groups. Treatment groups received either live or recorded preferred music in addition to standard care in the preoperative unit, while the control group received standard care alone. A one-way ANOVA comparison revealed that the addition of either live or recorded music facilitated by a board certified music therapist significantly reduced patient-perceived anxiety ($p = 0.001$) more than standard care alone. The findings here may provide a basis for future research where further evidence can be established by developing a more controlled alternative to 'standard care' and by investigating different surgical populations at a multitude of diverse medical institutions.

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# CHAPTER ONE: INTRODUCTION

Breast cancer is the leading cause of fatality for women aged 35- 50 (Xiao-Mei, 2011), and the second leading cause of death among American women (National Breast Cancer Society, 2013). A potentially cancerous mass or diagnosis of malignancy propels many women toward necessary decisions regarding the paramount course of action in preventing metastization. Modern-day technologies that permit early detection and swift surgery have increased the probability of long-term remission and survival.

Although there are various treatment options, including chemotherapy and hormone therapy, prognosis of a cure significantly improves when tissue removal surgery is paired with radiation therapy (Clarke, 2005). Feasible operations range from total mastectomy to lumpectomy to surgical biopsy (American Cancer Society, 2013). Although stage one breast cancer currently has an 88% survival rate (American Cancer Society, 2013), it is not surprising that breast cancer surgery may still be accompanied by fear and uncertainty (Miller, 1995).

Women facing the combination of surgery *and* prospective cancer may be faced with intense anxiety. Anxiety surrounding breast cancer encompasses apprehension of pain, embarrassment and possible diagnosis (Burgess, 2005). Specific to surgery, the anxiety is directly related to fright surrounding an unfamiliar environment, loss of control, risk of deformity, and fear of death (Cowan, 1991).

*Rationale*

The American Music Therapy Association defines music therapy as the clinical and evidence based practice of using music intervention to accomplish individualized goals within a therapeutic relationship (AMTA, 2013).

Music therapy has been found to be extremely helpful in the reduction of anxiety. This medium has the ability to facilitate relaxation and anxiety reduction by promoting reduced muscle tension, reduced respiratory rate, and an optimal sense of well-being (Gfeller, 2008). In the surgical arena, music therapy has been commissioned to decrease anxiety, heart rate and blood pressure preoperatively (Mok, 2006), reduce anesthesia requirements intraoperatvely (Zhang, 2005), manage pain postoperatively (Tse, 2005), and raise patient satisfaction with the entire process (Heitz, 1992).

*Statement of the Problem*

The purpose of this research is to study the effect music therapy has on the anxiety levels of women awaiting surgical breast biopsy. Although recorded music has been found to reduce preoperative anxiety, there is little known research using live, preferred music in the preoperative arena. While recorded music has been studied preoperatively, it is typically selected and administered by a nurse. This investigation, with its large sample size, will explore the facilitation of *both* live and recorded preferred music listening in the preoperative area by a board certified music therapist. The data for this study is a subset of records taken from a larger study approved by the Cancer IRB of University Hospitals, Cleveland.

*Significance of the study/potential impact*

The purpose of this study is to learn whether live or recorded, preferred music therapy is a valid means of treating anxiety in persons facing surgery when compared to standard care with no music. If results are significant, it may provide new realms of employment for music therapists in the surgical arena.

*Research Question*

> Are live and recorded music therapy equally effective in reducing preoperative anxiety in women awaiting breast cancer surgery when compared to a control group who receives no music in the preoperative area?

*Hypothesis*

Because live and recorded music reduced anxiety more than no intervention for hospitalized patients, there will be a significant difference in anxiety levels in favor of both live and recorded music groups when compared to a control group of women awaiting breast cancer surgery.

*Null Hypothesis:*

There will be no statistically significant difference in pre-to-postoperative anxiety reduction across the live music, recorded music and no music groups ($p < .05$

## CHAPTER TWO: LITERATURE REVIEW

*Introduction to Breast Cancer*

The American Cancer Society estimates that an astounding approximation of 232,340 new breast cancer cases are diagnosed in the United States each year, resulting in 39,640 annual deaths (American Cancer Society, 2013). Breast cancer develops when abnormal, mutated cells with damaged DNA cultivate and invade surrounding normal cells, forming a mass of tissue called a lump or tumor. If left untreated, cancer cells, which fail to die as typical cells do, can metastasize and spread to other tissues and organs throughout the body. Although the exact cause of breast cancer is unknown, family history is a major risk factor, making the diagnosis devastating to generations of family members (National Breast Cancer Foundation, 2013).

Timely treatment of breast cancer is important to its remission and surgery is often the best option for diagnosing and removing cancerous tissue (American Cancer Society, 2013). It is indicated that the 5-year-event-free survival rate is significantly higher for those who opt for surgery in addition to radiation therapy (Clarke, 2005).

If detected early enough, a partial, (or segmented) mastectomy, can be performed. During partial mastectomy, only the affected portion of the breast is removed and most of the organ is saved. The idiom 'partial mastectomy' can be an umbrella term for a myriad of tissue removal procedures including biopsy, lumpectomy and re-excision. A surgical breast biopsy is the removal of a lump or abnormal area of questionable tissue that has been found during mammographic imaging. A lumpectomy is a very similar procedure although the term typically implies that the lesion is already known to be malignant and additional care is taken to try to ensure clear margins when excising the tumor. A re-excision is a secondary

surgery that is performed when the margins around an excised lump were found to be inadequate during the primary operation. If the surgeon can not remove enough tissue to ensure negative (or clear) margins during re-excision, a total mastectomy where all breast tissue is removed must be considered (American Cancer Society, 2013). Such procedures are often performed under monitored anesthesia care (MAC) where the patient is placed in a twilight sleep while the site of incision is numbed with a local anesthetic. Although a depressed level of consciousness is experienced, patients maintain their sense of hearing during the procedure (Newman, 2010).

A woman awaiting breast biopsy is faced with the fear of possible cancer while a woman preparing for lumpectomy or re-excision may likely be worried whether or not all tissue margins will be cleared. Not only does high anxiety decrease patient satisfaction with the perioperative experience (Thomas, 1998), but "anxiety is [such] an unpleasant emotion [that it] may cause patients to avoid a planned operation" (McCleane, 1990). Anxiety is a valid concern, as an investigation by Burgess, Cornelius, et al., found that nearly half of all women diagnosed with early breast cancer experience anxiety, depression, or both in the year following identification of the disease (2005).

*Anxiety*

Anxiety is a mood state associated with anticipation for possible upcoming negative events (Barlow, 2004). While anxiety is a natural human response and adaptive warning mechanism, uncontrollable and excessive manifestations of the condition can develop into a pathological disorder (Cleveland Clinic, 2010). A momentary feeling of apprehension from heightened autonomic nervous system activity is considered to be 'state anxiety' while the

predisposition to perceive ambiguous situations as highly threatening is referred to as 'trait anxiety.' Trait anxiety frequently leads to an anxiety disorder (Funder, 2012).

The *Diagnostic and Statistical Manual of Mental Disorders,* fifth edition, organizes anxiety disorders into categories such as generalized anxiety disorder (GAD), social anxiety disorder, specific phobia, panic disorder with and without agoraphobia, obsessive-compulsive disorder (OCD), posttraumatic stress disorder (PTSD), and anxiety secondary to medical condition (American Psychiatric Association, 2013). While exact pathophysiologic mechanisms of anxiety have yet to be determined, symptoms of the resulting disorders are believed to be caused by disrupted modulation within the central nervous system (Mayo Clinic, 2013). Known risk factors include family history, substance abuse (Weissman, 2006), and significant physical health complications such as breast cancer.

Behavioral indicators of anxiety can present as restlessness, shortness of breath, fatigue, muscle tension, and fearful facial expression, while physiological responses can include increased blood pressure, heart rate, respiratory rate, and metabolism (Robb, 1995). Standard medical treatment for anxiety includes psychotherapy, cognitive behavioral therapy, and drug intervention. Antidepressants such as Selective Serotonin Re-uptake Inhibitors (SSRI) prevent the reuptake of the neurotransmitter, serotonin into the presynaptic cell. The alternative, Buspirone, alters the chemical messages nerve receptors receive by stimulating type A1 serotonin receptors while also affecting dopamine receptors. Benzodiazepines such as Valium and Xanax induce sedation to combat anxiety (Mayo Clinic, 2013). Integrative medicine techniques such as meditation, guided imagery, and acupuncture are also employed to promote relaxation and reduce the perception of nervousness (University Hospitals, 2013). Furthermore, the use of music and the clinical practice of music therapy can also assist in managing anxiety.

*Music and Anxiety*

Music has long been associated with relaxation. As a familiar and aesthetic medium, music has the ability to ease anxiety, act as a diversion, and dispel the fear that accompanies the unknown (Stevens, 1990). The human body responds to stressors by producing chemicals such as endorphins that reduce distress (Sarafino, 2006). Groundwork research suggests that musical stimuli may influence biochemical production, subsequently reducing distress (Tanioka *et al.,* 1985; Gfeller, 2008).

Music can be used to combat tension by reversing the behavioral indicators and physiological responses of anxiety. It can cue a relaxation response by promoting decreased muscular tension and deeper respiration which facilitates reduced muscular pressure on nerve endings and restores a stable supply of oxygen to muscle tissue (Pelletier, 2004; Robb, Nichols, Rutan, Bishop, & Parker, 1995). In addition, from infancy, music can have noticeably positive effects on one's heart rate, oxygen saturation levels and respiratory rates (Cassidy & Standley, 1995). These vitals, with the addition of blood pressure, which all typically rise to uncomfortable levels with anxiety, can be reduced with music listening. (Watkins, 1997; Wong *et al.,* 2001).

*Music Therapy and Anxiety*

Music therapy is defined by The American Music Therapy Association as the clinical and evidence based practice of using music intervention to accomplish individualized goals within a therapeutic relationship (AMTA, 2013). One of the many objectives music therapy can be employed for is reducing assessed anxiety. Music therapy can decrease anxiety by enhancing

emotional well-being, regulating biological indicators, and increasing comfort through the normalization of an unfamiliar environment (Gfeller, 2008).

The discipline of music therapy has many options for reducing anxiety and a few subspecialties that focus on this intention (Bonny, 1989). Playing, composing, drawing and moving to music are all interventions employed by music therapists (Gfeller, 2008). Specific to the medical/surgical realm, music can be paired with relaxation techniques (with or without guided imagery) to promote deep breathing and reduced tension. Selected music listening (client or therapist chosen) can also be used to relieve tension (Thaut & Davis, 1993), and the interventions can consist of either live or recorded compositions (Augustin, 2006; Walworth, 2008).

*Music and Surgical Anxiety*

An abundance of literature discusses the implementation of music therapy to reduce anxiety in patients awaiting surgery. Research indicates that such a reduction of apprehension in patients anticipating surgery enables faster recovery and discharge (Good et al, 2001; Sarafino, 2006). A study by Lepage (2001) found that "preoperative anxiety can be managed equally whether we opt for listening to music or for using larger dosages of anxiolytic drugs." Due to the "depressing effect on circulation and respiration of many centrally acting drugs, a diminished use seems attractive in general and any non-drug alternative [is] of particular interest" (Walter-Larsen, 1988). A study of ambulatory surgery patients by Bringman, et al found that subjects randomized to passive music listening experienced a greater reduction in anxiety than those who took the oral sedative midazolam (2009). Therefore, music therapy serves as a non-invasive, non-pharmacological alternative to reducing anxiety in patients awaiting surgery.

Past research has investigated the effect of music listening on anxiety in all stages of the surgical process. Researchers have found that patients who listened to preferred music prior to surgery had significantly lower heart rates than patients in the control group who received only preoperative instruction (Augustin, 2006). In a similar study, Mok learned that patients who listened to their choice of music preoperatively experienced significantly lower heart rates, anxiety levels, and blood pressure than patients who did not listen to music (2006). In addition, a study on the effect of recorded music in the postoperative care unit found that patients who listened to music after surgery perceived their surgical experience as significantly more pleasant the next day and one month later when compared to patients who did not receive music postoperatively" (Heitz, 1992). An early study on the effects of music on perioperative stress found that music-listening before, during and after an operation decreased perceived stress while increasing a patient's sense of well-being and control throughout the surgical process (Allen, 1983). Twenty years later, a study by Lee, Henderson and Shum, found that listening to self-selected music during the pre-procedure period assisted in reducing anxiety more significantly that a relaxing environment of reading or watching television (2003).

Specific to breast cancer surgery, music therapy has been shown to significantly reduce preoperative anxiety in women awaiting surgical breast biopsy. A study by Millar established evidence of the presence of anxiety in women awaiting breast cancer surgery by finding that the distribution of anxiety scores ranged from low to high, with most self-assessments clustered around the mid-range (1995). A pilot study by Haun (2001) on the effects of music on the anxiety levels of women awaiting breast biopsy showed that patients who received music experienced significantly less anxiety than those who did not.

Each of the above mentioned studies deal with staff-selected, recorded music distributed by a nurse and most of the known literature involves passive music-listening through headphones (Gooding, 2012). Beyond the surgical arena, however, live music therapy has been found to be beneficial in the reduction of anxiety. As early as 1983, it was found that patients "listening to live music reported significantly less tension-anxiety than did [those] listening to taped music" (Bailey, 1983). In 2007, research on the effect of live music on chemotherapy patients found that preferred live music did indeed decrease perceptions of anxiety (Ferrer, 2007). In addition, a surgical study by Walworth indicated that using live, patient-preferred music, can be beneficial in improving quality of life indicators such as perception of procedure and perceived anxiety (2008). Furthermore, a study on the effect of live music on vascular and thoracic surgical patients found that live harp music reduced pain and anxiety, further supporting the use of live music with surgical patients (Aragon, 2006).

Given the evidence, it is reasonable to suggest that live music therapy may be effective in reducing the anxiety levels of women awaiting a breast cancer operation. This study, with its large sample size, inclusion of live, patient-selected music, and facilitation by a board certified music therapist, will allow the medical field to further understand music's effect on anxiety during a potentially tense situation such as impending surgery and potential cancer diagnosis. This may ultimately introduce and validate significant means of improving cost effectiveness with less need for drug intervention and increased patient satisfaction, both of which are of utmost concern in modern hospital care.

# CHAPTER THREE: METHODOLOGY

*Research Design*

The research design is a randomized controlled trial with three groups (live music experimental group, recorded music experimental group and control group). One hundred and one patients were included in the study based on the happenstance of their upcoming surgical breast biopsy at University Hospitals, Cleveland. These patients will be the first 101 participants from a larger 201 subject parent study. Investigators received the schedules of patients undergoing surgical breast biopsy under monitored anesthesia from the physician's office. Patients were contacted by the investigator via phone to obtain verbal consent prior to surgery. After patients consented to the study, the investigator conducted a standardized phone call protocol to learn about the patient's music preference. Patients chose a favorite song she would like to hear in the pre-operative area in the event she was selected for either the live or recorded music groups. *101* subjects were randomized in a 1:1:1 ratio to a control and two experimental groups.

*Randomization Procedures*

Prior to the study, the study biostatistician prepared the randomization list using a random number generator. A permuted block randomization scheme was used with random block sizes to prevent personnel from being able to guess the next assignment. To implement the randomization, the study used an online randomization module in the REDCap software (Research Electronic Data Capture, version 4.11.1) available to University Hospital researchers through the Clinical and Translational Sciences Collaborative. The study investigator

randomized the patients by logging onto REDCap using a user ID and secure password, then followed a link allowing the researcher to request and receive the next assignment, i.e., which of the three groups the next patient will be in: control group, live music group, or recorded music group. This procedure ensured that the person carrying out the randomization could not see the entire randomization list and was unaware of the next group assignment.

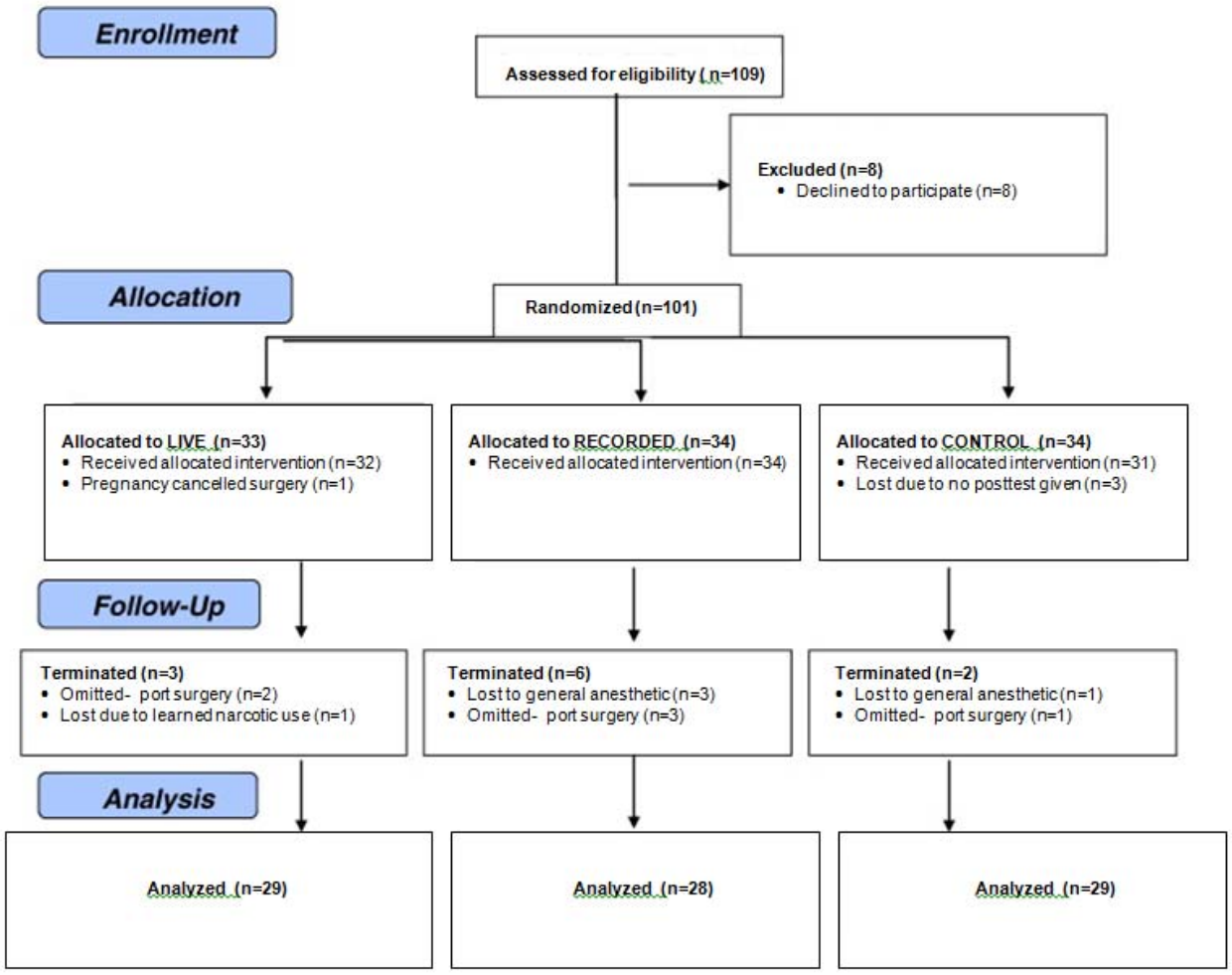
Randomization into one of three groups occurred after verbal consent was granted and phone calls were complete. Randomization occurred prior to written consent due to the researcher needing to know whether to learn a preferred song or download a song from iTunes. If a patient had decided not to participate before written consent, she would have received her surgery under standard procedures and researchers would have removed her from the investigation. With this in mind, researchers created a randomization list 20% larger on Redcap, allowing for up to 1 in 5 patients to drop out after verbal agreement. Patients were not informed as to which group they were randomized to until after written consent was obtained. The patients, however, were able to decline from participation, even after written consent was obtained.

*Participants*

Subjects undergoing surgical breast biopsy (removal of tissue) under monitored anesthesia care were eligible to participate in the study. Only English speaking women over 18 with an ASA classification of I (no systematic disease), II (mild to moderate disease who are medically stable) or III (severe systematic disease, not incapacitating) were asked to participate. Patients with profound mental illness, developmental disability, significant hearing loss where music would not be heard from headphones, and those currently taking narcotics were excluded

from the study. A total of 109 patients were contacted, of which 8 declined the study, giving the investigation a 93% accrual rate. Several subjects (N=15) were removed from the study due to: narcotic use (1), being converted to general anesthetic (4), surgery being a port removal/insertion (6), no post-test given due to pre-op time constraints (3), and positive HCG pregnancy test canceling surgery (1). **Table 1**

**Table 1: Consort**



*Procedure and Materials*

Patients randomly selected to the live music group (n= 29) were prepared one patient-selected song which was performed live by the music therapist, without interruption, in the preoperative room between standard care operations. The song selection was provided by the patient during the initial phone interview and learned by the therapist prior to the surgery date. While facilitating the patient's song choice with voice and/or guitar, the therapist stood two feet from the patient's bedside. After the live song, the therapist shared verbal communication with the patient over why the patient chose her particular song.

Patients randomly selected for the recorded music group (n=28) were given an Apple iPod touch with Sony MDR-NC7 noise cancelling headphones and listened to a recorded version of her one preferred song, without interruption, in the preoperative room in between standard care operations. The song selection was provided by the patient during the initial phone interview and downloaded from Apple iTunes by the therapist prior to the surgery date. While the patient listened to her song via iPod/headphones, the therapist left the room once volume was set to a patient-preferred level. After the song, the therapist returned to the room and shared verbal communication with the patient over why the patient chose her particular song.

Patients randomly selected for the control group (N=29) received no music while waiting for surgery, in between standard care operations. Pre/post tests were given 5 minutes apart by a nurse. During the 5-minute time period, patients waited for surgery in her preoperative room and did not share communication with the music therapist after signing consent. Standard care for all three groups included gathering of patient history, meetings with the anesthesia team, collection of vitals and consultation with the surgeon, all before drug intervention. For the sake of ethics,

control patients received their preferred song selection in the post operative area after study protocol and surgery were complete.

*Measures*

Patient anxiety was measured twice using a Global Anxiety Visual Analog Scale GA-VAS which ranged from 1 to 174 **(Appendix A)**. In investigating GA-VAS as a rating tool for anxiety, a study by Williams demonstrated "the reliability, validity and responsiveness of the GA-VAS measure [which also] minimizes patient burden" (Williams, 2010). Researchers have chosen to use the GA-VAS for this study due to its "ease of use compared with multi-question tools like the State Trait Anxiety Test (STAI)" (Kindler, 2000).

Using a GA-VAS, patients self-rated her anxiety twice. The left side of the GA-VAS scale read "not at all anxious," while the right side read "extremely anxious." Using a ball point pen, the subject marked a vertical line on the portion of the GA-VAS that corresponded with their level of her perceived current anxiety twice. A pretest was given in the preoperative area before intervention and a posttest was given after the live song, the recorded song, or 5 minutes of standard care while awaiting surgery. The investigators measured the subject's marking (vertical line) on the GA-VAS from the left end of the GA-VAS to the subject's line using a ruler. Data was recorded in millimeters and entered onto the data collection sheet **(Appendix B)**.

*Data Analysis Procedures*

Baseline clinical and demographic characteristics of the participants will be summarized by intervention group using means. The main outcome for this analysis will be the change from pre 'waiting for surgery' to post 'waiting for surgery' in VAS scores for anxiety given by each

patient, identified as a secondary outcome in the original protocol. The primary comparisons of interest will be to compare each of the two music groups to the control (non-music) group, using a one-way ANOVA using pretest to posttest change scores analyzed in SAS. Differences between the three groups will be assessed.

## CHAPTER FOUR: RESULTS

*Summary of data*

101 eligible patients were randomized. As per the CONSORT diagram, 101 patients were assessed for eligibility and randomized (33 in the Live group, 34 in the Recorded group, and 34 in the Control group). After exclusions due to pregnancy, no post-surgery data, exclusion due to learned narcotic use, loss due to use of general anesthetic, and exclusions due to port surgery, the numbers of subjects included in this analysis were 29, 29, and 28 in the Control, Live, and Recorded groups, respectively. Table 1 summarizes subject race and type of breast cancer surgery by treatment arm.

**Table 1. Baseline Factors- Race and Surgical Procedure**

| | **Control (n=29)** | **Live (n=29)** | **Recorded (n=28)** |
|---|---|---|---|
| Race n (%) | | | |
| Asian | 1 (3.45) | 1 (3.45) | 0 (0.0) |
| Black | 6 (20.69) | 8 (27.59) | 6 (21.43) |
| Hispanic | 0 (0.0) | 1 (3.45) | 0 (0.0) |
| White | 22 (75.86) | 19 (65.52) | 22 (78.57) |
| | | | |
| Surgical Procedure n (%) by surgeon L or S | | | |
| L Bx | 12 (41.38) | 15 (51.72) | 10 (35.71) |
| L Lump | 4 (13.79) | 2 (6.90) | 8 (28.57) |
| L Reex | 4 (13.79) | 4 (13.79) | 2 (7.14) |
| S Bx | 5 (17.24) | 5 (17.24) | 4 (14.29) |
| S Duct | 1 (3.45) | 0 (0.00) | 1 (3.57) |
| S Lump | 1 (3.45) | 2 (6.90) | 0 (0.00) |
| S Mass | 1 (3.45) | 0 (0.00) | 1 (3.57) |
| S Reex | 1 (3.45) | 1 (3.45) | 2 (7.14) |

Table 2 summarizes pre- and post VAS scores, as well as the change in VAS Score (post-pre) by treatment group (upper panel).

**Table 2. VAS Pre-test and Post-test scores**

| | **Control (n=29)** | **Live (n=29)** | **Recorded (n=28)** |
|---|---|---|---|
| VAS Pre | | | |
| mean ± SD (Median) | 48.6 ± 42.9 (37) | 61.7 ± 41.5 (50) | 65.1 ± 39.6 (57.0) |
| [min,max] | [1, 142] | [5, 142] | [6,146] |
| | | | |
| VAS Post | | | |
| mean ± SD (Median) | 47.8 ± 40.5 (34) | 36.3 ± 32.0 (24) | 39.4 ± 32.3 (28.5) |
| [min,max] | [1, 138] | [0, 106] | [2, 121] |
| | | | |
| VAS change (post-pre) | | | |
| mean ± SD (Median) | -0.8 ± 16.5 (0) | -25.4 ± 38.3 (-14) | -25.7 ± 24.1 (-19) |
| [min,max] | [-67, 22] | [-123, 67] | [-73, 14] |

*Statistical Analysis*

The collected data was imported via Excel 2009 and analyzed using Statistical Analysis System (SAS 9.2) software. The SAS program calculated a one-way ANOVA. This statistical test was used to test for a difference in the means of pre to post change in treatment effects ($p < .05$). Table 3 confirms that there is a significant variance between the means of the treatment groups.

**Table 3. ANOVA Data**

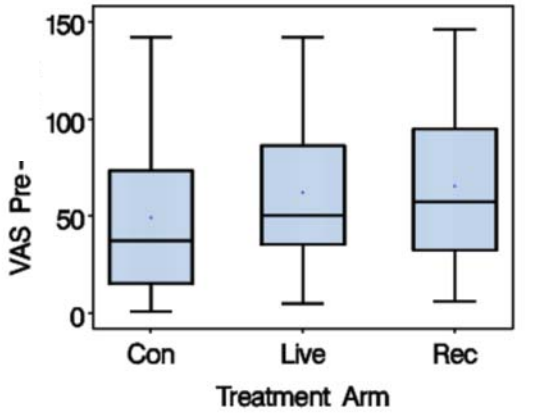
| Source | DF | Sum of Sqaures | Mean Square | F Value | p-value |
|---|---|---|---|---|---|
| Model | 2 | 11743.55276 | 5871.77638 | 7.56 | 0.0010 |
| Error | 83 | 64454.67980 | 776.56241 | | |
| Corrected Total | 85 | 76198.23256 | | | |

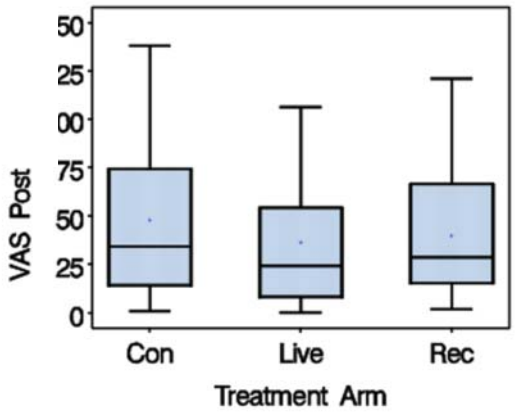
In the second analysis, the VAS Scores of live versus control, recorded versus control, and live versus recorded were compared. Table 3 displays the comparison of VAS scores across treatments. P-values must be less than 0.05 to be declared statistically significant. P-values that are significant using this criterion are labeled with asterisks.

**Table 4. Comparison of VAS Scores difference across treatments**

| Comparison of VAS Scores across treatments | DF | Contrast SS | Mean Square | F Value | p-value |
|---|---|---|---|---|---|
| Live vs. Control | 1 | 8740.413793 | 8740.413793 | 11.26 | 0.0012* |
| Recorded vs. Control | 1 | 8822.989889 | 8822.989889 | 11.36 | 0.0011* |
| Live vs. Recorded | 1 | 1.598479 | 1.598479 | 0.00 | 0.9639 |

Figure 1 presents box plots summarizing the VAS pre- and post-op scores as well as the change score. In the box plot, the lower and upper edges of the box represent the $25^{th}$ and $75^{th}$ percentiles, the horizontal line within the box represents the median, and the plus sign represents the mean. The lines extending above and below the box extend to the minimum and maximum values.



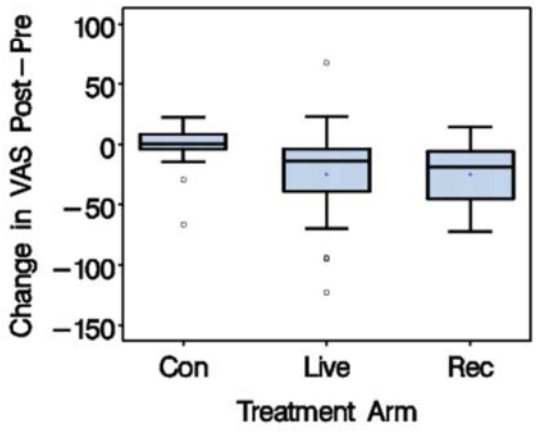




**Figure 1. Box plots of VAS Pre-test and post test scores**

The results show that in this trial, both live and recorded preferred music were statistically significant in reducing anxiety in women awaiting breast cancer surgery, thus rejecting the null hypothesis. Our statistical test reveals that there is only .001% chance of type 1 error and if the same investigation were to be repeated, the same results would be obtained in 99.99% of future trials. There was no significant difference between live and recorded music in this trial.

## CHAPTER FIVE: DISCUSSION

This study determined both live and recorded music listening of one preferred song in the preoperative area to be statistically significant in reducing anxiety in women awaiting breast cancer surgery when compared to the anxiety levels of those in the control group who did not receive a music intervention. Although live music was found to be slightly more beneficial than recorded music, the difference could not be declared statistically significant.

With a population of 86 participants, the sample size was large enough to determine significance, however the data is part of an ongoing trial that will continue for another year, accruing a total of 201 patients. This parent study will allow the researcher to further determine effectiveness and statistical significance of the music therapy intervention. With an accrual rate of 93%, researchers can infer that the offer of music therapy prior to surgery is an appealing one for women facing breast cancer.

Even with promising results, the trial was not void of limitations. Finding a period of time to facilitate the music therapy intervention in a high-paced, preoperative environment not accustomed to music therapy practices posed a challenge. The researchers were required to facilitate the live or recorded music at varied times when other staff was not interviewing or preparing the patient for surgery. Because the intervention did not happen in the same order of procedural occurrence for each patient questions about anxiety levels due to other factors arise. Collaboration and structure is vital, yet difficult with an ever-changing team of surgeons, nurses, anesthesiologists and nurse anesthetists. Future research may wish to work with a limited team so that a strict order can be added to the protocol. Due to such time constraints and varied personnel, however, the VAS proved to be an excellent anxiety measurement tool and is

recommended for further use in the preoperative unit. It was swift to implement, easy to explain, and understandable to patients. Its facilitation by a staff member not providing the intervention also established a condition of non-bias.

Another substantial limitation was the control condition of '5 minutes of standard care in the absence of a music therapist' which did not provide consistency within the control group during this trial, leading to the question of whether anxiety levels of the experimental group improved due to personal human contact and not the music alone. Although one can argue that the human element is part of the package presented by a music therapist, other studies have compared the effects of music listening to a very controlled environment such as reading or watching television in a waiting room (Lee, 2004), and future research in the preoperative area should remove variability to the control group.

Offering patients a song of her choice posed additional demands on the therapist, not typically transferable to real-world setting. In giving the patient such a broad option of hearing "any song that helps you feel calm and supported," many patients needed time to consider her selection. Therapists had to call several subjects many times, learn a new song for each live music case or download a song from iTunes for each recorded music case. In an actual work environment, this would not be cost-effective nor reasonable for each surgical patient and it is recommended that future investigations be done with a book of varied song selections and/or playlist filled with pre-downloaded songs that a patient can choose from on the morning of her surgery. This revision may translate better to real-world practices where many patients could be reached on a daily basis with ease.

In looking at the pretest means between the three groups, it is evident that the control group averaged lower pretest anxiety than the live and recorded music groups. This could affect

the results since the pretest scores were not similar between the three groups. In order to account for this, the results were checked using a 2 x 3 ANCOVA of change scores, where the pre-test was entered as the covariate. Results indicated that the live and recorded groups had significantly lower change scores at this
overall mean pre-test score (-23.28 and -23.35), compared to the Control (mean -2.08). Additionally, the plots suggest that at higher anxiety levels, the live group experienced greater anxiety reduction than the recorded group, making a case for the importance of music therapist facilitation in cases of extreme anxiety. Another possibility would be to use non-parametric statistics, which do not have the assumption of normal distribution in the data. Future researchers should consider alternative methods of analyzing similar data.

To investigate the mechanisms behind this study's success, one can begin with the music alone, which has been found to produce anxiety-reducing effects. By lowering heart rate, blood pressure and respiratory rates, music provides a physiological state where anxiety cannot thrive. Since anxiety is often understood to be an imbalance in the nervous system (Friedman, 1998), music may activate the relaxation response in the parasympathetic branch of the autonomic nervous system, thus counteracting the sympathetic nervous system's 'fight or flight' response to a potential danger such as cancer or surgery.

A study by White (1999) revealed that patients recovering from myocardial infraction who listened to music in a restful environment experienced greater cardiac autonomic balance as measured by decreased heart rate, respiratory rate and myocardial oxygen demand when compared to those who experienced only a restful environment or standard care.

George Mandler theorized that arousal of the sympathetic branch of the ANS results when an actual event conflicts with what was anticipated (Thompson, 2009). Surgery and cancer

can certainly be understood as unexpected occurrences. The incongruence between what is expected and what is real can promote qualities of anxiety such as increased breathing, heart rate, and blood pressure. Dissimilarly, preferred music delivers the expected. Pleasant and familiar melodies, rhythmic patterns and lyrics of a song may provide a welcome contrast to trauma when one receives that which is anticipated, thus restoring balance to the ANS.

Another reason why those who experienced personalized music therapy experienced an overall reduction in anxiety may be due to the extra and unique care they received in the preoperative area. Anecdotal data from this study was provided by patients on the day of surgery after discharge criteria was met and provides insight into the reasoning behind the success of the intervention. Testimonies from subjects in the two experimental groups reveal several things. Comments such as: "*In a place where everyone has control over you and everything is a question mark, this gave me the power"* and "*The music worked for me, I loved it… I had surgery six weeks ago and this really helped me to be more calm"* disclose that music therapy provides autonomy and stress relief in an setting filled with mystery and tension. Other explanations such as "*I am a blessed woman! I prayed to be selected and God answered my prayer… this really helped lower my anxiety*" and *"I was really happy when I got called about the music…If I didn't have the music, I'm sure I would've been very anxious… I felt very special, like a celebrity"* expose the nature of the music therapy intervention to allow patients to feel special and important at a crucial time. A study by Richards (2007) found that music not only reduces patient anxiety, but that this reduction and satisfaction is linked to the relationship formed between the health care provider and the patient. It suggests that health care facilities that strive to enhance the relationship between patients and staff will retain current customers and appeal to new ones. Anecdotal reports from this trial further lead us to believe that music

therapy may be a means of building patient-staff relationships and increasing satisfaction as secondary gains through interventions that simultaneously promote reduced levels of anxiety.

*Conclusions*

Since the null hypothesis was rejected in this case, it is possible that music therapy can reduce patient- perceived anxiety prior to surgery. In a setting where anxiety can lead to increased pharmacological intervention, dissatisfaction, and cancelled procedures, the findings in this trial provide a foundation for music therapy facilitation and employment in the surgical arena. Music therapists may not only directly serve surgical patients, but may serve as experts who can educate staff and coach patients on ways of beneficially using music. Through this trial, the surgical department of University Hospitals has become directly aware of the potential music therapy has to serve patients in the operating arena. In addition to patient anxiety and satisfaction levels being affected, hospital staff has expressed immense satisfaction and feelings of improved morale due to the interventions described in this study.

More research on the effect of live and recorded music in the preoperative environment is needed. To the best of this researcher's knowledge, no additional study on the effect of live music with women undergoing surgical breast biopsy is available. The findings here may provide a basis for future research where further evidence can be established by developing a more controlled alternative to 'standard care' and by investigating different surgical populations at a multitude of diverse medical institutions.

## REFERENCES


American Cancer Society. (2013). *Cancer Facts and Figures.* Retrieved August 21, 2013, from http://www.cancer.org/research/cancerfactsfigures/

American Music Therapy Association (2013). *What is Music Therapy.* Retrieved August 22, 2013, from http://www.musictherapy.org/about/musictherapy/

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.

Augustin P., & Hains A.A. (1996). Effect of music on ambulatory surgery patients' preoperative anxiety. *Association Of Perioperative Registered Nurses Journal, 63*(4), 750-758.

Aragon, D., Farris, C., & Byers, J.F. (2002). The effects of harp music in vascular and thoracic surgical patients. *Alternative Therapies in Health and Medicine*, *8*, 52–60.

Bailey, L. M. (1983). The effects of live music versus tape-recorded music on hospitalized cancer patients. *Music Therapy*, *3*(1), 17-28.

Barlow, D. H. (2004). *Anxiety and its disorders: The nature and treatment of anxiety and panic*. Guilford press.

Bonny, H. L. (1989). Sound as symbol: Guided imagery and music in clinical practice. *Music Therapy Perspectives 6*, 7–10.

Bringman, H., Giesecke, K., Thörne, A., & Bringman, S. (2009). Relaxing music as pre□medication before surgery: a randomized controlled trial. *Acta Anaesthesiologica Scandinavica*, *53*(6), 759-764.

Burgess, C., Cornelius, V., Love, S., Graham, J., Richards, M., & Ramirez, A. (2005). Depression and anxiety in women with early breast cancer: five year observational cohort study. *British Medical Journal*, *330*(7493), 702.

Cassidy, J. W., & Standley, J. M. (1995). The effect of music listening on physiological responses of premature infants in the NICU. *Journal of Music Therapy*, 32, 208-227.

Cowan, D.S., (1991). Music therapy in the surgical arena. *Music Therapy Perspectives, 9*, 42-45.

Cleveland Clinic (2010). Anxiety Disorders. Retrieved September 12, 2013, from http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/psychiatry-psychology/anxiety-disorder/

Craske, M. G., Rauch, S. L., Ursano, R., Prenoveau, J., Pine, D. S., & Zinbarg, R. E. (2009). What is an anxiety disorder? *Depression and Anxiety*, *26*(12), 1066-1085.

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

Ferrer, A. (2007). The effect of live music on decreasing anxiety in patients undergoing chemotherapy treatment. *Journal of Music Therapy, 44*(3), 242-255.

Fisher, B., Dignam, J., Wolmark, N., Mamounas, E., Costantino, J., Poller, W., ... & Kavanah, M. (1998). Lumpectomy and radiation therapy for the treatment of intraductal breast cancer: findings from National Surgical Adjuvant Breast and Bowel Project B-17. *Journal of Clinical Oncology*, *16*(2), 441-452.

Friedman, Bruce H., and Julian F. Thayer. "Autonomic balance revisited: panic anxiety and heart rate variability." *Journal of psychosomatic research* 44, no. 1 (1998): 133-151.

Funder, D. C. (2012). *The personality puzzle*. New York: Norton.

Gfeller, K.E. (2008). Music: A Human Phenomenon and Therapeutic Tool. Davis, W. B., Gfeller, K. E., & Thaut, M. H., *An introduction to music therapy: Theory and Practice* (pp.41-75). Silver Spring, Maryland: The American Music Therapy Association.

Gfeller, K.E. (2008). Music Therapy, Medicine and Well-Being. Davis, W. B., Gfeller, K. E., & Thaut, M. H., *An introduction to music therapy: Theory and Practice* (pp.305-341). Silver Spring, Maryland: The American Music Therapy Association.

Good, M., Stanton-Hicks, M., Grass, J. A., Anderson, G. C., Lai, H. L., Roykulcharoen, V., & Adler, P. A. (2001). Relaxation and music to reduce postsurgical pain. *Journal of advanced nursing*, *33*(2), 208-215.

Gooding, L., Swezey, S., & Zwischenberger, J. B. (2012). Using Music Interventions in Perioperative Care. *Southern medical journal*, *105*(9), 486-490.

Haun M., Mainous R.O., & Looney S.W. (2001). Effect of Music on Anxiety of Women Awaiting Breast Biopsy. *Behavioral Medicine*, *27*(3), 127-132.

Heitz L., Symreng T., & Scamman F.L. (1992). Effect of music therapy in the postanesthesia care unit: a nursing intervention. *Journal of Postanesthesia Nursing*, *7*(1), 22-31.

Kessler, R. C., Demler, O., Frank, R. G., Olfson, M., Pincus, H. A., Walters, E. E., ... & Zaslavsky, A. M. (2005). Prevalence and treatment of mental disorders, 1990 to 2003. *New England Journal of Medicine*, *352*(24), 2515-2523.

Kindler, C. H., Harms, C., Amsler, F., Ihde-Scholl, T., & Scheidegger, D. (2000). The visual analog scale allows effective measurement of preoperative anxiety and detection of patients' anesthetic concerns. *Anesthesia & Analgesia*, *90*(3), 706-712.

Lee, D., Henderson, A., & Shum, D. (2004). The effect of music on preprocedure anxiety in Hong Kong Chinese day patients. *Journal of clinical nursing*, *13*(3), 297-303.

Lepage C., Drolet P., Girard, M., Grenire, Y., & DeGange, R. (2001). Music decreases sedative requirements during spinal anesthesia. *Anesthesia & Analgesia, 93*, 912-916.

Mandler, G. *Mind and body: Psychology of emotion and stress*. New York: WW Norton, 1984.

Mayo Clinic (2013). A*nxiety Treatment and Drugs.* Retrieved September 12, 2013, fromhttp://www.mayoclinic.com/health/anxiety/

Mayo, D. (1996). *Anxiety Levels in the Preoperative Patient* (Master's Thesis). Case Western Reserve University, Cleveland, Oh.

McCleane, G.J., & Cooper, R. (1990). The nature of pre-operative anxiety. *Anaesthesia*, *45*,153–155.

Millar, K., Jelicic, M., Bonke, B., & Asbury, A. J. (1995). Assessment of preoperative anxiety: comparison of measures in patients awaiting surgery for breast cancer. *British Journal of Anaesthesia*, *74*(2), 180-183.

Mok E., & Wong K.Y. (2006). Effects of music on patient anxiety. *Association Of Perioperative Registered Nurses Journal*, *77*(2), 396-410.

National Breast Cancer Foundation (2013). *What is Cancer.* Retrieved August 21, 2013, from http://www.nationalbreastcancer.org/what-is-cancer

Pelletier, C. L. (2004). The effect of music on decreasing arousal due to stress: a meta-analysis. *Journal of music therapy*.

Peto, R., Boreham, J., Clarke, M., Davies, C., & Beral, V. (2000). UK and USA breast cancer deaths down 25% in year 2000 at ages 20–69 years. *The Lancet*, *355*(9217), 1822.

Richards, T., Johnson, J., Sparks, A., Emerson, H. (2007). The effect of music therapy on patients' perception manifestation of pain, anxiety, and patient satisfaction. *Medsurg Nursing, 16* (1), 7-14.

Robb, S. L., Nichols, R. J., Rutan, R. L., Bishop, B. L., & Parker, J. C. (1995). The effects of music assisted relaxation on preoperative anxiety. *Journal of Music Therapy*, *32*, 2-2.

Sarafino, E. P. (2006). *Health psychology: Biopsychosocial interactions*. John Wiley & Sons Inc.

Stevens, K. (1990). Patients' perceptions of music during surgery. *Journal of Advanced Nursing*, 15(9), 1045-1051.

Tanioka, F., Takazawa, T., Kamata, S., Kudo, M., Matsuki, A., & Oyama, T. (1985). Hormonal effect of anxiolytic music in patients during surgical operations under epidural anaesthesia. In R. Groh & R. Spintge (Eds.) *Angst, schmerz, musik in der anasthesie* (pp. 199-204). Basel, Switzerland: Editiones Roche.

Thaut, M. H., & Davis, W. B. (1993). The influence of subject-selected versus experimenter-chosen music on affect, anxiety, and relaxation. *Journal of Music Therapy*, *30*(4), 210-223.

Thomas, T., Robinson, C., Champion, D., McKell, M., & Pell, M. (1998). Prediction and assessment of the severity of post-operative pain and of satisfaction with management. *Pain*, *75*(2), 177-185.

Thompson, W. F. (2009). *Music, thought, and feeling: Understanding the psychology of music.* New York: Oxford University Press

Tse, M. M., Chan, M. F., & Benzie, I. F. (2005). The effect of music therapy on postoperative pain, heart rate, systolic blood pressure and analgesic use following nasal surgery. *Journal of Pain and Palliative Care Pharmacotherapy*, *19*(3), 21-29.

University Hospitals (2013). *Integrative Medicine.* Retrieved September 14, 2013, from http://www.universityhospitals.org/integrativemedicine

Walther-Larsen, S, Diemar,V., & Valentin, N. (1988). Music during regional anesthesia: a reduced need of sedatives. *Regional Anesthesia & Pain Medicine*, *13*(2), 69-71.

Walworth, D., Rumans, C. S., Nguyen, J., & Jarred J. (2008). Effects of live music therapy sessions on quality of life indicators, medications administered and hospital length of stay for patients undergoing elective surgical procedures for brain. *Journal of Music Therapy*, *45* (3), 349-359.

Watkins, G. R. (1997). Music therapy: proposed physiological mechanisms and clinical implications. *Clinical Nurse Specialist*, *11*(2), 43-50.

Weissman, M., Wickramaratne, P., Nomura, Y., Warner, V., Pilowsky, D., & Verdeli, H. (2006). Offspring of depressed parents: 20 years later. *American Journal of Psychiatry*, *163*(6), 1001-1008.

White, J.M. "Effects of relaxing music on cardiac autonomic balance and anxiety after acute myocardial infarction." *American Journal of Critical Care* 8, no. 4 (1999): 220-230.

Williams, V.S.L., Morlock, R.J., & Feltner, D. (2010).Psychometric evaluation of a visual analog scale for the assessment of anxiety. *Health and Quality of Life Outcomes, 8* 57-65.

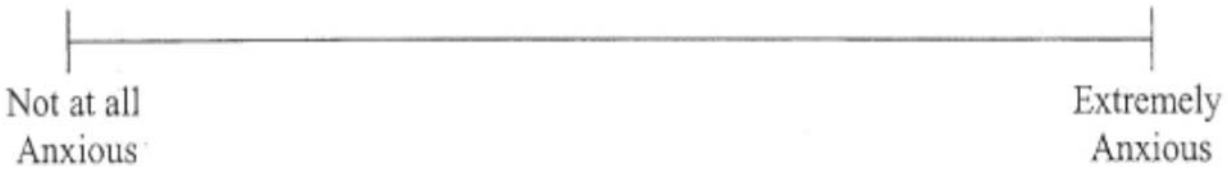
Wong, H. L. C., Lopez-Nahas, V., & Molassiotis, A. (2001). Effects of music therapy on anxiety in ventilator-dependent patients. *Heart & Lung: The journal of acute and critical care*, *30*(5), 376-387.

Xiao-mei, L.., Yan, H., Zhou, K., Dang, S., Wang, D., & Zhang, Y. (2011). Effects of music therapy on pain among female breast cancer patients after radical mastectomy: Results from a randomized controlled trial. *Breast Cancer Research Treatment, 128,* 411-419.

Zhang, X. W., Fan, Y., Manyande, A., Tian, Y. K., & Yin, P. (2005). Effects of music on target-controlled infusion of propofol requirements during combined spinal-epidural anaesthesia. *Anaesthesia*, *60*(10), 990-994.

## Appendix A

# Global Anxiety
# Visual Analog Scale



# Appendix B

## Data Collection Sheet

**Music Therapy Study**

**Investigators:** Jaclyn Palmer, MT-BC phone: 216.844.2086 cell: 310.893.4460 Pager: 39919
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**Phone Call Data**

Patient reference number: _____ Patient Age: _____ Race: _____

Date of surgery:_____ Time of surgery: _____

Surgeon:_____ Specific surgery: Lump Bx Reexcision

Location: UHCMC UHR

1. Preferred song: _____

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**Preoperative Data**

EXPERIMENT LIVE / EXPERIMENT RECORDED / CONTROL

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**<u>Anxiety ratings on Visual Analog Scale</u>**:

1. Self rate one in Pre-Op (baseline) _____

2. Self rate two in Pre-Op (after 10 minutes music therapy/ standard care) _____