THE IMPACT OF EVIDENCE-BASED EDUCATION ABOUT MUSIC LISTENING ON NURSING KNOWLEDGE

by

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As members of the DNP Project Committee, we certify that we have read the DNP project prepared by Amanda Marie Romaine titled The Impact of Evidence-Based Education About Music Listening on Nursing Knowledge and recommend that it be accepted as fulfilling the DNP project requirement for the Degree of Doctor of Nursing Practice.

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DEDICATION

This project is dedicated to my parents, Jim and Evelyn Romaine. Thank you for trusting in science, and in me, especially during the pandemic. The things that I have accomplished in my life are because of the way you raised me and the opportunities you've given me. You are the most important people in my life, and everything I do is to make you proud. I would not have made it through this program without the support and the unconditional love that you show me every day. Thank you for supporting me in everything I've ever done and for always being my biggest fans. You are the best parents I could ever ask for, and I am so thankful you are mine.

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ABSTRACT

Purpose: The purpose of this project was (i) to develop and present an evidence-based educational presentation about music listening for adolescent patients during painful procedures to the nursing staff in a pediatric oncology clinic in Tucson, Arizona and (ii) to assess the impact of the education on nurses' knowledge and nursing adoption of the intervention with patients.

Background: Pediatric oncology patients frequently undergo painful procedures throughout treatment, and inadequately treated pain can result in significant long-term consequences, including avoidance of medical care as an adult. Music listening is a low-risk, easily implemented, and cost-effective intervention that can be used in the clinic setting. Current research shows that music therapy is effective in improving the experiences of adolescents undergoing oncological treatment, and that because nurses are the first line in assessment of the patient and decision-making, they can play a substantial role in a multidisciplinary therapeutic approach incorporating music.

Methods: This quality improvement (QI) project utilized a pretest/posttest design with an evidence-based educational PowerPoint on music listening with adolescent patients during painful procedures. Participants were registered nurses (RNs) recruited from the Banner Diamond Children's oncology clinic. The eight-question pretest and six-question posttest contained three of the same knowledge-based questions about music listening. Nursing confidence with implementing the intervention before and after the educational session was also assessed.

Results: Eight RNs (n=8) completed the pretest, education session, and posttest, and six RNs (n=6) completed the post-project evaluation survey. All eight RNs answered 100% of the knowledge-based questions correctly on the posttest. There was a statistically significant increase in nursing knowledge following the educational session ($p=0.0209$). However, the education did not have a significant impact on nursing confidence with implementing music listening with patients ($p=0.0514$).

Conclusions: This project demonstrated that an evidence-based educational presentation on music listening did increase nursing knowledge in the Banner Diamond Children's oncology clinic. However, the educational presentation did not increase nursing adoption of the music listening intervention with adolescent patients during painful procedures. Several participants noted inadequate time and staffing as barriers to adoption.

INTRODUCTION

Pediatric oncology patients undergo frequent painful procedures throughout treatment, and inadequately treated pain and anxiety can result in significant long-term consequences, including post-traumatic stress disorder (PTSD) and avoidance of medical care as an adult (Friedrichsdorf & Goubert, 2019). Further, pediatric oncology nurses are at an increased risk for compassion fatigue and burnout due to the long-term relationships they form with patients and families, their active participation in grief and bereavement, and the ethical dilemmas that may be faced in clinical care (Sullivan et al., 2019). For this reason, the focus of this Doctor of Nursing Practice (DNP) project was on educating nurses on a music intervention that can be implemented with adolescent oncology patients undergoing a painful procedure. Music listening is a low risk, easily implemented, and cost-effective intervention that can be implemented in the clinic setting to improve the experiences of adolescents undergoing oncological treatment (Bradt et al., 2016; Coughtrey et al., 2017). This project utilized music listening implemented by nursing staff to assess the effectiveness of the intervention. This intervention is especially timely since many organizations do not have the resources to hire a music therapist and COVID-19 policies restrict the presence of non-family visitors. Multiple studies have shown that non-pharmacological methods like music listening can result in decreased levels of pain and anxiety (Rohilla et al., 2018; Van der Heijden et al., 2019; Villacres & Chumpitazi, 2018) and contribute to a more positive experience for the patient and their family (Jong et al., 2020; Ortiz et al., 2019).

Background Knowledge and Significance

An estimated 15,780 children are diagnosed with cancer each year in the United States (US) (American Childhood Cancer Organization, 2020). While advances in medicine have resulted in significant increases in five-year survival rates (Yeh et al., 2020), that survival also comes at a cost. For many patients, cancer treatment is a long and difficult process involving frequent medical appointments, countless painful procedures, multiple surgeries, and sometimes, extended hospitalizations. Length of treatment depends on the type of cancer and occurrence of relapse but generally ranges from one to three years (Warner et al., 2015). According to a systematic review by Bukola and Paula (2017), pediatric oncology patients report that invasive procedures are the most prevalent source of pain. Unfortunately, numerous invasive procedures are required in the diagnosis and treatment of cancer, with lumbar punctures, venipunctures, and port accessing being the most performed procedures (Bukola & Paula, 2017).

Mental health issues among adolescents and young adults are a growing concern in the medical community, and Schulte et al. (2020) suggest that the frequency and diversity of these painful procedures may put survivors of childhood cancer at an increased risk for mental health concerns during adolescence and later in life. Further, the authors developed a model for relating disease, treatment, and procedural pain to a host of biological, social, and psychological consequences, finding a positive association between pain and emotional distress, anxiety, depression, and suicidal ideation (Schulte et al., 2020). According to a cohort study by Nathan et al. (2016), childhood cancer survivors exhibited a 34% higher rate of medical visits for a mental health complaint when compared with the general population. In addition, visits were significantly more frequent among survivors of adolescent cancer, and multiple studies have demonstrated that adolescents are particularly susceptible to psychological challenges following cancer treatment (Barnett et al., 2016; Galán et al., 2016).

There is a significant body of evidence to support the use of psychological interventions like music therapy in pediatric patients undergoing painful procedures and use of these interventions may be able to decrease harmful effects, increase patient coping behaviors, and prevent increased pain and anxiety during future procedures (Flowers & Birnie, 2015). According to Olsen and Weinberg (2017), the optimization of noninvasive pain and anxiety management can assist providers in ambulatory settings to perform procedures that may have otherwise required care in an inpatient setting. Music listening is a type of music therapy and can be used during procedures in the outpatient setting. Music therapy can be described as a systematic process carried out by a credentialed music therapist to promote health and well-being for the patient. Music listening, sometimes referred to as “music medicine,” involves the patient listening to pre-recorded music before, during, and/or after a medical procedure, and is generally provided by a healthcare professional (Stegemann et al., 2019).

The holistic view assumed by the field of nursing means that pediatric nurses and pediatric nurse practitioners (PNPs) are well-prepared to provide quality care for pediatric oncology patients, incorporating both traditional and complementary therapies. Research suggests that because nurses are the first line in patient assessment and decision-making, they can play a substantial role in a multidisciplinary approach incorporating music (Poulsen & Coto, 2018). In addition, nurses with higher job satisfaction and lower burnout were found to incorporate patient individuality into care in a more substantial way. Therefore, interventions that support patient individuality (such as music listening) may contribute to increased nurse satisfaction and, in turn, increased patient satisfaction (Danaci & Koc, 2020).

Local Problem

Although music interventions are often used by Child Life Specialists (Child Life) as a distraction technique during painful procedures at a pediatric oncology clinic in Tucson, Arizona, they are not frequently used when Child Life is unavailable, as the nurses have not received education on implementing a music listening intervention. The clinic provides care for patients from birth up to 18 years of age. Procedures routinely performed at the clinic include blood draws, accessing implanted ports, IV catheter insertion for medication administration, dressing changes, lumbar punctures, and bone marrow biopsies. The clinic serves approximately thirty patients each day, and in March 2021, the clinic provided care to 671 patients. The problem was identified through a needs assessment done with the senior nurse manager and four nurses at the clinic. The nursing staff stated a desire for nonpharmacological interventions to provide support to their patients during painful procedures. Although music listening and music therapy are used on a regular basis in the clinic when Child Life is available, there was no distraction intervention used during painful procedures that could be implemented by nursing staff alone.

Relevant stakeholders include the nurses, the patients, the parents, and the Child Life Specialists. Child Life Specialists try to be present for all procedures, but because there is only one dedicated clinic specialist, that is not always possible. It is crucial to obtain buy-in from all these stakeholders to successfully implement this intervention in the oncology clinic.

Intended Improvement

Project Purpose

The purpose of this project was to develop and present an evidence-based educational presentation about music listening for adolescent patients during painful procedures to the nursing staff in the pediatric oncology clinic and to assess the impact of the education on nursing knowledge and nursing adoption of the music listening intervention with adolescent patients.

Project Question

The question that this project was attempting to answer is as follows: Does an evidence-based educational presentation on the use of music listening in adolescent patients during painful procedures increase (i) nursing knowledge of music listening and (ii) nursing adoption of a music listening intervention during painful procedures in the pediatric oncology clinic over a two-week period?

Project Objectives

The first objective of this project was to assess the effectiveness of an evidence-based education session in increasing nursing knowledge of music listening. The second objective of this project was to assess the effectiveness of an evidence-based education session on nursing adoption of a music listening intervention with adolescents during painful procedures in the pediatric oncology clinic.

Theoretical Framework

The “fundamental patterns of knowing” were originally formulated by Barbara Carper to explain how nurses think about nursing phenomena and to identify the types of knowledge that are central to the nursing profession (Moran et al., 2020). While the realms of personal, empirical, ethical, and esthetic knowledge are essential to nursing daily, carefully examining specific phenomena is also necessary. The Diffusion of Innovations theory provided direction and helped to clarify distinct aspects of this DNP project. The chosen theoretical framework was helpful in the development, assessment, implementation, and evaluation of an intervention for this project, and the use of an appropriate theory to support a practice change contributes to excellence within nursing practice (Moran et al., 2020).

Theory of Diffusion of Innovations

The Diffusion of Innovations theory conceptualized by Rogers (2015) served as the framework to guide this DNP project. The aims of this project required the introduction of a new intervention and a change in current practice for the nurses in the clinic. Implementation of change within an organization can be challenging, as it generally requires a change in established routines for many members of the healthcare team. Rogers (2015) describes diffusion as the process by which an innovation is communicated to the members of the social system through channels over time (Figure 1).

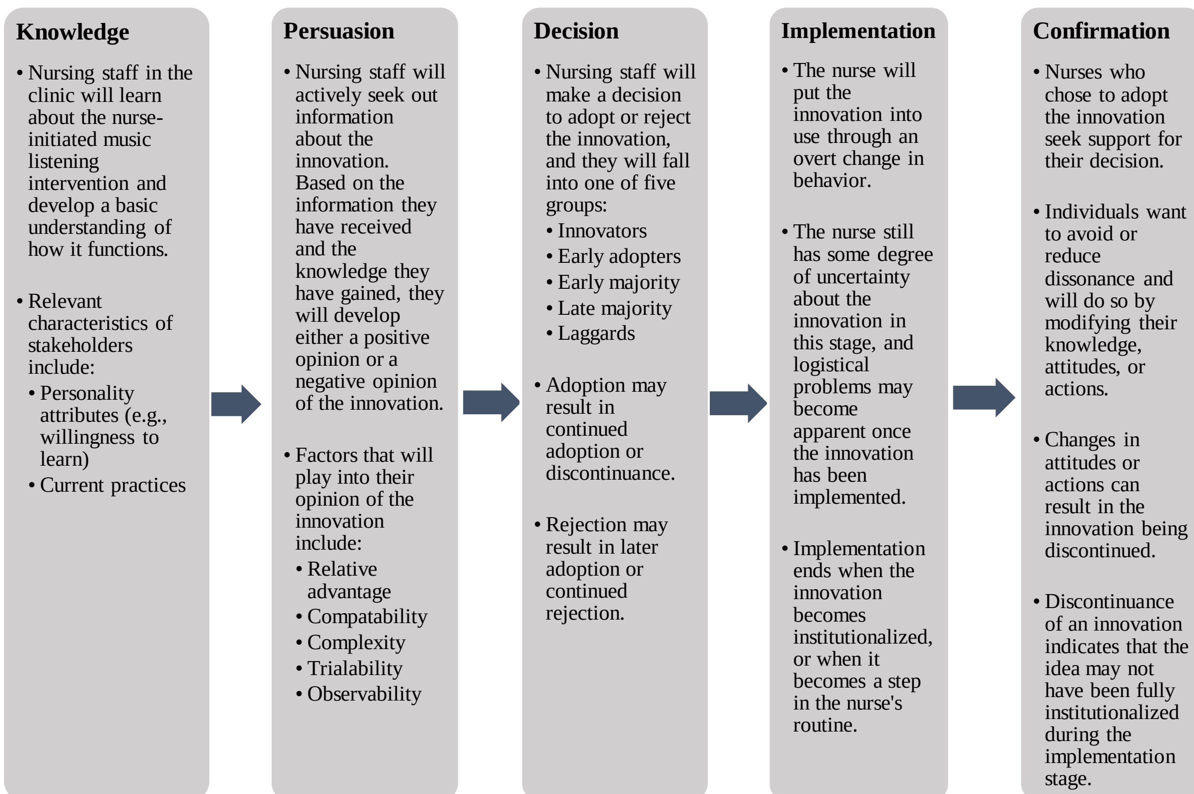
The Innovation

Innovation can refer to a practice, object, or idea that is viewed as new by the social system. Five characteristics of an innovation determine the rate at which it is adopted: relative advantage, compatibility, complexity, trialability, and observability. To be considered for implementation, members of the social system will need to determine the relative advantage of a music listening intervention, or the degree to which they perceive the innovation as better than current practice (Rogers, 2015). The relative advantage may be measured using several different metrics: economic value, level of convenience, and social prestige, to name a few. According to

Rogers, the objective advantage of an innovation is of much less importance than the level of advantage perceived by individuals within the social system, and the higher the perceived advantage, the faster the rate of adoption within the organization. Compatibility is determined by existing members of the social system and refers to the degree to which they consider an innovation to be congruent with their current values, needs, and previous experiences. If an innovation is incompatible with the values and norms of the social system, the rate of adoption will be far less rapid, if it occurs at all (Rogers, 2015).

Figure 1

Innovation Decision Making Process



Adapted from Rogers, E. (2003). *Diffusion of Innovations* (5th ed.). New York: Free Press.

When considering adoption of an innovation, members of the social system assess the complexity of the innovation, or how difficult they perceive the innovation to be to understand and to implement. Innovations that are simple to understand will be adopted more rapidly than innovations that are more complex and require the user to learn new skills. The ability to experiment with an innovation prior to implementation is considered the innovation's trialability, and innovations with higher trialability are generally adopted more rapidly. Observability refers to the extent to which the results of an innovation are visible to others. Members of the social system like to be able to visualize the results of an innovation, and the more clearly, they can see the results, the more likely they are to adopt an innovation (Rogers, 2015).

Stages of Change

The Diffusion of Innovations theory model consists of five stages: knowledge, persuasion, decision, implementation, and confirmation. Knowledge is produced when a member of the social system has exposure to an innovation and forms some understanding about how it functions (Mohammedi et al., 2018). For this DNP project, nursing staff within the clinic received information about the music listening intervention and developed a basic understanding of how it functions. Relevant characteristics of these individuals at the knowledge stage included personality attributes, current practices, and willingness to learn. In the persuasion stage, the individual used perceived attributes of the innovation (as discussed in the previous section) to form an opinion (Rogers, 2003). Stakeholders within the clinic actively sought out information about the music intervention and used this information to form either a positive or negative opinion of the innovation.

The decision stage involves the development of behavioral intentions to implement or not implement the innovation, resulting in either adoption or rejection of the innovation. The rate at which different stakeholders adopt or reject an innovation can vary, and the different categories of member adoption are discussed in the next section. Initial adoption of the innovation may result in continued adoption or eventual discontinuation of the intervention and similarly, initial rejection of the innovation may result in continued rejection or future adoption of the innovation (Rogers, 2003). The healthcare team in the clinic will ultimately decide whether they are going to adopt or reject the plan for implementation of a music intervention with their patients undergoing painful procedures, and the decision that is made initially may change based on how smoothly implementation goes. The implementation stage is closely connected to the decision stage and involves the overt behavior required for actual implementation of an innovation. At this stage, stakeholders may still have some degree of uncertainty about the innovation and logistical problems may become apparent. This stage ends when the innovation becomes institutionalized and thought of as part of the stakeholder's routine (Rogers, 2003). For this DNP project, this would mean that the nurses in the clinic would consider a music listening intervention part of their routine when performing a painful procedure with an adolescent patient.

Lastly, recognition of benefits and reinforcement of the decision comprise the confirmation stage (Walitzer et al., 2016). Stakeholders who have chosen to adopt the innovation will seek support for their decision and individuals will adjust their knowledge and actions to avoid or reduce dissonance. The discontinuation of an innovation during the confirmation stage often means that the innovation was not fully institutionalized in the previous stage (Rogers, 2003). For the implementation of a music intervention in the clinic, several factors may have an impact on whether the innovation is continued on a long-term basis. Nursing staff will most likely seek confirmation of the innovation's benefits from patients and their families, as well as organizational support for continuing to perform the music intervention.

Categories of Member Adoption

Members of the social system can be divided into five categories based on how they respond to an innovation: innovators, early adopters, early majority, late majority, and laggards (Rogers, 2015). Innovators are the first 2.5% of individuals in the social system to adopt the innovation, and these people in this group must be able to handle a large degree of uncertainty at the time of adoption. Early adopters are the next 13.5% of individuals to adopt the innovation, and members who have not yet decided look to this group as role models for advice to inform their decision. The early majority refers to the next 34% of individuals in the system to adopt the innovation, and this is done right after the median member adopts the innovation. Similarly, the late majority is the next 34% of individuals in the system to adopt the innovation, and this is done right after the median member adopts the innovation. Laggards are the final 16% of individuals in the social system to adopt an innovation, and this group often makes its decision based on what has been done in the past, requiring a guarantee that the new idea will not fail before they will agree to adopt (Rogers, 2003).

Relevant Constructs

The Diffusion of Innovations theory is applicable to this DNP project because it focuses on implementation of a new idea within an organization. Rogers places the focus of the process on the adopter as the center of decision-making and behavior changes (Balas & Chapman, 2018). Within the organizational structure of the oncology clinic, this intervention relies heavily on the participation of the adopters — in this case, the nurses — who will ultimately decide if the music listening intervention is useful to them and their patients and if they are willing to change the way they practice. Innovation cannot be forced into practice if its application is not useful and relevant to the setting and the population. Therefore, it is important that these stakeholders have knowledge of music listening and its potential benefits in the pediatric oncology population prior to deciding to adopt or reject the practice.

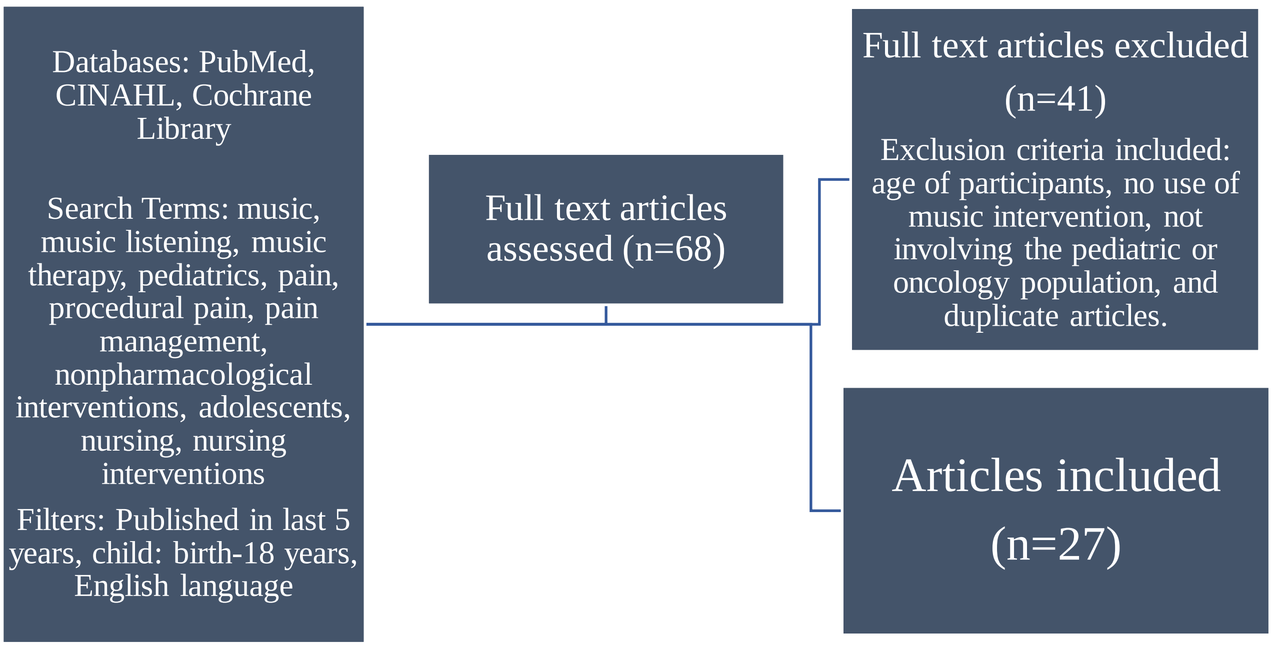
Literature Synthesis

Evidence Search

To design an evidence-based education presentation for nursing staff in the pediatric oncology clinic, a literature search was conducted using three databases: PubMed, CINAHL, and Cochrane Library (Figure 2). The following keywords were used: music, music listening, music therapy, pediatrics, pain, procedural pain, pain management, nonpharmacological interventions, adolescents, nursing, and nursing interventions. MeSH (medical subject heading) terms were utilized on the PubMed and Cochrane library databases. The results were filtered to include only literature published in the English language in the last five years and involving children from birth to 18 years old. A total of 68 articles were found. Articles were excluded if they did not incorporate a music intervention, if there were duplicate articles, or if they did not involve children under the age of 18 (some articles studied adults aged 18 and over and therefore were not filtered out). As a result of these exclusion criteria, 27 articles that directly applied to the content of this project were retained (Appendix G). The key themes identified in the review of the literature were: active music interventions, passive music interventions, and the impact of music interventions on patients during medical procedures.

Figure 2

Literature Search Flowchart



Comprehensive Appraisal of Evidence

A cancer diagnosis may result in both emotional and physical suffering, and the symptoms and treatment side effects can have a significant impact on patients' quality of life and well-being (Bradt, 2016). Research indicates that individuals with cancer experience higher levels of depression and anxiety in response to diagnosis and treatment, and childhood cancer survivors (adolescents especially) are particularly vulnerable to these effects (Nathan et al., 2016). In addition, experiences with inadequate pain management can adversely affect coping mechanisms and perception of pain in children (Villacres & Chumpitazi, 2018). The impact of cancer on mental health has wide-ranging implications for school attendance, quality of life, and the development of healthy relationships and communication skills in the future (Coughtrey et al., 2018).

Active Music Interventions

Active music interventions are interactive in nature and involve direct engagement from the patient to help the clinician create or play the music (McPherson et al., 2019). Yinger (2016) looked at the effects of live music therapy on levels of distress and pain during an immunization procedure in the clinic setting. The study included a sample of 58 pediatric patients between the ages of four and six years and found that parents in the experimental group reported lower levels of distress in their children, but that there was no statistically significant difference in parent ratings of their child's pain. Van der Heijden et al. (2018) conducted a randomized controlled trial in which they implemented a live music therapy session involving 135 pediatric patients with a median age of 22 months after a wound care procedure. They found that pain and distress scores differed significantly in children older than five years of age, which suggests that older children may be more responsive to this intervention than younger children. Nelson et al. (2017) evaluated the effect of a music therapy session led by a board-certified music therapist following a surgical procedure. Their randomized controlled trial included 44 participants between the ages of 10 and 19 years, and the music therapy session was conducted with a board-certified music therapist on post-operative day two, as the patient was getting out of bed for the first time. There was a statistically significant reduction in pre-therapy and post-therapy pain and anxiety levels, and the authors noted that if a music therapist is not available, a support person who is familiar with relaxation breathing and the use of music to temper pain response should be present (Nelson et al., 2017).

Passive Music Interventions

Passive music interventions involve patients listening to music rather than actively participating in producing it (McPherson et al., 2019). As passive music therapy is an intervention that is cost-effective and easy to implement, it is commonly used in the healthcare setting. Van der Heijden et al. (2019) conducted a randomized controlled trial with 191 participants aged 3 to 13 years undergoing a painful procedure (most commonly IV placement or cast application) in the emergency room setting. The experimental group listened to pre-recorded music through speakers during the procedure, while children in the control group received standard care. Data analysis showed that children in the music group exhibited significantly lower pain than children in the control group as assessed by an independent observer using the Alder Hey Triage Pain Score. Aydin and Sahiner (2017) examined the effect of different distraction methods during phlebotomy procedures in 200 pediatric patients aged 7 to 12 years. Although there was a decrease in pain and anxiety in the music intervention group, it was not a statistically significant difference. However, in the group in which more than one intervention was implemented (distraction cards & music), there was no effect on pain and anxiety experienced by the child. Atak and Ozyazicioglu (2021) used the Guide for Music Initiatives in Pediatric Patients to inform their intervention. Ninety children were split into three groups (classical music, Turkish music, & audiobook) and while classical music listening had the most significant effect in reducing postoperative pain, all three methods played an effective role in decreasing pain and anxiety.

Impact on Patients During Medical Procedures

Of the articles included in this synthesis, 21 investigated the impact of a music intervention on some aspect of the patient's experience: pain, anxiety, distress, coping, or physiological parameters (such as vital signs). Kuhlmann et al. (2020) measured pain in 95 infants using the COMFORT-Behavior scale and found that although there was a difference in scores between the experimental and control groups, the difference was not statistically significant. They suggested further research in music implementation, specifically in the preoperative period and with children experiencing higher levels of distress. Sundar et al. (2016) used the Modified Behavior Pain Scale (MBPS) to obtain parent ratings of their child's pain and found that all three parameters measured by the MBPS – facial expression, cry, and movement – showed significant improvement. Sahiner and Bal (2016) used the Wong-Baker FACES Scale to assess pain in 120 patients aged 6 to 12 years old and found that there was a significant decrease in pain levels of children in all the distraction groups, including music.

Many of the studies included in this synthesis looked at the child's level of anxiety, whether rated by the child, their parent, or an observer. Celikol et al. (2019) conducted a randomized controlled trial of 200 children aged 8 to 12 years and measured anxiety before and after the procedure using the State-Trait Anxiety Inventory for Children. They found a statistically significant decrease in anxiety scores for patients in the experimental groups, which either listened to music or watched a video during the procedure. Millett and Gooding (2017) assessed participant anxiety in 40 patients before and after a painful outpatient procedure using the modified Yale Pediatric Anxiety Scale, and caregiver anxiety was also measured using the short-form State Trait Anxiety Inventory. They found a significant reduction in anxiety for both the passive music therapy experimental group and the active music therapy experimental group.

Other studies explored the effects of music on physiological parameters. Bashiri et al. (2018) looked at changes in vital signs and sedation usage in the adolescent and adult population and found that patients listening to music in both the conscious sedation and deep sedation groups exhibited a significant decrease in heart rate, mean arterial pressure, and amount of sedation medication required when compared to the control group. Franzoi et al. (2016) found a statistically significant difference in preoperative anxiety based on differences in respiratory rate between the experimental and control groups.

Two of the studies included an experimental group in which multiple non-pharmacological interventions were implemented during the same procedure (e.g., using cartoons in conjunction with the Buzzy cold device). Aydin and Sahiner (2017) and Bergomi et al. (2018) both found that single interventions had a more significant effect on patient-reported pain and anxiety than multiple interventions implemented together, suggesting that it is ideal to focus on a single distraction technique during painful procedures.

Strengths of the Literature

A major strength of the literature included in this review is that researchers used a wide range of assessments to evaluate a diverse group of variables relating to the effectiveness of a music intervention during painful procedures. This ensures that the broad findings of this research are not subject to the weaknesses of any particular methodology; rather, they generally provide a broad understanding of the effects of music interventions on pain and anxiety in the pediatric population. For example, while some pain assessment methodologies exhibit greater validity than others, a wide range of methods have been validated for use in the pediatric population (Birnie et al., 2019), and these diverse methods are represented in the literature on music listening.

Many of the studies included in this review used patient ratings of their own pain or anxiety using an age-appropriate scale (Atak & Ozyazicioglu, 2021; Celikol et al., 2019; Hsu et al., 2016; Nelson et al., 2017; Staphorst et al., 2017). As pain is an incredibly individualized experience, self-report using an age-appropriate, validated scale is the preferred method of assessment (Birnie et al., 2019). Other studies used parent or nurse ratings of the child’s pain, anxiety, and/or distress (Bergomi et al., 2018; Ortiz et al., 2019; Sundar et al., 2016; Yinger, 2016), and still other used ratings by the researcher or independent assessor using a scoring system (Kuhlmann et al., 2020; Millett & Gooding, 2017; van der Hiejden et al., 2019). Lifland et al. (2017) conducted a study in which 295 children (aged 8 to 18 years) and their parents reported on pain intensity using a numeric rating scale. They found statistically significant agreement between child and parent reports of pain intensity and concluded that parent report of pain is a valid proxy for child self-reported pain intensity. In addition, two studies have combined pain and anxiety reports from three separate parties: the patients, the parents, and an observer, and were able to compare pain and anxiety ratings between the three groups (Aydin & Sahiner, 2017; Fox et al., 2016; Sahiner & Bal, 2016). Some studies also collected data on pain and anxiety indirectly, considering analgesic use and changes in vital signs (Bashiri et al., 2018; Franzoi et al., 2016; Rohilla et al., 2018).

Another strength of the literature is that many of the studies involved large sample sizes (i.e., greater than 100 participants). Several of the studies included over 100 participants, and

Aydin and Sahiner (2017), Brudvik et al. (2017), Celikol et al. (2019), and Staphorst et al. (2017) each included over 200 participants. Due to the low risk and relatively low cost of implementation, researchers are often able to include larger numbers of participants in trials using music listening. This can give us greater confidence in the reliability of the findings.

Weaknesses of the Literature

Of the 28 studies included in this synthesis, only one study attempted to blind participants to their experimental condition. This was a challenge acknowledged in many of the studies (Geipel et al., 2018; Rohilla et al., 2018; van der Heijden et al., 2019). Franzoi et al. (2016) conducted a randomized controlled trial that included 52 patients aged 3 to 12 years undergoing elective surgery. In an attempt to blind participants to their group assignment, both the control group and experimental group listened to music, with the control group listening to music only after the completion of data collection. Although the children and their parents were blinded to the music intervention, the research team was aware of which participants were in which group. The difficulty in blinding participants is more of a systematic problem, rather than a failure on the part of the researchers, due to the nature of the intervention involved. Birnie et al. (2018) conducted a systematic review that included 59 trials with 5,550 participants undergoing needle-related procedural pain. The authors suggested that the quality of evidence across the literature could be improved through enhanced design, implementation, and reporting; however, they also discussed the difficulty of obtaining high quality evidence in randomized controlled trials involving psychological interventions, as many of these interventions, by nature, preclude the possibility of true blinding.

Another weakness of the literature is the potential for these types of methodological difficulties to undermine the internal validity of the research. For example, if the medical provider knows the patient is in the experimental condition, they might not only change how they perceive and report pain, but it may affect how they perform the procedure itself. They may be more cognizant of the potentially painful aspects of the procedure, having been primed to think about them by the intervention.

A systematic review by Bradt et al. (2016) looked at music interventions for improving psychological and physiological outcomes in oncology patients specifically. The review included 52 trials with 3,731 participants, and both live music therapy and music listening interventions. The authors identified some specific areas on which future research should focus, including the impact of frequency and duration of music interventions on treatment effects, the impact of music interventions on physiological indicators such as respirations and blood pressure, and patient characteristics that may increase or decrease the effect of a music intervention.

Gaps and Limitations

While advances in research have contributed to an improved understanding of the nature of pain in pediatric patients, there are still significant gaps in current knowledge and in the application of knowledge to clinical care. Pediatric patients continue to report inadequate pain management during painful procedures, after surgery, and in the context of chronic illness. More research is needed in non-pharmacological pain interventions as well as the psychological, social, and cognitive factors that are associated with pain symptoms in pediatric patients (Chambers, 2018).

Another significant gap indicated by this literature review is that no research has been done on nurse perception of music listening interventions and the impact of evidence-based education on nursing knowledge of music listening. Although nurses spend a significant amount of time with the patient and are often the ones performing the painful procedure, there is little research on non-pharmacological interventions intended to be implemented by nursing alone. This DNP project helps to fill some of these gaps by introducing evidence-based education for nursing staff on music listening implemented with adolescent oncology patients undergoing painful procedures.

METHODS

Project Design

This QI project used a one group pretest and posttest design to assess the impact of an educational presentation on nursing knowledge and nurse adoption of a music listening intervention with adolescent patients. In this type of study, pretest data is collected, an educational intervention is performed, and posttest data is collected. This type of study can indicate a change in knowledge levels of the participants (Holly, 2019). This project also incorporated a post-project evaluation survey to gather data on nursing perception of the effectiveness of the intervention and directions for future research.

Model for Implementation

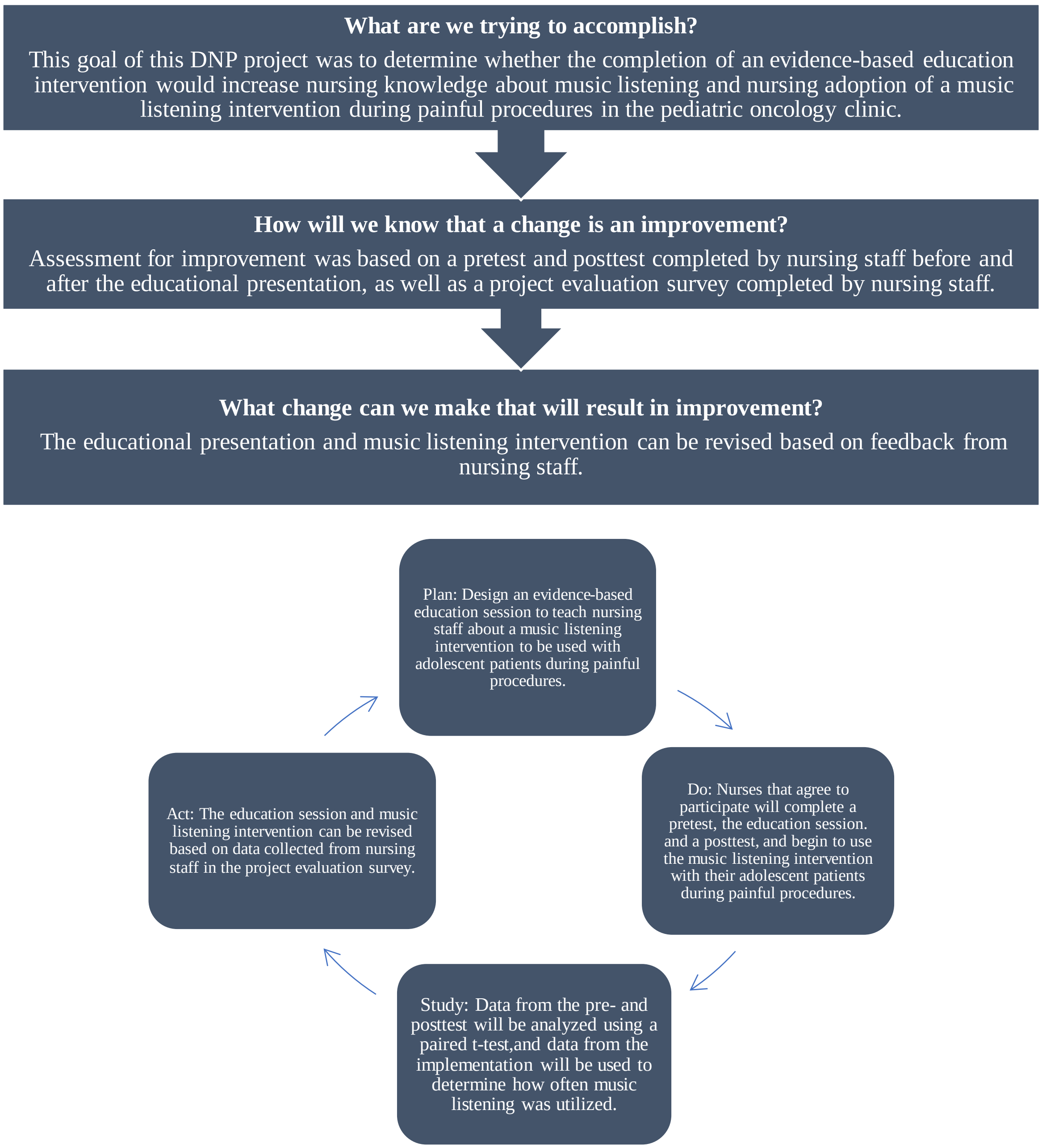
The Institute for Healthcare Improvement's (IHI) Model for Improvement (MFI) was used as a framework to guide this DNP project. The model is made up of two parts: a set of fundamental questions and the Plan-Do-Study-Act (PDSA) cycle, which involves testing a change quickly on a small scale before making revisions and implementing the change on a broader scale (IHI, 2020).

Plan-Do-Study-Act (PDSA) Cycle

In the "plan" stage, the objective of the project is clarified, and a plan is developed to test the change, including a plan for collecting data (IHI, 2020). For this QI project, this stage involved designing an evidence-based education session to teach nursing staff about a music listening intervention to be used with adolescent patients during painful procedures. In the "do" stage, the test is carried out on a small scale and any problems or unexpected events are documented (IHI, 2020). Nursing staff who agreed to participate in the project completed a pretest, the education session, and a posttest, and used the music listening intervention with their adolescent patients undergoing painful procedures as appropriate. In the "study" stage, analysis of the data is completed, and the data is summarized to show what was learned (IHI, 2020). Data from the pretest and posttest were analyzed using a paired t-test. Data collected during intervention implementation was analyzed to determine how often music listening was utilized and why the nurse did or did not use it. Lastly, in the "act" stage, the project can be revised based on any issues identified during implementation, and a plan is prepared for future implementation (IHI, 2020). The nursing staff completed a post-project evaluation survey at the end of the project to collect data on nurse perception of the project and suggestions for future research. Figure 3 depicts how the Model for Improvement was specifically applied to this DNP project.

Figure 3

Model for Improvement



Adapted from Institute for Healthcare Improvement. (2020). How to improve. Retrieved from http://www.ihi.org/resources/Pages/HowtoImprove/default.aspx

Setting and Stakeholders

This DNP project was implemented in a pediatric oncology clinic in Tucson, Arizona. Tucson is the largest city in Pima county, with a population of approximately 545,897 people in 2018 (DataUSA, 2018). According to the United States Census Bureau (2019), 72.1% of the population is Caucasian, 5.2% of the population is Black or African American, 3.7% of the population is American Indian or Alaskan Native, and 3.2% of the population is Asian, with 43.6% of the population being of Hispanic or Latino origin. Tucson has a median household income of $43,676 and 89.3% of the population has health coverage (DataUSA, 2018).

The oncology clinic employs five physicians, five nurse practitioners (NPs), 10 registered nurses (RNs), and three medical assistants (MAs). The clinic provides outpatient care to pediatric patients from birth to 18 years on weekdays from 8 AM to 5 PM. Procedures routinely performed at the clinic include blood draws, accessing implanted ports, IV catheter insertion for medication administration, dressing changes, lumbar punctures, and bone marrow biopsies. The clinic is part of the Banner healthcare organization, which is the primary source for pediatric healthcare and the sole provider of oncology care for pediatric patients in the Tucson area. The patients seen at this clinic are considered a vulnerable population.

Stakeholders that were identified for this DNP project included the clinic staff (physicians, NPs, RNs, MAs, & the Child Life specialist), administration within the Banner organization (director of professional practice, clinic director, & quality improvement coordinator), parents, and the patients themselves. Meetings were conducted with the director of professional practice and clinic director to discuss the DNP project and plan for implementation. Nursing staff were directly involved with the procedure, as they completed the education session on music listening and had the opportunity to implement the music listening intervention with the patients. Risks to the nurse included slowing down their workflow and causing a delay in their schedule. Risks to patients and parents included a potential increase in the length of the clinic visit or procedure.

Planning the Intervention

The project implementation occurred in two phases. First, an educational session on the music listening intervention was conducted with the nursing staff who agreed to participate in the project. The educational session took approximately 15 minutes and was held during a regularly scheduled staff meeting. The educational session discussed what music listening is, how to implement the music listening intervention, possible risks and benefits of the intervention, and inclusion criteria for oncology patients with whom the music listening intervention could be used. Educational objectives for the session can be found in Appendix E. Staff that agreed to participate in the project completed a pretest before the session and a posttest after the session (Appendix E).

The second stage of project implementation occurred over a two-week period following the education session during which the nursing staff had the opportunity to implement music listening with their adolescent patients during painful procedures. For each adolescent patient they cared for who was undergoing a painful procedure, the nurse was instructed that they could fill out a procedure form (Appendix D) indicating the procedure that was performed, whether music listening was used, and if used, the nurse’s perception of the effectiveness of the intervention using a Likert scale. If music listening was not used, the nurse could circle one of the options to indicate why the intervention was not used: the patient did not want to listen to music, the nurse did not think it would be helpful for the patient, there was not enough time, or there were not enough resources.

Participants and Recruitment

This DNP project utilized a convenience sample of pediatric oncology nurses. The only inclusion criteria for participation was that the participants were registered nurses in the pediatric oncology clinic at Diamond Children's Medical Center. All clinic nurses were invited to participate in the project through email and a recruitment flyer in the clinic breakroom (Appendix C). A 15-minute educational session was provided multiple times during a lunch break so that all the nurses had the opportunity to attend. All nurses that chose to participate received a disclosure form (Appendix B) that outlined what was required of them, which stated that their participation is voluntary and that by participating in the project, they were agreeing to have their responses used and therefore giving implied consent.

Consent and Ethical Considerations

Ethical considerations for this QI project involving participants were guided by four basic principles: respect for autonomy, beneficence, non-maleficence, and justice. Respecting the autonomy of a patient means that there is recognition that the patient has a right to make informed decisions for themselves based on their personal beliefs and values (Artal & Rubenfeld, 2017). The autonomy of the healthcare staff was respected by making participation voluntary and advising staff that participation would have no effect on employment. By presenting the intervention to adolescent patients and allowing them to decide whether they would like to use music listening during their procedure, the nurses were also respecting the autonomy of patients.

Beneficence requires healthcare providers to act in a way that benefits the patient, and non-maleficence means that healthcare providers should be seeking to do no harm. The goal of this DNP project was to provide education to nursing staff about a low-risk music listening intervention to improve the experiences of pediatric patients undergoing a painful procedure. Based on the literature review that was conducted, there is evidence to support the use of music interventions with pediatric oncology patients during painful procedures to improve their experience.

Lastly, the principle of justice ensures that all patients are treated fairly and equitably as they receive care (Doody & Noonan, 2016). Prior to implementation, institutional review board (IRB) approval was obtained from the Banner organization. A disclosure agreement (Appendix B) was also provided to nurses that elected to participate in the project to ensure their understanding of the project's purpose and their consent to participate in the project. All information that was collected was de-identified and securely stored. No protected health information was collected.

Although these ethical principles can be applied to many fields, there is an additional concept of vulnerability that is particularly relevant in healthcare. Any individual that receives medical care is required to demonstrate vulnerability in some way, whether it is to a small or large degree (Boldt, 2019). Due to the long course of treatment, potential hospitalizations, and traumatic nature of a childhood cancer diagnosis, pediatric oncology patients and their families are particularly vulnerable. In implementing a DNP project at the pediatric oncology clinic, all these ethical principles were considered. For the purposes of this DNP project, patients and families were not involved in the data collection for this project, and therefore, data was not collected on a vulnerable population.

Timeline

A timeline (Appendix F) was created to ensure appropriate progression of the DNP project and to outline the steps that would occur in the planning, pre-implementation, implementation, and evaluation stages of the project. The timeline dates required some modification based on the timeline of approval received from the Banner Research Determination Committee.

Data Collection

Data collection was done through a pretest prior to the education session, a posttest immediately following the education session, a procedure form to be completed by the nurse with each adolescent patient undergoing a painful procedure, and a post-project evaluation survey. The pretest (Appendix E) assessed the nurse's current knowledge of music listening and previous experiences with music listening, along with his or her level of confidence using music listening with patients using a Likert scale. The posttest (Appendix E) assessed the nurses' understanding of the information presented in the education session and, using a Likert scale, their levels of confidence in using music listening with patients. The procedure form (Appendix D) was available to be filled out by the nurse each time he or she performed a painful procedure with an adolescent patient. If music listening was used, the nurse was to use a Likert scale to record his or her perception of the effectiveness of the intervention in improving the patient's experience. If music listening was not used, the nurse was to circle an option to indicate why it was not used.

The Likert scale is frequently used to assess participant satisfaction because it is easily understood and gives the respondent several options to choose from (Pini et al., 2014). For this project, a five-point Likert scale was used. However, it is important to address the potential for central tendency bias, as participants may avoid extreme response categories and may respond to statements in a way which they believe pleases the primary investigator (PI), resulting in acquiescence bias (Taherdoost, 2019).

No protected health information was collected. The only person with access to the nurse responses was the PI. Following completion of the project, the data was transferred to the University of Arizona College of Nursing's password-protected cloud file service, where it will be stored for six years.

Data Analysis

Data collected through paper surveys during the implementation stage was visualized and analyzed using Microsoft Excel and Stata. Given the within-subjects design of this project and the fact that the data collected was non-parametric, statistical significance was assessed using a paired t-test (Siedlecki, 2020). A *p*-value of 0.05 was selected to indicate statistical significance. The pretest/posttest design of this study did pose a threat to internal validity, as this type of design can impact the performance of participants on each of the tests (Polit & Beck, 2017). The external validity of the educational content was reviewed by two content experts, Child Life specialists at Banner prior to implementation to ensure the accuracy of the information being taught.

RESULTS

Outcomes

The education session occurred on September 30, 2021, in the Banner Diamond Children's oncology clinic in Tucson, Arizona. The project evaluation survey was done 2.5 weeks later, on October 18, 2021. The education was open to all RNs in the clinic who attended the staff meeting. One month prior to implementation, the senior manager of the clinic sent out an email to staff members to let them know about the education session. The pretest consisted of eight questions to assess the nurse's previous experiences with and understanding of music listening with patients during painful procedures. The posttest consisted of six questions used to assess understanding of the material presented in the educational PowerPoint. Eight participants total completed the pretest, educational PowerPoint, and posttest. Six of these participants went on to complete the project evaluation survey 2.5 weeks after the initial education, allowing time for nursing staff to use the music listening intervention and fill out the nurse procedure form as indicated. The pretest, posttest, and project evaluation surveys were matched using a participant identifier created by the participant and used to label each form.

Table 1

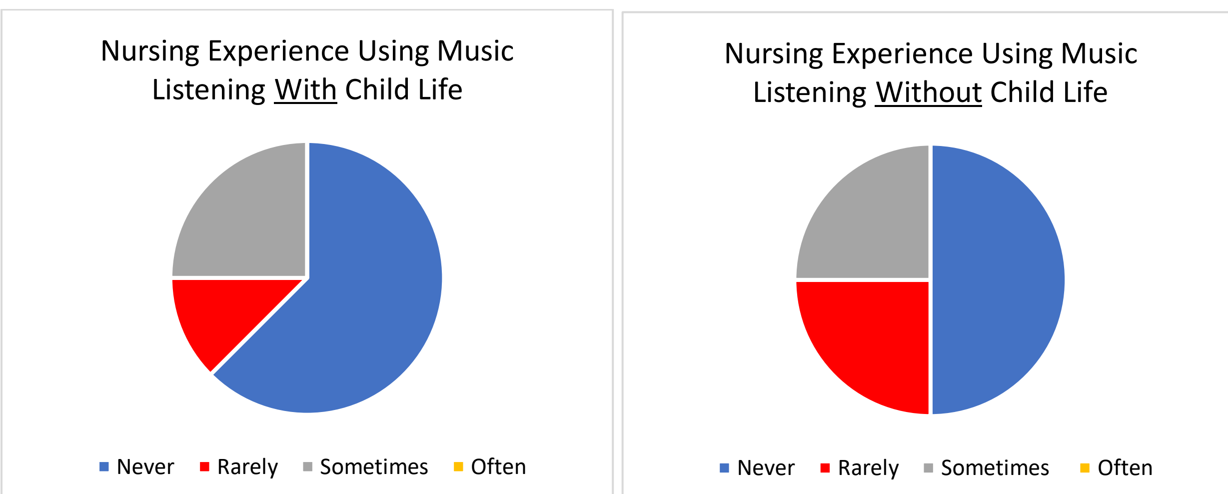
Pretest and Posttest Participation Summary

	n
Completed pretest	8
Completed posttest	8
Completed project evaluation survey	6

The first objective of this project was to determine the effectiveness of an evidence-based educational presentation on music listening in adolescent patients during painful procedures on nursing knowledge of music listening. To assess this, participants were given a pretest, the educational presentation, and a posttest. The chart below shows how the participants answered when asked about their experience using music listening with patients either with or without the help of a Child Life specialist. For participants that answered ‘never’ or ‘rarely,’ they were asked a select-all-that-apply question to indicate why they chose this answer. Five nurses said that they were unaware Child Life provided this service, three nurses said that they did not have enough time, and three nurses said that they were unfamiliar with music listening.

Figure 4

Nursing Experience Using Music Listening



A comparison of the pretest and posttest answers can be seen in Figure 5. The first question asked about the type of music that should be used, the second question asked about when the music should be started and stopped in relation to the procedure, and the third question discussed the method of delivery for the music (i.e., headphones or a speaker). All eight participants (n=8) answered all the knowledge-based questions correctly on the posttest following the education session. A two-tailed paired *t*-test was done using Stata. The *p*-value was 0.0209, which is statistically significant ($p<0.05$). As shown in Table 2, there was a statistically significant increase in the number of correct answers after the educational session.

Figure 5

Question Comparison from the Pretest and Posttest

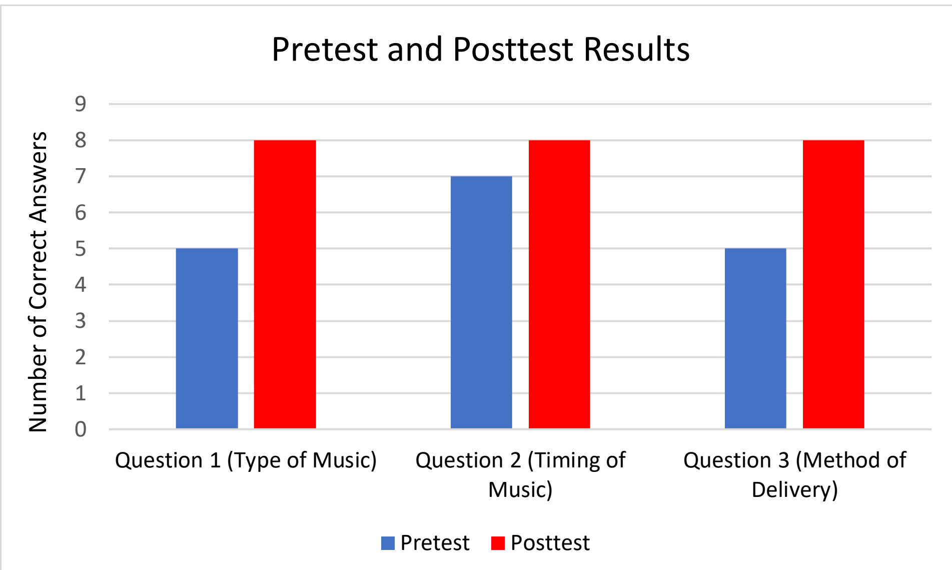


Table 2

Paired t-test Results for Pre and Posttest Answers

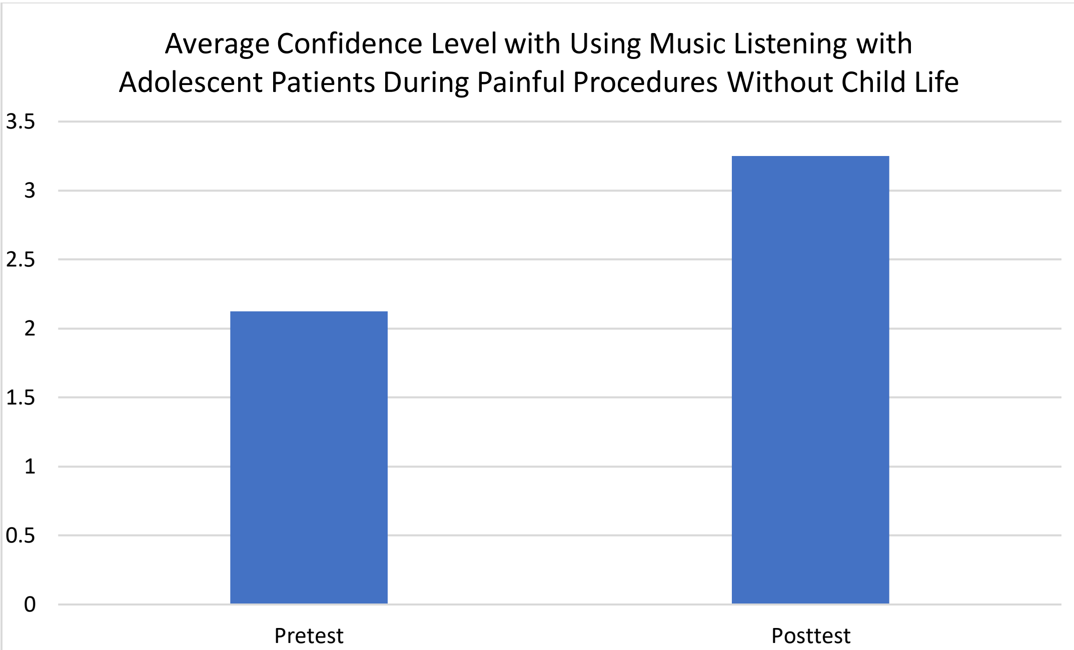
	Pretest	**Posttest**	***P*-value***
Mean (sd)	2.13 (0.83)	3.00 (0)	0.0209
Median (min, max)	2 (1,3)	3(3,3)	

*$p<0.05$

The final question on the posttest was the same as the final question on the pretest: How confident do you feel about using music listening with your adolescent patients during painful procedures without the help of Child Life? The figure below demonstrates the paired answers for participants on the pretest and posttest.

Figure 6

Final Question Comparison on Pretest and Posttest



As indicated in the table below, the p-value was calculated in Stata using a two-tailed paired t-test. The *p*-value was 0.0514, which is not statistically significant ($p<0.05$). This means that there was not a statistically significant increase in nursing confidence with using music listening with adolescent patients during painful procedures following the education session.

Table 3

Paired t-test Results for Nursing Confidence

	Pretest	**Posttest**	***P*-value***
Mean (sd)	2.125 (1.13)	3.25 (0.89)	0.0514
Median (min, max)	2 (0,4)	3.5 (2,4)	

*p <0.05

The second objective of this project was to determine the effectiveness of an evidence-based educational presentation of nursing adoption of a music listening intervention in the pediatric oncology clinic. No nurse procedure forms were filled out in the 2.5-week period between the education session and the project evaluation survey. When the PI distributed the project evaluation surveys, several participants indicated that they had used music listening with their patients but did not have time to fill out a procedure form. The data collected for this project indicates that an evidence-based educational presentation did not have an impact on nursing adoption of a music listening intervention in the pediatric oncology clinic.

The post-project evaluation survey assessed nurses' perceptions of the music listening intervention and the project itself. When asked what changes they would make to the project, five of the participants said that they feel they would be able to successfully implement it with more time, one participant suggested providing headphones to patients and one participant suggested having a handout to give to patients explaining music listening. When asked about other uses for this type of intervention in the clinic, one participant stated that music listening would be useful during lumbar punctures and bone marrow biopsies, one participant thought it could be useful for staff stress reduction, and one participant suggested it become part of the standard of care for patients during clinic appointments.

DISCUSSION

Summary

Inadequately treated pain during painful procedures can be harmful to the mental health of any patient, but the pediatric oncology population is at increased risk for long-term effects due to the frequency and diversity of these painful experiences throughout oncological treatment

(Schulte et al., 2020). Pediatric oncology nurses are also at an increased risk for burnout due to the extended course of treatment for many of their patients and the possibility for poor outcomes (Sullivan et al., 2019). The published literature indicates that music interventions can be useful, specifically in the oncology population, to improve patient experiences during painful procedures (Flowers & Birnie, 2015). It also indicates that nurses who can incorporate patient preferences and individuality into the care they provide report higher job satisfaction and lower levels of burnout (Danaci & Koc, 2020). The pediatric oncology clinic is a setting that these patients visit on a regular basis for care, and therefore, was an appropriate setting to implement this project.

Interpretation

The key findings of this project are that the evidence-based education session did increase nursing knowledge of music listening with patients during painful procedures, and that this increase was statistically significant ($p = 0.0209$). However, the educational intervention did not result in a statistically significant increase in nursing confidence with using music listening with patients during painful procedures ($p = 0.0514$). Overall, while the nursing staff felt like this was an intervention that could be useful in improving the experiences of their patients, it was difficult to find the time to implement such an intervention in addition to their other responsibilities.

Implications

Practice

The results of this project will be presented to the nursing staff and stakeholders at the pediatric oncology clinic. This will inform the management at the clinic that nursing staff are interested in using interventions like music listening, as well as the barriers that they feel are in the way of successful implementation. There may be a use for this type of intervention in pediatric primary care, as painful procedures frequently occur in the primary care setting (e.g., immunizations), but Child Life is not a resource that is available in this setting.

Education

The nursing staff in the pediatric oncology clinic are responsible for providing education to families on several topics. To lessen the burden on nursing staff, they could provide education to families on music listening and possible benefits, and the families could work together to use music listening during a painful procedure. As demonstrated by this project, the education provided resulted in increased nursing knowledge of music listening, and it could be effective in increasing parent knowledge of music listening as well. Alternatively, education on music listening could be included in the orientation materials for any new nursing staff at the oncology clinic, which could potentially increase the use of this intervention.

Research

This DNP project focused on the education of nursing staff, but for future research, this type of educational intervention could be implemented with patients and/or their families to assess understanding and effectiveness. Future research implications would be to expand this project to include a larger population; for example, parents and adolescents completing a questionnaire to assess patient experience with this type of intervention and its impact on levels of pain and anxiety during procedures. A longitudinal study on the use of music listening with patients would also be helpful in exploring mental health outcomes in the pediatric oncology population.

Policy

Based on the findings of this DNP project, education for nursing staff on music listening may be useful for all nursing staff working with adolescent patients within Banner. Banner Health's vision states that, as an organization, they strive to be recognized for clinical excellence, innovation, and a highly coordinated patient experience, and interventions like music listening can contribute to this goal. One possibility for Banner hospitals is the implementation of a policy for music listening or other types of music therapy during painful procedures.

Limitations

The major limitation of this project is that it is not generalizable to other settings due to the small sample size (n=8) and the specific setting in which it was implemented (the pediatric oncology clinic). While there was a statistically significant change in nursing knowledge, it is not possible to infer whether the evidence-based education would have the same effect in a larger sample size or in a different setting. Further, staffing changes related to the COVID-19 pandemic may have had an impact on the nursing staff's willingness and motivation to incorporate another task into their schedule.

As Polit and Beck (2017) discuss, a pretest/posttest study design can pose a threat to internal validity due to the possibility of acquiescence bias, in which the participants tend to respond in a way that they believe the PI wants them to respond (this is more common with questions related to opinion or confidence level) (Taherdoost, 2019). Although not statistically significant, confidence levels did increase following the education intervention, and this could have been a result of the participants' increased knowledge on the subject or a result of acquiescence bias. To increase the external validity of this project, two content experts at Banner

Diamond Children's Hospital reviewed the educational content for accurate information. They also reviewed the pretest and posttest to ensure that they were a good representation of the information presented in the educational PowerPoint. Based on their feedback, some minor changes were made to the wording on the PowerPoint to clarify the instructions for using the music listening intervention. No changes were made to the pretest or posttest based on the content experts' review.

DNP Essentials Addressed

This project addressed two of the essentials of doctoral education for advanced nursing practice (ANP) as defined by the American Association of Colleges of Nursing (AACN) (2006). DNP Essential III was addressed first: clinical scholarship and analytical methods for evidence-based practice. One of the key activities of DNP graduates is the translation of research and the integration of new knowledge into practice. To fulfill this essential, the DNP program prepares graduates to design, direct, and evaluate quality improvement (QI) methodologies that promote patient-centered care (AACN, 2006). The primary objective of this project was to assess whether an evidence-based education session would result in an increase in nursing knowledge of music listening. This project involved an analysis of the existing literature, the development of an evidence-based education session on music listening during painful procedures, and the dissemination of knowledge among nurses in the pediatric oncology clinic.

DNP Essential VI was also addressed: interprofessional collaboration for improving patient and population health outcomes. In working to fulfill the Institute of Medicine's (IOM) mandate to provide care that is safe, effective, patient-centered, timely, efficient, and equitable, nurse practitioners must work in highly collaborative teams with professionals from other disciplines (AACN, 2006). In the oncology clinic, providers, nurses, medical assistants, respiratory therapists, dietitians, and Child Life specialists work with patients and their support systems to ensure that patients are receiving care in all areas. The design and implementation of this QI project required collaboration between the PI, management within the Banner facility, management within the pediatric oncology clinic, Child Life, and the nursing staff.

Conclusions

The purpose of this DNP project was to assess the effectiveness of evidence-based education on nursing knowledge of music listening and adoption of a music listening intervention in a pediatric oncology clinic in Tucson, Arizona. There was a statistically significant increase in nursing knowledge following the evidence-based education, but there was not a statistically significant increase in nursing confidence with using a music listening intervention following the education. There was not an increase in nursing adoption of a music listening intervention with pediatric patients during painful procedures, and most of the participants cited a lack of time as a barrier to implementation. This QI project indicates that an evidence-based education session was an effective method to increase nursing knowledge of music listening with adolescent patients during painful procedures in the pediatric oncology clinic, and that nursing knowledge was not the primary barrier to adoption.

Plan for Sustainability

As demonstrated by nursing feedback collected through the project evaluation survey, the nurses were very interested in using music listening during painful procedures but sometimes felt that a lack of time and a lack of equipment were barriers to implementation. While improved staffing is not always feasible, there could be a flyer placed in each room explaining music listening to families and encouraging them to bring their device and headphones to use at their next appointment. This would take some of the pressure off the nursing staff and allow patients and families to be more directly involved in their care. Another option would be to include information on music listening in a new patient packet so that all families are informed of the recommendation for music listening during any procedures their child undergoes.

Plan for Dissemination

To further address the second objective of this QI project, which was to assess the effectiveness of an evidence-based education session on nursing adoption of a music listening intervention, a summary of the results of this project will be shared with stakeholders within the oncology clinic. Per stakeholder request and due to the difficulty of coordinating participant schedules, the results of this project will be disseminated through e-mail using a PowerPoint presentation. The results of this project will also be presented to faculty at the University of Arizona as part of a DNP project final defense.

APPENDIX A:

BANNER HEALTH SITE APPROVAL

Banner Health

FWA #00002630
IORG #0004299

August 16, 2021

Amanda Marie Romaine, BSN
Banner - University Medical Center Tucson
1625 N Campbell Ave
Tucson, AZ 85719

RE: RDC Project # -21-0059: The impact of evidence-based education about music listening on nursing knowledge
iRIS Reference # 021100
RDC Review and Approval: Project Review Application (Version 1.1 dated 07/22/2021), Disclosure Agreement (Version 1.2 dated 08/13/2021), Education Session PowerPoint Outline (Version 1.1 dated 07/22/2021), Music Listening Intervention Educational Session Learning Objectives (Version 2.0 dated 07/22/2021), Music Listening Intervention Pre-test (Version 1.1 dated 07/22/2021), Music Listening Intervention Education Post-test (Version 1.1 dated 07/22/2021), Nurse Procedure Form (Version 1.1 dated 07/22/2021), Post-Project Evaluation Survey (Version 1.0 dated 07/22/2021)
Research Determination Committee Evaluation: Not Research, No IRB Review and Approval Required

Dear Ms. Romaine,

Thank you for your submission of your project. The Research Determination Committee (RDC) on behalf of the Banner Health Institutional Review Board (IRB) Chair reviewed your project information on August 10, 2021 pending changes to the Disclosure Agreement. The RDC is now in receipt of those changes and has aproved the project.

The RDC determined this project is not research per 45 CFR 46.102. As such, this project does not require IRB review and approval.

PLEASE NOTE

The RDC/NRDUC determination is based on the information you provided to the committee on your application version 1.1 and supporting documents. If the project is modified in any way, such as, but not limited to, re-analysis of data, adding/revising data sheets, changing team members or the addition of new information, the determination is no longer valid. You must resubmit a Banner Research Project Review and Determination Form to the RDC for review and approval.

Please note: As part of continuing process improvement, random audits are conducted to assess compliance and adherence with submitted/approved applications.

APPENDIX B:

CONSENT DOCUMENT (DISCLOSURE AGREEMENT)

Disclosure Agreement

THE IMPACT OF EVIDENCE-BASED EDUCATION ABOUT MUSIC LISTENING ON NURSING KNOWLEDGE

Amanda Romaine

The purpose of this project is to develop and implement a music listening education session for pediatric oncology nurses caring for adolescent patients undergoing painful procedures in the clinic and to assess the impact of the education session on nursing knowledge of music listening and nurse adoption of a music listening intervention.

If you choose to take part in this project, you will be asked to attend a music listening education session, complete a pre- and posttest, and implement a music listening intervention with adolescent patients in the oncology clinic undergoing a painful procedure. It will take approximately 15 minutes to complete the educational session and approximately 3 minutes to fill out the procedure form with each procedure. There are no foreseeable risks associated with participating in this project. You will receive no immediate benefit from your participation. Your responses are anonymous. Your name will not be collected or linked to your answers.

If you choose to participate in the project, participation is voluntary and refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may withdraw at any time from the project. In addition, you may skip any question that you choose not to answer. By participating, you do not give up any personal legal rights you may have as a participant in this project.

For questions, concerns, or complaints about the project, you may contact Amanda Romaine RN, BSN at amandaromaine@email.arizona.edu.

You agree to have your responses used for this project.

APPENDIX C:

RECRUITMENT MATERIAL (RECRUITMENT FLYER)

ATTENTION PEDIATRIC ONCOLOGY NURSES!

ARE YOU INTERESTED IN LEARNING MORE ABOUT A MUSIC LISTENING INTERVENTION THAT YOU CAN USE WITH YOUR PATIENTS DURING PAINFUL PROCEDURES?

MUSIC LISTENING EDUCATION SESSION

UNIVERSITY OF ARIZONA PEDIATRIC NURSE PRACTITIONER STUDENT AMANDA ROMAINE WILL HOLD A 15-MINUTE EDUCATIONAL SESSION ON **SEPTEMBER 1ST AFTER THE REGULARLY SCHEDULED STAFF MEETING**

EMAIL **AMANDAROMAINE@EMAIL.ARIZONA.EDU** WITH ANY QUESTIONS

APPENDIX D:

EVALUATION INSTRUMENTS (NURSE PROCEDURE FORM / PROJECT EVALUATION SURVEY)

Nurse Procedure Form

1. Procedure being done (please circle one):

   Blood draw | IV insertion

   Port access | Dressing change

   Other: ______________________

2. Did you use music listening with your patient during their clinic visit today?

   Yes | No

3. If you answered **YES** to question 2, using the scale below, please circle one of the options to indicate you feel about the following statement: The music listening intervention improved the patient's experience undergoing a painful procedure.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

4. If you answered **NO** to question 2, please circle one of the options below to indicate why music listening was not used.

   Patient did not want to listen to music.

   I didn't think it would be helpful for this patient.

   There was not enough time.

   There were not enough resources.

Project Evaluation Survey

Participant Identifier (first two letters of middle name, a 2-digit number that has meaning to you, and first two letters of mother's maiden name): ______________________________

1. **I feel like I was able to successfully implement the music listening intervention.**

   Strongly disagree Disagree Neutral Agree Strongly agree

2. **Music listening improved the experiences of adolescents undergoing painful procedures in the oncology clinic.**

   Strongly disagree Disagree Neutral Agree Strongly agree

3. **I am likely to use music listening with my patients undergoing painful procedures in the future.**

   Strongly disagree Disagree Neutral Agree Strongly agree

4. **The music listening intervention disrupted my workflow significantly.**

   Strongly disagree Disagree Neutral Agree Strongly agree

5. **What changes would you make to the music listening implementation process?**

6. **Are there any additional uses for this type of intervention in your practice?**

APPENDIX E:

PARTICIPANT MATERIAL (MUSIC LISTENING INTERVENTION PRETEST / MUSIC LISTENING INTERVENTION EDUCATION POSTTEST / MUSIC LISTENING INTERVENTION EDUCATIONAL SESSION LEARNING OBJECTIVES / EDUCATION SESSION POWERPOINT OUTLINE)

Music Listening Intervention Pretest

Participant Identifier (first two letters of middle name, a 2-digit number that has meaning to you, and first two letters of mother's maiden name): ______________________________________

Below, please indicate your decision to either participate in the study or withdraw from the study:

_____ I agree (participate in study and take test)

_____ I disagree (withdraw from study and end test)

Please circle your answers to the following questions:

1. Have you ever used music listening with your patients during a procedure WITH a Child Life specialist?

   Never Rarely Sometimes Often

2. If you answered "never" or "rarely" to question 1, why not? Select all that apply.
   a. The Child Life specialist is not available or busy with another patient.
   b. I was not aware that the Child Life specialist provided this service.
   c. I don't believe it would help my patients.

3. Have you ever used music listening with your patients during a procedure WITHOUT a Child Life specialist?

   Never Rarely Sometimes Often

4. If you answered ‘no’ to question 2, why haven’t you used it? Select all that apply.
    a. I don’t know how.
    b. I don’t have time.
    c. I don’t believe it would help my patients.
    d. I am unfamiliar with music listening.

5. Classical music should always be used (circle one):

    True False

6. The music should be started at least 2 minutes prior to the procedure and continue until at least 2 minutes following the procedure (circle one):

    True False

7. Patients should always use headphones to listen to music during a painful procedure (circle one):

    True False

8. How confident do you feel about using music listening with your adolescent patients during painful procedures without the help of Child Life? Circle one:

    Not confident at all Slightly confident Somewhat confident Fairly confident Completely confident

Music Listening Intervention Education Posttest

Participant Identifier (first two letters of middle name, a 2-digit number that has meaning to you, and first two letters of mother's maiden name): ___________________________________

1. Classical music should always be used (circle one):

   True False

2. The music should be started at least 2 minutes prior to the procedure and continue until at least 2 minutes following the procedure (circle one):

   True False

3. Patients should always use headphones to listen to music during a painful procedure (circle one):

   True False

4. Amanda is a 5-year-old being seen in clinic for a blood draw. Does Amanda meet the inclusion criteria for the music listening intervention in this quality improvement project?

   Yes No

5. Name one possible risk and one possible benefit of the music listening intervention.

6. How confident do you feel about using music listening with your adolescent patients during painful procedures <u>without</u> the help of Child Life? Circle one:

   Not confident at all Slightly confident Somewhat confident

   Fairly confident Completely confident

Music Listening Intervention Educational Session Learning Objectives

Upon completion of the educational session, participants will be able to:

1. Describe the process of implementing music listening for a patient undergoing a painful procedure, including what type of music to use, when to start and stop the music, and how the music should be played (using headphones or speakers).
2. State possible benefits and risks of the music listening intervention for patients in the oncology clinic.
3. Describe inclusion criteria for oncology patients with whom the music listening intervention can be used.

Education Session PowerPoint Outline

- Slide 1
  - Title and introduction
- Slide 2
  - Educational objectives for session
- Slide 3
  - Risks for pediatric oncology patients and information about mental health in this population
- Slide 4
  - What is music listening?
  - How is music listening different from music therapy?
- Slide 5
  - How could music listening be helpful for adolescent patients in the clinic undergoing a painful procedure?
  - Definition of adolescent for the purpose of this project: 10 to 18 years
- Slide 6
  - Possible benefits of music listening for nursing staff
- Slide 7
  - Possible risks of the music listening intervention for patients and staff
- Slides 8 and 9
  - What is the process for implementing music listening with patients?
    - Explain the intervention to the patient.
    - They can use their own device and headphones or the speaker, based on preference.
    - The patient should choose the music they would like to listen to.
    - The music should be started approximately 2-5 minutes before the procedure, continue throughout the procedure, and end 2-5 minutes after the procedure has been completed.
- Slide 10
  - Explanation of the procedure form to be filled out for each procedure that the nurse performs and whether music listening was used
- Slide 11
  - Questions
- Slide 12
  - References

APPENDIX F:

PROJECT TIMELINE

Completion Date	Planning	Pre-Implementation	Implementation	Evaluation
10/2020	Meet with stakeholders at the Banner Children's oncology clinic to present project information and obtain support of project implementation			
1/2021	Complete informal needs assessment of healthcare team at the oncology clinic regarding painful procedure process in clinic			
5/2021	Complete development of staff education, implementation plan, and surveys			
6/2021		Project proposal defense		
7/2021		Submit project to the Banner Research Determination Committee for approval		
9/2021			Conduct educational session with oncology clinic staff regarding music listening during painful procedures	
9/2021			Implement music listening intervention in clinic	
10/2021			Project evaluation survey of oncology clinic staff	Evaluate and analyze survey results and complete results section
11/2021				Final project defense
12/2021				Present findings to staff at Banner Children's oncology clinic

Adapted from Roush, K. (2019). *A nurse's step-by-step guide to writing a dissertation or scholarly project* (Second Ed.). Indianapolis, IN: Sigma Theta Tau International.

APPENDIX G:

LITERATURE REVIEW GRID

Project Question: *Does an evidence-based educational presentation on the use of music listening in adolescent patients during painful procedures increase (i) nursing knowledge of music listening and (ii) nursing adoption of a music listening intervention during painful procedures in the pediatric oncology clinic over a two-week period?*

Pub. Year Author's Last Name	Title of Publication	Type of Study	Main Outcomes or Findings	Support for and/or Link to Project
Atak & Ozyazicioglu, 2021	The effect of different audio distraction methods on children's postoperative pain and anxiety	Pretest/posttest experimental study	The study included 90 children between the ages of 7 and 14. There were 30 children in each of 3 groups: the classical music group, the Turkish music group, and the audiobook group. Data were collected using the Visual Analog Scale, the Wong-Baker Faces Pain Scale, and the State-Trait Anxiety Inventory for Children. Classical music listening was the most effective method in reducing postoperative pain, but all three methods played an effective role in decreasing pain and anxiety.	Discussed the Guide for Music Initiatives in Pediatric Patients and discussed the impact of different types of music in decreasing postoperative pain and anxiety.
Aydin & Sahiner, 2017	Effects of music therapy and distraction cards on pain relief during phlebotomy in children	Randomized controlled trial	Pain and anxiety relief was seen in all three distraction methods during phlebotomy procedures in pediatric patients; however, it was not a statistically significant difference. The authors discuss the recommendations of different medical associations (The American Society for Pain Management in Nursing, the American Academy of Pediatrics) regarding providing pain	The authors of the study found that music therapy and distraction cards used together had no effect on pain and anxiety experienced by the child, which suggests that it is ideal to focus on a single distraction technique during painful procedures.

Pub. Year Author's Last Name	Title of Publication	Type of Study	Main Outcomes or Findings	Support for and/or Link to Project
			management strategies during painful procedures.	
Bashiri et al., 2018	Evaluation of pain and patient satisfaction by music therapy in patients with endoscopy/colonoscopy	Randomized controlled double-blinded trial	In patients undergoing sedation-assisted endoscopies and colonoscopies, patients listening to music in both the conscious sedation and deep sedation groups exhibited a significant decrease in HR and MAP values during and after the intervention, decreased doses of sedative drug required, and increased patient satisfaction. Patients in the sedation and music groups stated that they would prefer the same method for their next procedure.	This study included adults as well, which may be useful in determining applicability to the adolescent population but is not useful for the younger pediatric population.
Bergomi et al., 2018	Efficacy of non-pharmacological methods of pain management in children undergoing venipuncture in a pediatric outpatient clinic: a randomized controlled trial of audiovisual distraction and external cold and vibration	Randomized controlled trial	Children's perception of pain (measured using the Wong-Baker Faces Pain rating scale) increased less in the non-pharmacological intervention groups as compared to the group with no distraction. The difference was statistically significant in the animated cartoon group, and secondary analysis showed that the cold distraction method was highly effective in children less than nine years old. Parent anxiety, nurse perception of child anxiety, and parent perception of child anxiety decreased more in the non-pharmacological intervention	Non-pharmacological methods of pain management during venipuncture are an easy way to increase level of compliance among children and parents, and the anxiety of children and parents can be improved with these methods.

Pub. Year Author's Last Name	Title of Publication	Type of Study	Main Outcomes or Findings	Support for and/or Link to Project
			groups when compared to the group with no distraction .	
Birnie et al., 2018	Psychological interventions for needle-related procedural pain and distress in children and adolescents	Systematic review	Looked at 59 trials with 5550 participants aged 2 to 19 years undergoing needle procedures. Most common interventions were distraction, hypnosis, combined CBT, and breathing interventions.	The quality of evidence in the studies included was low, and results may be biased by small sample sizes or by children being aware of the intervention they received. However, the conclusion of the article stated that despite low-quality evidence, the potential benefits of reduced pain or distress or both support the evidence in favor of using these interventions in clinical practice.
Bradt et al., 2016	Music interventions for improving psychological and physical outcomes in cancer patients (Review)	Systematic review	This review included 52 studies with 3731 participants in total. The findings suggest that music interventions may have beneficial effects on anxiety, pain, fatigue, and quality of life in people with cancer. They may also have a small beneficial effect on heart rate, respiratory rate, and blood pressure.	The authors note that many of the studies included in this review presented a high risk of bias, and therefore the quality of evidence is low. They suggested that future studies involving pre-recorded music should report more details related to music selections and that researchers should consider the potential negative impact of headphones during procedures due to hampered communication between the patient and medical staff.
Brudvik et al., 2017	A comparison of pain assessment by physicians, parents and children in an outpatient setting	Cross-sectional study	The study involved 243 children aged 3 to 15 years treated in the emergency department. Patient pain intensity was measured using an age-appropriate pain scale (Faces Pain Scale-Revised, Wong	This study looks at whether providers can accurately assess a child's pain and we are able to see that parent assessment of pain is more accurate than provider assessment of pain.

Pub. Year Author's Last Name	Title of Publication	Type of Study	Main Outcomes or Findings	Support for and/or Link to Project
			Baker Faces Pain Rating Scale, or Visual Analogue Scale) and parents and physicians scored the patient's pain using the numeric rating scale. The study concluded that pediatric pain was significantly underestimated by providers, and in the absence of self-reported pain by the child, parents' evaluation should be used.	
Celikol et al., 2019	Children's pain, fear, and anxiety during invasive procedures	Randomized controlled trial	200 children aged 8 to 12 years old were randomly assigned to one of three groups: the music group, the video group, and the control group. Children in the experimental groups either listened to music or watched a video during the blood draw procedure. The Fear of Medical Procedures Scale and State-Trait Anxiety Inventory for Children were used to assess patient fear and anxiety before and after the procedure. There was a statistically significant decrease in fear and anxiety scores for patients in the music or video groups.	This study does not assess level of pain specifically, but rather looks at the patient's level of fear and anxiety during and after a blood draw procedure.

Pub. Year Author's Last Name	Title of Publication	Type of Study	Main Outcomes or Findings	Support for and/or Link to Project
Coughtrey et al., 2018	The effectiveness of psychosocial interventions for psychological outcomes in pediatric oncology: a systematic review	Systematic review	Included 12 RCTs that evaluated psychosocial interventions in children under 18 years with current and previous cancer diagnosis. Outcome measures were both psychological and physical. Interventions included cognitive behavioral therapy, family therapy, physical exercise therapy, music video, self-coping strategies, and a wish fulfillment intervention.	Discusses the mental health of pediatric oncology patients in depth and the need to address this in these patients specifically to result in better mental and physical health outcomes.
Fox et al., 2016	Children's anxious reactions to an invasive medical procedure: the role of medical and non-medical fears	Pretest/posttest	34 children in total undergoing a voiding cystourethrogram were included in the study. Child distress behaviors during the procedure were taped and coded using the Child-Adult Medical Procedure Interaction Scale-Revised and ratings of child procedural anxiety and pain were obtained from children, parents, and examiners after the procedure. Associations were observed between medical fears, procedural anxiety, and coded distress behaviors.	The authors of the study note that the sample was relatively small and comprised of mostly females. They also concluded that the findings of this study may inform preparation efforts to reduce anxiety related to invasive medical procedures.
Franzoi et al., 2016	Music listening for anxiety relief in children in the preoperative period: a randomized clinical trial	Randomized controlled trial	This study included 52 children aged 3 to 12 years undergoing elective surgery and randomly assigned to the experimental or control group. Anxiety was assessed using the modified Yale	The authors blinded this study by having the participants in the control group also listening to music, but only after the completion of data collection.

Pub. Year Author's Last Name	Title of Publication	Type of Study	Main Outcomes or Findings	Support for and/or Link to Project
			Preoperative Anxiety Scale and physiological variables (heart rate, respiratory rate, blood pressure, and oxygen saturation). There was a statistically significant difference in preoperative anxiety between the two groups in relation to the physiological variables and a statistically significant reduction in anxiety levels after 15 minutes of music listening.	
Geipel et al., 2018	Music-based interventions to reduce internalizing symptoms in children and adolescents: A meta-analysis	Meta-analysis	This analysis included data from five randomized controlled trials. Analysis of data indicated a greater reduction of internalizing symptoms in children receiving music-based interventions compared to different control group interventions.	The authors state that the existing evidence is limited to studies of low power and methodological quality, and that rigorous research is needed to replicate existing findings and provide a broader base of evidence.
Hsu, Chen, & Hsiep, 2016	Effect of music intervention on burn patients' pain and anxiety during dressing changes	Randomized controlled trial	Patients' pain and anxiety measurements were collected before, during, and after dressing changes and morphine usage was recorded. By the fourth day of music intervention, burn patients' pain and anxiety ratings before, during, and after dressing changes had significantly decreased; morphine dosage was unchanged between the experimental and control groups.	This study involved adult patients and their levels of pain and anxiety during dressing changes, so while it may be applicable to adolescent patients, it doesn't speak to the entire pediatric population.

Pub. Year Author's Last Name	Title of Publication	Type of Study	Main Outcomes or Findings	Support for and/or Link to Project
Jong et al., 2020	Development of an evidence-based decision aid on complementary and alternative medicine (CAM) and pain for parents of children with cancer	Mixed design: systematic review and needs assessment and focus group performed with parents	The focus group identified the needs of parents and their children, the ways in which they go about looking for CAM that they are interested in, and preferences for the form of the decision aid, to name a few. Music therapy may be considered for prevention or reduction of procedural pain. No reported side effects and can be provided by a music therapist, a CD, or an app.	This study looked at complementary approaches to pain in children with cancer, which would be particularly relevant if I implement my project at the hematology/oncology clinic.
Kuhlmann et al., 2020	Music interventions in pediatric surgery (the music under surgery in children study): a randomized clinical trial	Randomized controlled trial	This study included 195 infants aged 0 to 3 years and all participants were randomly assigned to the pre- and intraoperative music intervention group or the no music intervention (control) group. Preoperative level of distress, anxiety, and physiological measures were collected, as well as postoperative level of distress. There was not a statistically significant difference in COMFORT-Behavior scale scores between the intervention and control group.	The authors of this study concluded that music interventions do not seem to benefit all young children undergoing surgery.
Millett and Gooding, 2017	Comparing active and passive distraction-based music therapy interventions on preoperative anxiety in pediatric patients and their caregivers	Randomized clinical trial	40 pediatric patients undergoing outpatient procedures were included in this study and randomized to either an active or passive intervention group. Patient anxiety was measured	Active music therapy involved "musical alternate engagement" in which patients played music with the PI using age-appropriate instruments. Passive music therapy involved "music-assisted relaxation" during

Pub. Year Author's Last Name	Title of Publication	Type of Study	Main Outcomes or Findings	Support for and/or Link to Project
			before and after the intervention using the modified Yale Pediatric Anxiety Scale, and caregiver anxiety was measured using the short-form State-Trait Anxiety Inventory. The results of the study indicated a significant reduction in preoperative anxiety for patients and caregivers, regardless of whether the intervention was active or passive music therapy.	which patient or family-preferred music was play and patients often sang along or engaged in rhythmic movement to the music.
Nelson et al., 2017	Relaxation training and postoperative music therapy for adolescents undergoing spinal fusion surgery	Randomized controlled trial	This study evaluated the effects of music-assisted relaxation training with adolescents before surgery and a music therapy session with a board-certified music therapist on post-op day 2 while out of bed for the first time. 44 participants between 10 and 19 years old were included. Pain and anxiety were significantly reduced from immediately pre-therapy to post-therapy.	The authors note that when a music therapist is not available, a support person who is familiar with relaxation breathing, typical adolescent behavior, and the use of music to modulate pain response should be present with the adolescent.
Ortiz et al., 2019	Impact of a child life and music therapy procedural support intervention on parental perception of their child's distress during intravenous placement	Prospective analysis	Included a total of 41 parents whose children were undergoing a painful procedure. Pre and posttest scores were collected to evaluate parent perspective of their child's mood and behavioral responses. Statistical analysis revealed significant differences between pre and posttest scores across each of the 4 questions,	This study involved a child life specialist in addition to the music therapy intervention, which is a resource that may not be available in the clinic.

Pub. Year Author's Last Name	Title of Publication	Type of Study	Main Outcomes or Findings	Support for and/or Link to Project
			suggesting that the child life and music therapy intervention had a significant impact about improving comfort, level of fear, level of cooperation, and degree of calmness.	
Rohilla et al., 2018	Effect of music therapy on pain perception, anxiety, and opioid use during dressing change among patients with burns in India: a quasi-experimental, cross-over pilot study	Quasi-experimental pilot study	Included patients over 10 years old in a burn unit studied over a 2-month period. Each patient served as his or her own control, alternating between standard care and standard care plus patient-selected music. Median pain scores (measured using a numeric scale) and median anxiety scores (measured using the State Trait Anxiety Test) were significantly lower with the music intervention than during the standard dressing change. In addition, opioids were used significantly less frequently during the experimental change.	This study is very different because it involves using patients as their own control. This may be a useful strategy for me if I am able to see and collect data on the same patients' multiple times in the clinic.
Saglik & Caglar, 2019	The effect of parental presence on pain and anxiety levels during invasive procedures in the pediatric emergency department	Randomized controlled trial	Included 111 patients aged 9 to 12 years old who underwent procedures during a visit to the pediatric emergency department. The purpose of the study was to look at the effect of parental presence, parental involvement, and parental absence on the pain and anxiety levels of children. The State-Trait Anxiety Inventory, State-Trait Anxiety	This study also looked at parental anxiety and its effect on patient anxiety.

Pub. Year Author's Last Name	Title of Publication	Type of Study	Main Outcomes or Findings	Support for and/or Link to Project
			Inventory for Children, and Visual Analogue Scale were used to collect data. Pain levels of children in the parental absence group were significantly higher than those in the parental involvement group and the parental presence group. In addition, the children of parents with high trait anxiety levels had higher pre-procedural pain and anxiety levels.	
Sahiner & Bal, 2016	The effects of three different distraction methods on pain and anxiety in children	Randomized controlled trial	Included 120 patients 6 to 12 years old who required blood tests. Children were randomized into four groups: distraction cards, music, balloon inflation, and the control group. Data were obtained through interviews with children, their parents, and an observer before and after the procedure. Pain levels were assessed using the Wong-Baker FACES scale. Anxiety levels were assessed using Children Fear Scale. There was a significant difference in pain and anxiety perception for all the forms of distraction.	The recommendations of this study are that nurses use distraction methods such as cards or music to decrease anxiety and pain in children.
Staphorst et al., 2017	The child's perspective on discomfort during medical research procedures: a descriptive study	Cross-sectional descriptive study	The study included 357 children aged 8 to 18 years. Discomfort during the procedure was measured using the Children's Discomfort during Research	The Children's Discomfort during Research Procedures Questionnaire was developed specifically to measure discomfort rather than pain, distress, or anxiety.

Pub. Year Author's Last Name	Title of Publication	Type of Study	Main Outcomes or Findings	Support for and/or Link to Project
			Procedures Questionnaire, and anxiety proneness was measured using the State-Trait Anxiety Inventory for Children or the anxiety scale of the Child Behavior Checklist. Most children reported limited discomfort during procedures and 60.3% of the children suggested providing distraction to reduce discomfort during procedures.	
Sundar et al., 2016	Live music therapy as an active focus of attention for pain and behavioral symptoms of distress during pediatric immunization	Randomized controlled trial	The study included 100 children divided into experimental and control groups. Parents used the Modified Behavior Pain Scale (MBPS) to measure pain levels. The MBPS evaluates 3 parameters – facial expression, cry, and movements. Duration of crying and the blood pressure and heart rates of the parents holding the child were measured before and after the immunization in both groups. All 3 parameters of the MBPS showed significant improvement. Pain and distress levels showed improvement, but it was not statistically significant.	The study cited the fact that parents were used as a proxy to measure pain and distress levels in the children a limitation but went on to say that a recent study has shown that parents' proxy pain scores can be reliably used as a surrogate measure for measurement of pain in children.
Van der Heijden et al., 2018	Can live music therapy reduce distress and pain in children with burns after wound care procedures? A randomized controlled trial	Randomized controlled trial	Included 135 patients between zero and 13 years old undergoing their first or second wound care procedure. Intervention group received one live music therapy	Self-reported distress in children older than 5 years indicated a significant reduction in distress after live music therapy, suggesting that older children

Pub. Year Author's Last Name	Title of Publication	Type of Study	Main Outcomes or Findings	Support for and/or Link to Project
			session directly after wound care. Primary outcome, distress, was measured with the Observational Scale of Behavioral Distress-revised. The secondary outcome, pain, was measured with the COMFORT-behavioral scale and the FACES scale in children over 5. Change scores did not differ significantly between the intervention and control groups for distress or pain.	may be more responsive to this intervention.
Van der Heijden et al., 2019	Children listening to music or watching cartoons during ER procedures: a RCT	Randomized controlled trial	Included 197 children aged 4 to 10 years old. In multivariable analysis, pain assessed with the Alder Hey Triage Pain Score from video footage was significantly lower in the music group than in the control group. Self-reported pain was lowest in the music group, but it was not statistically significant.	Listening to recorded music seemed to be a beneficial distraction for children experiencing procedural pain, whereas watching cartoons (which is something we often use inpatient) did not seem to reduce pain or distress.
Villacres & Chumpitazi, 2018	Acute pediatric pain management in the primary care office	Review	Older children and adolescents may benefit from music therapy and while child life therapists are not usually present in this setting, medical personnel can be easily educated on the techniques described.	Discusses challenges that the outpatient setting presents and strategies for optimal management that include nonpharmacological modalities. It also discusses having the medical staff or parents implement the intervention as opposed to a child life specialist, as one may not be available in the outpatient setting.

Pub. Year Author’s Last Name	Title of Publication	Type of Study	Main Outcomes or Findings	Support for and/or Link to Project
Yinger, 2016	Music therapy as procedural support for young children undergoing immunizations: a randomized controlled study	Randomized controlled trial	There was a statistically significant different between the music therapy and control groups in rates of child coping and distress behaviors and parent distress-promoting behaviors. Parents of children in the experimental group reported that their child’s level of distress was less than during previous medical experiences, while parents of children in the control group reported that their child’s level of distress was greater. There was not a statistically significant different in parents’ ratings of their child’s pain or in rates of nurse behavior.	This study looked at the effects of live music therapy during immunizations, as opposed to recorded music.

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