Effects of Music on Anxiety and Pain in the Diagnosis and Treatment of Patients With Breast Cancer

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Effects of Music on Anxiety and Pain in the Diagnosis and Treatment of Patients With Breast Cancer

Abstract
Both pain and anxiety are common in women that are experiencing breast cancer. Biopsies during diagnosis of breast cancer, and mastectomies and chemotherapy to treat cancer are all painful and stressful events. Breast cancer patients must deal with the fear of not being able to care for children, with changed body image, sexual rejection, recurrence, medical bills and harm from adjuvant therapies. Music therapy has been shown to lessen pain and anxiety in patients during a number of different types of surgeries and chronic disease and may have the potential to help breast cancer patients.

Method: An exhaustive literature search of available medical literature was conducted using Medline-OVID, CINAHL, EBMR Multifile, and Medline-PubMed using the keywords: breast cancer and music therapy. A search on the National Institute of Health (NIH) clinical trials site was also conducted. The bibliographies of the articles were further searched for relevant sources. The search was narrowed to include only English language articles and articles that contained primary data. Only studies that were randomized controlled trials (RCTs) were included. All articles that described personal accounts or case studies were excluded. All studies that did not relate to anxiety and pain were also excluded. Relevant articles were assessed for quality using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE).

Results: Five studies met inclusion criteria and were included in this systematic review. The search on the National Institute of Health (NIH) clinical trials site revealed an unpublished study examining the effects of music therapy on the reduction of fatigue that was not included because the data had not been published. These studies examined music therapy’s affect on anxiety and pain in women during the diagnosis and treatment of breast cancer. There were three articles that addressed anxiety alone, one study that regarded only pain, and one study that evaluated both pain and anxiety.

Conclusion: The articles reviewed in this paper show that music therapy could have the potential to be a cost-effective, safe, non-pharmacologic tool for lowering pain and anxiety in the diagnosis and treatment of breast cancer patients.

Degree Type
Capstone Project

Degree Name
Master of Science in Physician Assistant Studies

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Effects of Music on Anxiety and Pain in the Diagnosis and Treatment of Patients With Breast Cancer

A Clinical Graduate Project Submitted to the Faculty of the School of Physician Assistant Studies

Pacific University

Hillsboro, OR

For the Masters of Science Degree, August 2013

Faculty Advisor: Saje Davis-Risen PA-C
Clinical Graduate Project Coordinator: Annjanette Sommers, PA-C, MS
Biography

Alysia Greco grew up living in many regions of the US, in states including California, Florida, Virginia and Nebraska. She returned to the South East to attend college at Warren Wilson College in North Carolina where she earned a B.A. in Environmental Studies with a concentration in Sustainable Agriculture. After graduation she moved “out West” to work with the Bureau of Land Management doing plant and wildlife surveys in Eastern California and Western Oregon. She then went to graduate school at Washington State University and earned an MS in Crop Science. While there, she studied the life cycle physiology of perennial wheat. After working as a horticultural researcher at Oregon State University she turned her attention to working with people and worked as a CNA before entering the PA program. She hopes to work in a rural community when she graduates.
Abstract

Background: Both pain and anxiety are common in women that are experiencing breast cancer. Biopsies during diagnosis of breast cancer, and mastectomies and chemotherapy to treat cancer are all painful and stressful events. Breast cancer patients must deal with the fear of not being able to care for children, with changed body image, sexual rejection, recurrence, medical bills and harm from adjuvant therapies. Music therapy has been shown to lessen pain and anxiety in patients during a number of different types of surgeries and chronic disease and may have the potential to help breast cancer patients.

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**Conclusion:** The articles reviewed in this paper show that music therapy could have the potential to be a cost-effective, safe, non-pharmacologic tool for lowering pain and anxiety in the diagnosis and treatment of breast cancer patients.

**Keywords:** Breast cancer, music therapy, anxiety, pain
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To my family and dear friends, who are ever supportive of my constant state of renewal. To Alex, my strength, my light and my love.

"O nos hacemos infelices o nos hacemos fuertes. La cantidad de trabajo es la misma."

~Carlos Castañeda
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Table I: GRADE Quality of Assessment and Summary of Findings

List of Abbreviations

AMTA.........................................................American Music Therapy Association
ECG...............................................................Electrocardiogram
GRADE........ Grading of Recommendations, Assessment, Development and Evaluation
NIH.............................................................National Institute of Health
MRI.............................................................Magnetic Resonance Imaging
MT..............................................................Music Therapy
PaO2..........................................................Partial Pressure of Oxygen in the Blood
PET.............................................................Positron Emission Tomography
RCT...........................................................Randomized Controlled Trials
SAI or STAI..................................................Spielberger State Anxiety Scale
SD..............................................................Standard Deviation
Effects of Music on Anxiety and Pain in the Diagnosis and Treatment of Patients With Breast Cancer

BACKGROUND

Music has the power to induce and modify moods and emotions\(^1\) and was first recorded as being used therapeutically via phonograph during surgery in 1914.\(^2\) Kane reported that music “fills the ears of the perturbed patient with agreeable sounds and his mind with other thoughts than that of his present danger.”\(^2\) Since then music has not only been recognized as a diversion, but also as tool to lower pain and anxiety, two main factors which evidence suggests influences the quality of life in hospitalized patients.\(^3\)

The American Music Therapy Association (AMTA) defines music therapy as the ‘clinical and evidence-based use of music interventions to accomplish individualized goals within a therapeutic relationship by a credentialed professional who has completed an approved music therapy program’.\(^4\) The AMTA promotes music therapy as a tool to foster wellness, manage stress, alleviate pain, express feelings, enhance memory, improve communication and aid in physical rehabilitation.\(^4\) There are now 73 programs that offer music therapy training. There are generally two types of music therapy, receptive or active. Receptive therapy usually entails the patient and music therapist choosing music together for the patient to listen to that arouses specific emotions, and aids in recalling memories. Active forms of music therapy encourage the patient to sing or play instruments and improvise song writing. Solely listening to music selected by the patient without help of the therapist is classified as mere music stimulation,\(^5\) and it is the most commonly encountered form of music therapy in experiments.
Music has been a well-reported means of relieving pain. A meta-analysis suggested that music therapy reduce post-operative patients’ pain intensity by 50% and that those patients required less opioid analgesia. In a 2009 study that directly indicated music-induced hypoalgesia, Zhao and Chen subjected patient’s hands to a hot-water bath. Patients that listened to pleasant music as compared to a recorded lecture had significantly reduced pain ratings. Studies have also showed that music can reduce the amount of postoperative pain medicine and intraoperative anesthesia required. In patients that listened to preferred music for one hour after a c-section, postoperative tramadol consumption and additional analgesic use was significantly less in the first four hours. An intraoperative study showed that patients that had headphones on during the surgery required less propofol for sedation under regional anesthesia. Patients have also benefitted from the analgesic effects of music in procedures for chronic illness. Pothoulaki et al found a significant decrease in pain intensity in patients that listened to preferred music during hemodialysis.

Pain cannot be adequately discussed without the anxiety that often exacerbates it. Neuroimaging research shows that anxiety, or the anticipation of a painful event, can be processed differently in the hippocampal region of the brain causing the patient to experience more pain than if the event had not been preceded by apprehension. This can cause patients with higher anxiety and depression levels to have higher postoperative pain and analgesic requirements. Therefore, the lowering of anxiety in medical settings has the possibility to decrease pain and in turn increase the quality of life.
There has been a lot of work done on the tendency of music to decrease anxiety in patients in the surgical suite and other medical arenas. Wang et al\textsuperscript{12} found that 30 minutes of patient-selected music before surgery decreased preoperative anxiety by 16%. In another study,\textsuperscript{13} patients that listened to music intra operatively had significantly lower anxiety ratings, systolic blood pressures and heart rates. Of course, anxiolytic power of music may not rival that of antianxiety medications like midazolam during induction of anesthesia,\textsuperscript{14} but it may potentiate the depth of sedation when music is used in conjunction with midazolam.\textsuperscript{15} Outside the operating room music has been shown to provide relief of anxiety in patients in chronic treatments such as chemotherapy,\textsuperscript{16} radiation\textsuperscript{17} and hemodialysis.\textsuperscript{3}

A self-reporting tool called the Spielberger State Anxiety Scale measures anxiety in most studies. It is abbreviated either SAI or STAI. The validity of this test has been demonstrated in medical and surgical patients. The possible scores of the SAI range between 20 and 80, higher scores indicate higher levels of anxiety. Scores between 20-39 suggest low anxiety; scores between 40-59 suggest moderate anxiety and scores higher than 60 indicate high anxiety.\textsuperscript{18}

The reduction in pain and anxiety in patients subjected to music may be well documented, but how music therapeutically affects the brain is not fully physiologically understood. Studies show that the process is rooted in the same limbic and paralimbic structures of the brain that elicit emotion.\textsuperscript{19} In positron emission tomography (PET) studies, Blood and Zatorre\textsuperscript{20} showed that when individuals listened to intensely pleasurable music that gave them the ‘chills’, their cerebral blood flow increased in brain regions which are thought to be involved in reward motivation, emotion, and arousal.
These regions included ventral striatum, midbrain, amygdala, orbito-frontal cortex and ventral medial prefrontal cortex. \(^{20}\) “These are some of the same brain structures known to be active in response to other euphoria-inducing stimuli, such as food, sex, and drugs of abuse”. \(^{20}\) Similar results were shown via Magnetic Resonance Imaging (MRI) when patients listened to joyful, upbeat music. \(^{21}\)

In addition to activity in structures of the brain, music has been shown to encourage the neurochemical production of endorphin and oxytocin and to lower blood cortisol levels. \(^{22}\) Goldstein\(^{23}\) showed an opiate-receptor blocker, naloxone was used to reduce the occurrence of music-produced ‘thrills’, which further suggested the production of endorphin (an opioid peptide) under the influence of intensely pleasurable music.

In a 2009 study, \(^{24}\) Nilsson found patients who had undergone open heart surgery that were allowed, during bed rest after surgery, to listen to soft, relaxing, music of 60 to 80 beats per minute for 30 minutes, had significantly higher levels of oxytocin in contrast to the control group who trended over time, to have decreasing levels of oxytocin. Nilsson found this rise in oxytocin in conjugation with significantly higher subjective relaxation levels and higher levels of partial pressure of oxygen in the blood (\(\text{PaO}_2\)). \(^{24}\)

Music has shown a remarkable tendency to help lower patients’ pain and anxiety and in breast cancer patients these are particularly high. \(^{25-27}\) Breast cancer patients must deal with fear of not being able to care for children, changed body image, sexual rejection, recurrence, medical bills and harm from adjuvant therapies. \(^{28}\) Burgess\(^{26}\) found that “In women with early breast cancer, the prevalence of depression, anxiety, or both in the year after diagnosis is around twice that of the general female population.”
In addition to anxiety, breast cancer patients must also deal with pain from surgeries, radiation and chemotherapy. This pain usually only exists during and around the time of these treatments, but women may also experience phantom and chronic pain well after the surgery. About 25% of breast cancer survivors experience phantom sensations in the breast, years after mastectomy.\(^{29}\) There is some suggestion that the amount of anxiety and pain perceived during the original procedure might have some bearing on this ongoing pain.\(^{27}\)

Music therapy could have the potential to be a cost effective, safe, non-pharmacologic tool for lowering pain and anxiety in the treatment of breast cancer patients. If pain and anxiety are reduced, especially during and around surgical procedures such as mastectomy and biopsies, then the patient may have less potential for experiencing chronic and phantom pain and generally increase the quality of life for breast cancer patients. *How does music therapy affect anxiety and pain perception in patients with breast cancer over the course of diagnosis and treatment?*

**METHODS**

An exhaustive literature search of available medical literature was conducted using Medline-OVID, CINAHL, EBMR Multifile, and Medline-Pub-Med using the keywords: breast cancer and music therapy. A search on the National Institute of Health (NIH) clinical trials site was also conducted. The bibliographies of the articles were further searched for relevant sources. The search was narrowed to include only English language articles and articles that contained primary data. Only studies that were RCTs
were included. All articles that described personal accounts or case studies were excluded. All studies that did not relate to anxiety and pain were also excluded. Relevant articles were assessed for quality using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE).  

RESULTS

Six studies met inclusion criteria and were included in this systematic review. The search on the National Institute of Health (NIH) clinical trials site revealed an unpublished study examining the effects of music therapy on the reduction of fatigue that was not included because the data had not been published. These studies examined music therapy’s affect on anxiety and pain in women during the diagnosis and treatment of breast cancer. There were three articles that addressed anxiety alone, one study that regarded only pain, and one study that evaluated both pain and anxiety. Because of their methodical similarity and same lead author, Li, one of the anxiety articles and the pain only article are presumed to be two papers published from the same study.

Anxiety Only Articles:


This study was a randomized control trial and was blinded to neither participant nor researcher. It did not report how the patients were randomized. It evaluated the effect of music therapy on anxiety in a population of breast cancer patients receiving adjuvant postsurgical chemotherapy treatment. The study was conducted in Italy and
enrolled 60 patients. Inclusion criteria were surgical intervention, Stage I-II (Staging System of American Joint Committee on Cancer) breast cancer, admission to day hospital for adjuvant chemotherapy treatment, Italian nationality, married with children and aged between 40 and 60 years. The primary outcome was anxiety level measured by the Spielberg State- Trait Anxiety Inventory (STAI) that was modified to suit the Italian population. The study was conducted while the patients were waiting for approximately 30 minutes before their chemotherapy treatment. The experimental group listened to their chosen selection of pre-taped musical themes on a Walkman and earphones for 15 minutes. The patients took the STAI before they received the therapy and then 15 minutes after the music therapy or equivalent “standard assistance” in the control group. The average scores of the pretreatment state anxiety in the experimental and control groups were 46.2 (SD= 11.0) and 43.4 (SD = 10.6), respectively. The comparison of these values did not reveal any significant statistical differences. The post-treatment anxiety scores were not reported numerically but on a bar graph; the averages are visually estimated to be approximately 36 for the treatment group and 45 for the control group. However, no SD or CI’s were reported with this value. The authors reported that post-treatment anxiety scores in the music therapy group were significantly lower that the post-treatment scores in the experimental group (P< .001). The authors did not report any limitations to this study.  


This randomized control study examined the effect of music therapy on anxiety levels, blood pressure, respiration rates and heart rates in women awaiting breast
biopsies. The participants were randomized by coin toss and neither the participants nor the researchers were blinded. There were 20 participants in the study, women were excluded if they had a medical history of cancer surgery, hypertension, cardiac or pulmonary disease or had hearing deficits. Anxiety levels were accessed with a STAI questionnaire and vital signs were collected via electrocardiogram (ECG) monitor and a noninvasive blood pressure monitor. One researcher was responsible for taking the vital signs of all the participants. The pretest STAI was administered and other vital signs were taken immediately after the patients had completed the preparations for surgery (disrobing, admission assessment, establishment of an intravenous line). The patients in the experimental group then listened to 20 minutes of “new age” music via headphones. The control group spent the 20 minutes sleeping or talking with friends or family and these participants were not allowed to see the experimental group. The posttest STAI and the other vital sign tests were then conducted again after the 20 minutes and then the patients were taken to have the biopsy. All the physiological signs except the respiratory rate were statistically insignificant between the music therapy and control groups. The respiratory rate of the experimental and control group before the treatment was 17.6 ± 2.1 and 17.6 ± 1.6, respectively. The respiratory rate after the treatment was 16.4 ± 2.1 in the experimental group and 18.4 ± 2.1 in the control group. The STAI score of the experimental and control group before the treatment was 45.3 ± 11.1 and 47.9 ± 10, respectively. The STAI score after the treatment was 32.8 ± 7.0 in the experimental group and 46.6 ± 9.3 in the control group. The author’s described limitations to this study include use of self-reporting tool (STAI), failure to account influence of the family
member that was waiting with the patients, lack of music selection, and small number of participants in the study.  


This RCT was conducted in China and examined the effects of music therapy on state anxiety in female breast cancer patients following radical mastectomy. Inclusion criteria for the participants were the patient must be a female between ages 25 and 65 with a diagnosis of breast cancer, chosen treatment of radical mastectomy, modified or extensive radical mastectomies. Patients were excluded if they did not like music or had the voice sensitivity of epilepsy. One hundred and twenty patients were recruited to the study. The size of the study was calculated based on the parameters of state anxiety (measured by SAI) in other related studies on cancer patients. Li et al calculated that 100 patients were needed, but increased the study to 120 patients to allow for a 20% participant dropout. The primary outcome in this study was state anxiety and was measured with the State Anxiety Inventory (SAI). Both of the groups completed the pretest SAI before the mastectomy and the three posttest SAI’s were conducted on the day before the patients were discharged from the hospital, and the second and third times that the patients were admitted to the hospital for chemotherapy. The intervals between the data collections were approximately 14, 21 and 28 days. Patients were randomized into groups with a computer-generated randomization. Patients in the experimental group were given a selection of music that included Chinese classical folk music, famous world music and music recommended by the American Association of Music Therapy
(AAMT). They were allowed to listen their selection via headphones for 30 minutes in the morning and 30 minutes in the evening of the days that they were in the hospital for their mastectomies (13.6 ± 2.0 days) and the two chemotherapy treatments (18.9 ±7.1 days). The patients in the control group were given routine nursing care and were not offered any information on music therapy. Six patients dropped out of the experimental group and 9 patients dropped out of the control group leaving 54 in the experimental group and 51 in the control. The pretest SAI scores were 52.02 ± 8.76 for the control group and 51.97 ± 8.50 for the experimental group. The mean SAI scores of the experimental group were all statistically significant from that of the control group at each of the three post-tests. The mean difference between experimental and control group together with 95% CI was -4.57 (-6.33, -2.82), -8.91 (-10.75, -7.08) and -9.69 (-11.52, -7.85) at the 1st, 2nd and 3rd post-tests, respectively. The p-value for the interaction test was <0.0001, suggesting that the treatment effect increases with the follow-up time. Study limitations included that the data was self-reported and that no physiological variable was used.\textsuperscript{18}

**Pain Only Article**


This randomized controlled trial\textsuperscript{31} was conducted in China and examined the effects of music therapy on pain perception in female breast cancer patients following radical mastectomy. Inclusion criteria for the participants were the patient must be a female between ages 25 and 65 with a pathological diagnosis of breast cancer requiring radical mastectomy, modified and extensive radical mastectomies. Patients were
excluded if they had the voice sensitivity of epilepsy or did not like music. One hundred and twenty patients were recruited to the study. The size of the study was calculated based on the change in Pain Rating Index (PRI)-total score. It was calculated that 100 patients were needed, but the study was increased to 120 patients to allow for a 20% dropout. The primary endpoint in this study was change in the score of PRI-total from baseline with the secondary endpoints being the changes in the components of PRI-total (Sensory Affective and Word-Count), Visual Analog Scale (VAS), and Present Pain Intensity (PPI) from baseline. Pain levels were evaluated at baseline, first day after radical mastectomy (pre-test), on the day before discharge from hospital (1st posttest), and on the days of admission to hospital for the first (2nd posttest) and second (3rd posttest) chemotherapy sessions. The average intervals between different follow-up visits were 14, 21, or 28 days. Patients were randomized into groups with a computer-generated randomization. Patients in the experimental group were given a selection of music that included Chinese classical folk music, famous world music and music recommended by the American Association of Music Therapy (AAMT). They were allowed to listen their selection via headphones for 30 minutes in the morning and 30 minutes in the evening of the days that they were in the hospital for their mastectomies (13.6 ± 2.0 days) and the two chemotherapy treatments (18.9 ± 7.1 days). The patients in the control group were given routine nursing care and were not offered any information of music therapy. Six patients dropped out of the experimental group and 9 patients dropped out of the control group leaving 54 in the experimental group and 51 in the control. There were no significant differences between intervention and control groups’ pretest PRI scores. Significant improvements from baseline in all pain measurements were observed.
throughout the intervention period in both the study and control groups from the 1st post-test to the 3rd post-test. For the primary endpoint (PRI-total score), significant improvement was observed in the intervention group compared with the control group at the first post-test (P< 0.001; difference between groups: -2.38 (-2.80, -1.95). Although at the third post-test, the difference between the two groups had diminished, it still persisted: difference between the two groups: -1.87 (-2.33 to -1.42). The other indices followed a similar trend to that observed with the PRI-total. Study limitations included that the data was self-reported, that no physiological variable was used and that the assessor was not masked regarding the patient allocation.31

**Pain and Anxiety Article**


This study34 was of randomized controlled design and examined the effects of perioperative music intervention on changes in the mean arterial pressure (MAP), heart rate (HR), anxiety and pain in women with a diagnosis of breast cancer undergoing mastectomy. A sample of 30 women was assigned randomly, using random numbers grabbed out of a bag, to the control or music intervention group. Inclusion criteria were women receiving a diagnosis of breast cancer and deciding to undergo mastectomy. Women in the intervention group listened to music throughout the perioperative period (during the preoperative, intraoperative and postoperative periods), the women in the control group received standard care. Women in the music intervention group were provided an iPod with the choice of four types of music. To avoid repetition, the patient's music selection contained four hours of continuous nonrepeating music. Music
intervention began after the participant received midazolam preoperatively and continued throughout the surgery until the patient was in the postanesthesia care unit (PACU). The patients in the control group also were given an iPod and just wore the ear buds to make sure there was no bias given by the surgical staff. Data on all study variables were collected preoperatively at time 1 (T1) in the presurgical area and postoperatively at time 2 (T2) when the participant was ready for discharge from the (PACU). Anxiety was measured by using the 20-item SAI; pain was measured by using a 100-mm VAS. All anesthesia and pain medicine given to the patients was the same before, during and after the surgery. There were no significant differences between the women in the intervention and control groups in baseline measurements of the physiological study variables (MAP, HR) and the subjective outcomes (anxiety and pain). There was a significant difference between the intervention and control groups in the MAP T1 and T2 change scores. The MAP for the control group increased postoperatively by a mean of 4.5 mm Hg, whereas the MAP for the intervention group decreased postoperatively by 15.1 mm Hg. There was no significant difference between the women in the intervention and control groups in the T1-T2 change scores in HR. The women in the intervention group had a significantly greater decline in anxiety levels from T1 to T2 compared with women in the control group (P < .001). The postoperative SAI score for the control group increased by a mean of 7.7, whereas the SAI score for the music group decreased by 10.8. The women in the intervention group reported a significantly greater decrease in pain levels (as measured on the VAS) from T1 to T2 (P = .007) compared with the control group. The VAS for the control group increased by a mean of 50.7, whereas the VAS for the intervention group increased by only 29.7. The women in the intervention group
experienced a 41.4% smaller increase in pain compared with women in the control group. Limitations to the study included that the patients self reported the data, also that the sample size was relatively small.\(^{34}\)

**DISCUSSION**

Music has the potential to be an integral therapy in combating anxiety and pain in the treatment of patients with breast cancer. The studies reviewed showed evidence that music therapy can decrease anxiety and pain levels.

All articles that investigated the effect of music therapy on anxiety levels in breast cancer patients found a significant lowering in anxiety levels in the patients that received music therapy compared to the control groups. In all these studies, \(^{18,32-34}\) anxiety levels were estimated with a Spielberger State Anxiety Scale (SAI or STAI). These inventories were modified to suit the populations in the countries that were being studied. It is interesting to note that even though these studies were conducted in several different countries including Italy, \(^{32}\) China\(^{32}\) and United States\(^{33,34}\) and also studied different aspects of breast cancer diagnosis and treatment such as biopsy, \(^{33}\) mastectomy\(^{18}\) and chemotherapy, \(^{18,32}\) the pre-test and post-test experimental and control SAI scores were similar (see Table 1). In all of these articles, \(^{18,32-34}\) the intervention of music therapy lowered the patients’ anxiety score from the moderate to low levels while the patients that did not receive music therapy stayed at a moderate level of anxiety throughout the study.

Three physiological anxiety-related indicators were examined in two experiments.\(^{33,34}\) They include mean arterial pressure (MAP) and heart rate in the Binns-Turner case\(^{34}\) and respiratory rate in the Haun case.\(^{33}\) The MAP for the control group increased postoperatively by a mean of 4.5 mm Hg, whereas, the MAP for the music
intervention group decreased postoperatively by 15.1 mm Hg (see Table 1).\textsuperscript{34} There was no significant difference in music effects on the heart rate. In the Haun study,\textsuperscript{33} the respiratory rate of the experimental and control group before the treatment was 17.6 ± 2.1 and 17.6 ± 1.6, respectively. The respiratory rate after the treatment was 16.4 ± 2.1 in the experimental group and 18.4 ± 2.1 in the control group (See Table 1).\textsuperscript{33} These studies\textsuperscript{33, 34} indicate the anxiety lowering power of music therapy in not only self-reported anxiety, but also in physiological indicators of stress.

Two articles\textsuperscript{31, 34} examined the effects of music therapy on pain in breast cancer patients after mastectomy. Li et al.\textsuperscript{31} quantified pain with PRI-total (Sensory Affective and Word-Count), Visual Analog Scale (VAS) 10 cm scale, and Present Pain Intensity (PPI) from baseline and Binns-Turner quantified pain by using VAS 100 mm scale.\textsuperscript{34} Both groups of researchers\textsuperscript{31, 34} found that there was a significant lowering in pain in the music therapy groups as compared to the control groups (see Table 1).

Music therapy studies have the unavoidable method flaw of not being able to blind the patients that are and are not receiving music therapy, this was the case in all of the articles reviewed. For this reason all studies were of low to moderate quality, even though they were all RCTs. All attempts should be made in future studies to blind the researchers that collect the data, and even the hospital staff that work with the patients. An effort to blind hospital staff was made in the Binns-Turner experiment\textsuperscript{34} where the patients were all given iPods to wear throughout the surgery so the hospital staff would not know if they were listening to music or not. Something similar to this or having control group participants wear noise cancellation headphones could be done in future music therapy studies and would strengthen the validity of the following research.
Studies including Bulfone et al, Haun et al, Li et al, and Li et al were all downgraded to having very serious limitations (see Table 1) for not blinding participant and researcher as discussed above. Furthermore the Bulfone et al study did not describe how the study was randomized. The Bulfone et al study was downgraded to having very serious inconsistencies for having no confidence intervals to describe the posttest SAI scores, and the Haun et al study was downgraded having very serious inconsistencies (see Table 1) for having a very small sample size of only 20 participants in all, ten in each the control and experimental group.

All of the experiments chosen relied on a passive music therapy in the form of listening to songs. In this review the results were similar between active and passive music therapy. Further research comparing the passive and active music therapy to control would be interesting and valuable in furthering the body of literature surrounding music therapy and breast cancer.

**CONCLUSION**

Both pain and anxiety are common in women that are experiencing breast cancer. Biopsies during diagnosis of breast cancer, and mastectomies and chemotherapy to treat cancer are all painful and stressful events. Breast cancer patients must deal with fear of not being able to care for children, changed body image, rejection, cancer recurrence, medical bills and harm from adjuvant therapies. The articles reviewed in this paper show that music therapy could have the potential to be a cost effective, safe, non-pharmacologic tool for lowering pain and anxiety in the diagnosis and treatment of breast cancer patients. Future studies should concentrate on blinding the researchers and possibly blinding the participants through the use of noise cancellation. Larger sample
sizes would give these studies more credibility. Researchers should also consider conducting studies that compare active and passive music therapy.
References


Table I  Quality of Assessment and Summary of Findings

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Limitations</th>
<th>Indirectness</th>
<th>Imprecision</th>
<th>Inconsistency</th>
<th>Publication bias likely</th>
<th>Quality</th>
<th>Importance</th>
<th>TXA Placebo or no-TXA</th>
<th>Control</th>
<th>Experimental</th>
<th>Control</th>
<th>Experim ental</th>
<th>Control</th>
<th>Experimental</th>
<th>Control</th>
<th>Experimental</th>
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<tr>
<td><strong>Anxiety</strong></td>
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<tr>
<td>BULfone et al 31</td>
<td>RCT</td>
<td>Very serious limitations*</td>
<td>No serious indirectness</td>
<td>Serious imprecision **</td>
<td>No serious inconsistency</td>
<td>No bias likely</td>
<td>Low</td>
<td>Important</td>
<td>30/60</td>
<td>30/60</td>
<td>43.4 SD=10.6</td>
<td>46.2 SD=11.0</td>
<td>45 SD=not reported</td>
<td>56 SD=not reported</td>
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<tr>
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<td>Serious imprecision **</td>
<td>No serious inconsistency</td>
<td>No bias likely</td>
<td>Low</td>
<td>Important</td>
<td>10/20</td>
<td>10/20</td>
<td>47.9 SD=10</td>
<td>45.3 SD=11.1</td>
<td>46.6 SD=9.3</td>
<td>32.8 SD=7</td>
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<td>RCT</td>
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<td>Moderate imprecision</td>
<td>No serious inconsistency</td>
<td>No bias likely</td>
<td>Moderate</td>
<td>Important</td>
<td>54/105</td>
<td>51/105</td>
<td>52.02 SD=8.7</td>
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<td>Important</td>
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<td>Li et al 33</td>
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<td>No serious inconsistency</td>
<td>No bias likely</td>
<td>Moderate</td>
<td>Important</td>
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<td>51/105</td>
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<td>No serious inconsistency</td>
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<td>Moderate</td>
<td>Important</td>
<td>15/30</td>
<td>15/30</td>
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<td>64.9 SD=20.9</td>
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<td>92.1 SD=18.2</td>
<td>98.7 SD=15.7</td>
<td>96.6 SD=14.3</td>
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</table>

*Neither participants nor researchers were blinded to allocation in Bulfone et al, 32 Haun et al, 32 Li et al, 18 Li et al, 31; the process of randomization was not reported in the Bulfone et al 31 study

**No confidence intervals given in Bulfone et al; 32 a small sample size in Haun et al; 33

*** Visual Analog Scale of Pain was 10 cm scale for the Li et al, 31 and 100 mm scale for the Binns-Turner study 34