

ORIGINAL RESEARCH

Music therapy for pain and anxiety management in postoperative trauma patients

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ABSTRACT

Objective: Acute pain is a common and complex problem among postoperative trauma patients, burdening over 90% of the population. Although pharmacological interventions remain the mainstay of pain management in the inpatient setting, non-pharmacological interventions are emerging as legitimate adjuncts. The non-pharmacological intervention of music therapy has been shown to significantly and consistently lower pain and anxiety levels. This quality improvement project aimed to pilot the integration of music therapy for postoperative trauma patients at a Level I Trauma Center in the Southeast United States and evaluate its effects on pain and anxiety levels.

Methods: A before and after intervention study was conducted at the organization over a 10-week period. Unit registered nurses were educated on patient inclusion criteria and placed music therapy consultation orders accordingly. A board-certified music therapist provided evidence-based music therapy intervention for consulted patients. A survey consisting of the State-Trait Anxiety Inventory State-5 and the numeric rating scale for pain was administered pre- and post-intervention. A paired-sample *t*-test was run to evaluate the statistical significance of music therapy's effect on pain and anxiety.

Results: The mean pre-test State-Trait Anxiety Inventory State-5 score was 8.43 (sd = 3.46), and the post-test was 5.64 (sd = 1.10) among patients who received music therapy (n = 28). A significant decrease in anxiety was found ($t(27) = 5.227, p < .001$). The mean pre-test numeric rating scale for pain score was 6.36 (sd = 2.59), and the post-test was 4.57 (sd = 2.66). A significant decrease in pain was found ($t(4.90) = 4.892, p < .001$).

Conclusions: Patients who received music therapy as an adjunct intervention achieved a statistically significant decrease in pain and anxiety levels. This quality improvement project validates current research and bolsters evidence-based practice recommendations that reference music therapy as a legitimate adjunct to pharmacological pain and anxiety treatment regimens.

Key Words: Postoperative, Pain, Anxiety, Music therapy, Non-pharmacological

1. INTRODUCTION

1.1 Review of literature

Research overwhelmingly demonstrates the effectiveness of music therapy (MT) provided by a music therapist in reducing postoperative pain and anxiety. Databases used to synthesize an exhaustive summary of current literature regarding this phenomenon include PubMed, CINAHL, and Google Scholar. Search terms utilized include, "music

therapy," "non-pharmacological pain management," "non-pharmacological," "nonpharmacological," "post-operative anxiety," "postoperative," "post-surgical," "pain," "anxiety," and "acute pain." The Johns Hopkins Nursing Evidence-Based Practice Tool was utilized to appraise the evidence of literature.^[1] The cumulative evidence summary identified the gap at the organization and provided grade "A" high-quality evidence supporting a solution to close the gap. Multiple sys-

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tematic reviews and meta-analyses found that MT reduced anxiety and pain levels in adult surgical patients.^[2-7] A quality improvement (QI) project implementing MT for postoperative trauma step-down patients found that MT consistently produced immediate improvement of pain and anxiety at a statistically significant level.^[8] MT is a patient-centered intervention provided by a board-certified music therapist as opposed to music medicine, which simply utilizes music to aid in symptom improvement. Music medicine is unstructured, can be self-implemented, and has less sufficient data to support its effectiveness. The literature review identified MT as a viable evidence-based intervention for the reduction of pain and anxiety and supported the implementation for postoperative trauma patients.

1.2 Problem statement

In the selected clinical practice setting, a trauma step-down unit of a Level I Trauma Center, over 90% of postoperative trauma patients experience persistent acute pain with a pain level of at least 4/10 on the numeric rating scale (NRS) for pain. Despite evidence supporting MT's effectiveness in reducing both postoperative pain and anxiety, not a single patient was treated with MT intervention by a board-certified music therapist before project implementation. Persistent acute pain has shown to increase opioid usage and progression to chronic pain while decreasing quality of life and functional recovery.^[9] A reduction of only two points on the NRS for pain is considered clinically significant leading to improved outcomes.^[10,11] A 10-week electronic medical record (EMR) chart audit performed by the author from March 13, 2023, to May 22, 2023, analyzing 109 qualifying patients revealed that 91% of postoperative trauma patients reported a pain score of at least 4/10 (moderate 4-6/10 or severe 7-10/10) on the NRS for pain even with appropriate utilization of a multimodal pharmacological pain regimen. The QI nature of this project utilized this pre-needs assessment to analyze current patient outcomes without the utilization of MT. The practice setting of focus is currently non-compliant with best practice recommendations from the Centers for Disease Control (CDC) and the American Pain Society as both call for the utilization of non-pharmacological interventions for pain management.^[12,13]

1.3 Project purpose

The purpose of this project was to implement MT and assess the intervention's effect on pain and anxiety levels for adult postoperative trauma step-down patients with a Glasgow Coma Scale (GCS) score of 15 and a pain level of at least 4/10 on the NRS for pain. A GCS score of 15 was utilized as inclusion criteria to ensure that participants were cognitively intact. The objectives set included:

- 1) Throughout the eight-week implementation phase of the 10-week project, at least 80% of postoperative patients meeting the eligibility requirements of a GCS score of 15 and a pain level of at least 4/10 on the NRS for pain would receive a MT consultation order by a registered nurse (RN).
- 2) Throughout the eight-week implementation phase of the 10-week project, at least 70% of postoperative patients meeting the eligibility requirements of a GCS score of 15 and a pain level of at least 4/10 on the NRS for pain who received a MT consultation order would be offered MT intervention by a board-certified music therapist on at least one occasion.
- 3) Throughout the eight-week implementation phase of the 10-week project, the collective group of patients who received MT intervention would achieve a statistically significant decrease in pain and anxiety levels as evidenced by a paired-sample t-test comparison of pre- and post-MT intervention State-Trait Anxiety Inventory State-5 (STAIS-5) survey and NRS for pain survey results.^[14,15]

The goals were established by the author, the music therapist, and RN feedback. The organization currently employs a board-certified music therapist in the palliative care unit. This QI project utilized this music therapist, expanding her scope of practice, by piloting her on the trauma unit. The outcome measures of pain and anxiety levels would reveal if the project objectives were realized and answer the Patient, Intervention, Comparison, and Outcome (PICO) clinical question: among adult postoperative step-down patients (P) how does the implementation of MT (I) as compared to no implementation of MT (C) affect postoperative pain and anxiety (O)?

2. METHODS

2.1 Participants

Participants were selected via a non-probability convenience sampling method. During the first two weeks of project initiation, all full-time trauma step-down RNs attended a two-hour in-service presentation run by the author and the music therapist as well as a 15-minute one-on-one project overview with the author. These two sessions explained the intervention of MT, clarified the role of the music therapist, detailed the eligibility requirements for MT consultation, described how to place consultation orders, and gave RNs the opportunity to ask questions. A process map was utilized to inform RNs of participant inclusion criteria and methods for placing MT consultation orders. Over the following eight weeks, RNs recognized qualifying patients based on inclusion criteria and placed MT consultation orders within the organization's electronic charting system. Qualifying patients included all trauma step-down patients admitted during the eight-week project implementation phase that met the following inclusion criteria: 1) 18 years of age or older, 2) postoperative

status, meaning having been to the operating room any time during hospital admission, 3) a GCS score of 15, and 4) reporting a pain score of at least 4/10 on the NRS for pain. All participants were physically able to complete the survey except those with upper extremity fractures that prohibited utilizing the hospital-issued iPad. These participants were shown the questions on the iPad by the music therapist and verbalized answers as the music therapist physically selected the answers on behalf of the patient.

2.2 Setting

The project setting was a Level 1 Trauma Center in the Southeast United States. The project was conducted on the 17-bed trauma step-down unit. The unit has private rooms, ensuring that MT sessions were administered to the intended patient only. The project was excused from Institutional Review Board (IRB) oversight from the organization and the author's educational university due to its low risk and QI nature. Ethical principles were applied to ensure protection of patients throughout the project. The music therapist began each visit by obtaining verbal consent from the patient to participate in the project and to receive MT intervention. Participants were instructed that they could withdraw from participation by verbalizing this preference to the music therapist at any time.

2.3 Tools

Patients who were treated with MT intervention completed a pre- and post-intervention survey consisting of a STAIS-5 anxiety survey and a NRS for pain survey to measure pre- and post-intervention pain and anxiety levels. This survey utilized valid and reliable tools proven appropriate in clinical practice.^[14,15] Additionally, data was obtained via an EMR analysis to evaluate how many patients met inclusion criteria, how many patients received a MT consultation order, and how many patients were offered and treated with MT. This data, in conjunction with the survey results, revealed the effectiveness of the project.

2.4 Intervention and data collection

The project began with a two-week initiation period of front-line staff education intended to prepare RNs for project implementation. During the next eight-week implementation period, RNs recognized patients meeting the eligibility requirements and placed electronic MT consultation orders accordingly. The certified music therapist offered MT to consulted patients utilizing evidence-based interventions including music-assisted relaxation (MAR), live music, individual music preference integration, lyric discussion, and guided relaxation. The music therapist began each treatment session by explaining the QI project and MT intervention, ob-

taining verbal consent from the participant, and conducting an interview to assess the patient's background and specific music preferences. The music therapist spent, on average, 50 minutes with each patient and treated each participant on one occasion. Each patient who received MT took a self-administered pre- and post-intervention survey via the organization's secured REDCap database on a hospital-issued iPad. The pre-intervention survey was taken before MT intervention and the post-intervention survey was taken immediately upon completion of MT intervention. The survey was distributed by the music therapist to achieve the objective of analyzing MT's effect on postoperative pain and anxiety. The author collaborated with the music therapist and supervising physician for the data collection process. The outcome measures of the number of qualifying patients, the number of consultations placed, the number of consulted patients offered MT, and pre- and post-MT pain and anxiety scores were analyzed. The author utilized the data to conduct statistical analyses and summarize the outcomes to detail project results and implications for future practice.

3. RESULTS

Between September 18, 2023, and November 24, 2023, a total of 69 patients qualified for MT. Of the 69 patients meeting inclusion criteria, 69 patients (100%) received a consultation order by an RN, achieving the goal of > 80%. Of the 69 qualifying patients who received a MT order, 53 patients (76.8%) were offered MT services by a certified music therapist, achieving the goal of > 70%. Of the patients offered MT services, 28 were treated with MT. Reasons for not being treated included: unavailable due to procedure or working with other therapies, acute medical issues actively being addressed, refusal, or asleep. Of those treated with MT ($n = 28$), a paired-sample t -test was calculated utilizing the Statistical Package for the Social Sciences (SPSS) software to compare the mean pre- and post-MT anxiety and pain scores. The mean STAIS-5 score on the pre-test was 8.43 ($sd = 3.46$), and the mean on the post-test was 5.64 ($sd = 1.10$). A significant decrease from pre-test to post-test was found ($t(27) = 5.227$, $p < .001$) (see Figure 1). The mean NRS pain score on the pre-test was 6.36 ($sd = 2.59$), and the mean on the post-test was 4.57 ($sd = 2.66$). A significant decrease from pre-test to post-test was found ($t(4.90) = 4.892$, $p < .001$) (see Figure 2). This evaluation method utilized valid and reliable tools to test for the realization of project outcomes, revealing that MT reduced pain and anxiety at statistically significant levels. MT also led to clinically significant reductions in pain and anxiety. A STAIS-5 score of ≥ 10 is considered to demonstrate a clinically significant anxiety level.^[15] Of those who tested positive for clinically significant anxiety (n

= 10) on the pre-test survey, 100% (n = 10) tested below the clinically significant anxiety level on the post-test survey. A reduction of pain from severe to moderate, or moderate to mild levels according to the NRS for pain is considered clinically significant.^[14] Among participants receiving MT, 54% (n = 13) achieved a clinically significant reduction of pain as evidenced by transitioning from either severe to moderate pain, or moderate to mild pain.

As shown in Figure 1, each participant receiving MT took a pre- and post-intervention survey assessing subjective anxiety levels via the STAIS-5 survey. The STAIS-5 consists of five questions assessing components of anxiety on a Likert scale of 1-4. The possible score range is 5-20 with 5 representing no anxiety and 20 representing extreme anxiety. A statistically significant reduction in anxiety was realized (pre \bar{x} = 8.43, post \bar{x} = 5.64, t = 5.227, p < .001).

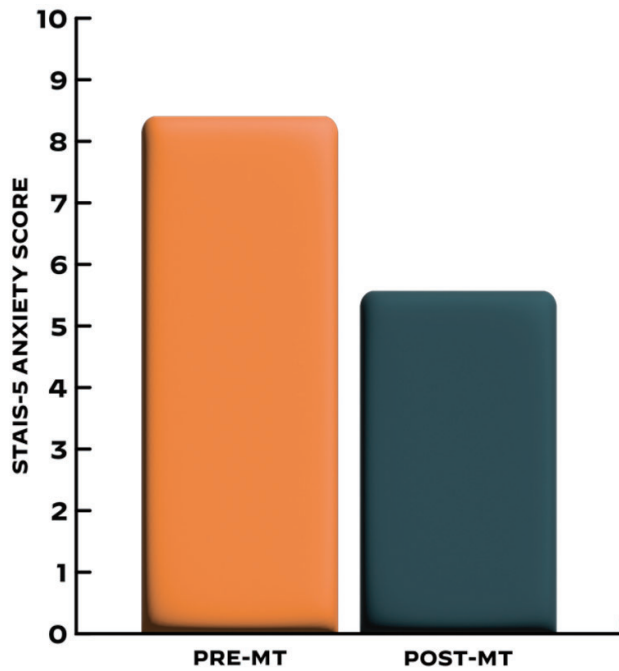


Figure 1. Average anxiety score pre- and post-MT intervention

As shown in Figure 2, each participant receiving MT took a pre- and post-intervention survey assessing subjective pain levels via the NRS pain score survey. The NRS for pain survey is one question assessing current pain level on a numerical scale of 0-10 with 0 representing no pain and 10 representing the worst pain possible. A statistically significant reduction in pain was realized (pre \bar{x} = 6.36, post \bar{x} = 4.57, t = 4.892, p < .001).

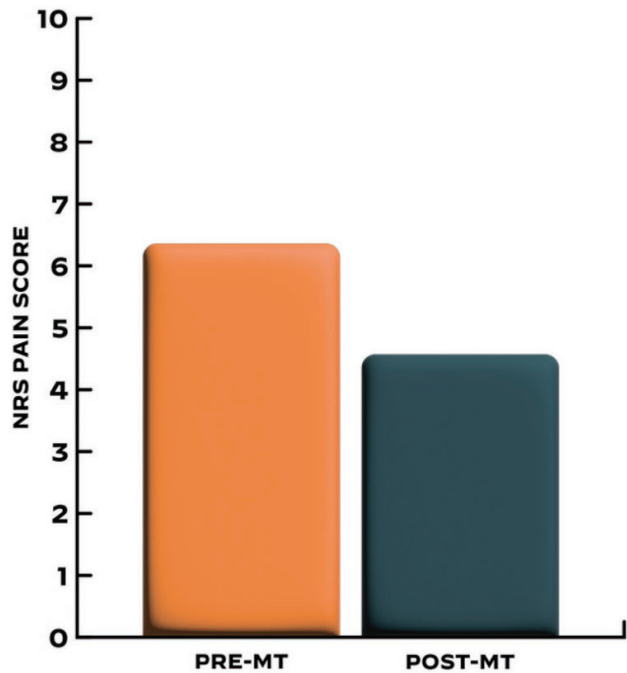


Figure 2. Average pain score pre- and post-MT intervention

4. DISCUSSION

The findings from this QI project revealed that MT provided by a board-certified music therapist is an effective intervention in the reduction of pain and anxiety among postoperative trauma patients. The project results, current research, and best practice recommendations support the need for a holistic and patient-centered treatment regimen incorporating both pharmacological and non-pharmacological interventions. Project results also revealed that in the practice setting of focus, RN compliance with recognizing appropriate patients and placing MT orders was outstanding as every qualifying patient received a MT consultation order. The results of the number of consulted patients who were offered treatment revealed that integration of this intervention is feasible in this practice setting. Both outcomes suggest the potential for successful integration of this intervention in other practice settings. A potential barrier at other organizations, however, may be lack of access to a board-certified music therapist. A barrier encountered during project implementation was occasional missed days where RNs did not place consults until at least 24 hours after a qualifying patient arrived on the floor, lowering the likelihood of the patient receiving treatment. Successful efforts to mitigate this issue included placing additional flow chart reminders around the unit. Another project limitation encountered was frequent unnecessary interruptions during MT treatments. Efforts to mitigate this issue included placing a sign on patient doors to indicate treatment in progress and frontline staff reminders to cluster care around MT treatment if medically

appropriate. A limitation recognized in the interpretation of results exists due to the survey being administered immediately before and after MT intervention. This leads to the risk of the Hawthorne effect where individuals may modify behavior while being observed. Future projects should consider allowing for a lag time after MT intervention and an opportunity for the participant to fill the survey out in private. Overall, the project achieved the aim of decreasing postoperative pain and anxiety both statistically and clinically. A holistic and patient-centered approach to pain and anxiety management that utilizes non-pharmacological interventions has been shown to improve patient outcomes. Further research is needed to better understand the effects of MT on various patient populations and its implications for future practice. Results of projects like this must be disseminated to hospital stakeholders needed to fund and encourage the implementation of board-certified music therapists in the inpatient setting.

5. CONCLUSION

The utilization of MT as an adjunct therapy in postoperative patients has shown to decrease pain and anxiety levels at a statistically and clinically significant level. The practice setting of focus revealed the promising potential of successful MT utilization and integration in the inpatient setting. This QI project validates current research and bolsters evidence-based practice recommendations that declare MT a legitimate adjunct to pharmacological pain and anxiety treatment regimens. Based on project results, current research, the low-risk nature of the intervention, and the potential for clinical improvements, it is recommended that MT be offered to postoperative trauma patients in the inpatient setting. Further research is needed to study the impact of MT on other patient groups.

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DATA SHARING STATEMENT

No additional data are available.

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REFERENCES

- [1] Dang D, Dearholt SL, Bissett K, et al. Johns Hopkins evidence-based practice for nurses and healthcare professionals: Model and guidelines, fourth edition (4th ed.). Sigma Theta Tau International. 2021.
- [2] Chandrababu R, Ramesh J, Sanatombi Devi E, et al. Effectiveness of music on anxiety and pain among cardiac surgery patients: A quantitative systematic review and meta-analysis of randomized controlled trials. *International Journal of Nursing Practice*. 2021; 27(4). PMID:33759286 <https://doi.org/10.1111/ijn.12928>
- [3] Kühlmann AR, de Rooij A, Kroese LF, et al. Meta-analysis evaluating music interventions for anxiety and pain in surgery. *British Journal of Surgery*. 2018; 105(7): 773–783. PMID:29665028 <https://doi.org/10.1002/bjs.10853>
- [4] Lin C, Hwang S, Jiang P, et al. Effect of music therapy on pain after orthopedic surgery—a systematic review and meta-analysis. *Pain Practice*. 2020; 20(4): 422–436. PMID:31785131 <https://doi.org/10.1111/papr.12864>

- [5] Lu G, Jia R, Liang D, et al. Effects of music therapy on anxiety: A meta-analysis of randomized controlled trials. *Psychiatry Research*. 2021; 304: 114137. PMID:34365216 <https://doi.org/10.1016/j.psychres.2021.114137>
- [6] Patiyal N, Kalyani V, Mishra R, et al. Effect of music therapy on pain, anxiety, and use of opioids among patients underwent orthopedic surgery: A systematic review and meta-analysis. *Cureus*. 2021. PMID:34725621 <https://doi.org/10.7759/cureus.18377>
- [7] Sibanda A, Carnes D, Visentin D, et al. A systematic review of the use of music interventions to improve outcomes for patients undergoing hip or knee surgery. *Journal of Advanced Nursing*. 2019; 75(3): 502–516. PMID:30230564 <https://doi.org/10.1111/jan.13860>
- [8] Bojorquez GR, Jackson KE, Andrews AK. Music therapy for surgical patients. *Critical Care Nursing Quarterly*. 2020; 43(1): 81–85. PMID:31789881 <https://doi.org/10.1097/cnq.0000000000000294>
- [9] Glare P, Aubrey KR, Myles PS. Transition from acute to chronic pain after surgery. *The Lancet*. 2019; 393(10180): 1537–1546. PMID:30983589 [https://doi.org/10.1016/s0140-6736\(19\)30352-6](https://doi.org/10.1016/s0140-6736(19)30352-6)
- [10] García-Monasterio E, Álvarez-Vázquez J, Morado-Quiñó P, et al. Post-operative pain management among surgical trauma patients in an acute ward. *JBIC Database of Systematic Reviews and Implementation Reports*. 2019; 17(9): 1941–1953. PMID:31356571 <https://doi.org/10.11124/jbisrir-2017-003916>
- [11] Tsze DS, Hirschfeld G, Baeyer CL, et al. Changes in pain score associated with clinically meaningful outcomes in children with acute pain. *Academic Emergency Medicine*. 2019; 26(9): 1002–1013. PMID:30636350 <https://doi.org/10.1111/acem.13683>
- [12] Chou R, Gordon DB, de Leon-Casasola OA, et al. Management of postoperative pain: A clinical practice guideline from the American Pain Society, the American Society of Regional Anesthesia and Pain Medicine, and the American Society of Anesthesiologists' Committee on Regional Anesthesia, Executive Committee, and Administrative Council. *The Journal of Pain*. 2016; 17(2): 131–157. PMID:26827847 <https://doi.org/10.1016/j.jpain.2015.12.008>
- [13] Dowell D, Ragan KR, Jones CM, et al. Cdc clinical practice guideline for prescribing opioids for pain — United States, 2022. *MMWR. Recommendations and Reports*. 2022; 71(3): 1–95. PMID:36327391 <https://doi.org/10.15585/mmwr.rr7103a1>
- [14] Karcioğlu O, Topacoglu H, Dikme O, et al. A systematic review of the pain scales in adults: Which to use? *The American Journal of Emergency Medicine*. 2018; 36(4): 707–714. PMID:29321111 <https://doi.org/10.1016/j.ajem.2018.01.008>
- [15] Zsido AN, Teleki SA, Csokasi K, et al. Development of the short version of the Spielberger State-Trait Anxiety Inventory. *Psychiatry Research*. 2020; 291: 113223. PMID:32563747 <https://doi.org/10.1016/j.psychres.2020.113223>