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Rebecca C. Pinchot

Wright State University - Main Campus, pinchot.2@wright.edu

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Music Therapy for Pain Management in Children

Rebecca C Pinchot

Wright State University

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Rebecca Pinchot is a Wright State senior nursing student with hopes of becoming a NICU nurse upon graduation. She can be reached at pinchot.2@wright.edu or (937) 507-1060.

Abstract

An evidence-based practice literature search was done to determine if music therapy during painful procedures could decrease distress in children. Literature was obtained from two electronic databases. Twenty-five articles were initially found through the search engines. Five of these articles were further evaluated based upon relevance to the research question. The studies were evaluated through consistent methods including setting, sample, purpose, design, findings, and limitations. Each study strength on the evidence hierarchy was identified. Four studies had moderately strong evidence while one study had moderately weak evidence. Each had significance for the use of music as a pain management technique, but three of the studies had no statistical significance. A significant reduction was found in preoperative anxiety before various procedures, such as ophthalmology, dentistry, surgery, urology, etc. Overall, data supports the use of music during painful procedures in children as an additive method to other pain managements.

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Chapter I. Introduction

Introduction

Encouragement of growth and development in terms of “physical, psychological, cognitive, behavioral, and/or social functioning” (Halverson-Ramos, F., et. al.¹, 2019, p. 1) is an important part of nursing, especially in children and adolescents. An “evidence-based use of music interventions to accomplish individualized goals” (Halverson-Ramos, F., et. al.¹, 2019, p. 1) has been shown to improve quality of life. Interventions to improve comfort and mental health of the youth in health care can improve nursing care in the health setting. Nursing care not only includes physical health, but also providing a holistic approach to the child. A holistic approach encompasses mind, body, spirit, emotion, environment, and all other aspects that affect the child. Music therapy can assist in all aspects of the holistic approach but specifically has “a beneficial effect on the mental and behavioral health of young people” (Halverson-Ramos, F., et. al.², 2019, p. 2). Stress, anxiety, and pain associated with healthcare procedures can “lead to preprocedural anxiety in future, needle fears, and also health care avoidance behaviors” (Sundar et al., 2016, p. 745). Incorporating music therapy into more healthcare may improve children’s views of health care, improve holistic health, and encourage future health maintenance.

Purpose

The purpose of this project is to undergo a literature review of the effects of music during painful procedures with children. The goal for this project is to identify if music therapy decreases pain and stress levels associated with painful procedures in

children, allowing nurses, parents, phlebotomists, etc. to be more efficient with procedures.

Significance

Significance to Patients: Children can become very distressed and experience extreme amounts of pain while in the hospital. Some researchers believe that children are often undermedicated for pain. (Perry et al., 2018) Undermedication and prolonged pain can cause long-term distrust and fear of the hospital. Pain medications are often avoided because of concern from parents and limited amounts of research. Unaddressed pain in childhood can create a distrust and avoidance of healthcare systems, pre-procedural fear, and fear of needles (Sundar et al., 2016). Avoidance of healthcare leads to long-term consequences in deteriorating health for the patient. As a member of the healthcare community, it is important to promote health before these problems arise. Pain relief by use of effective methods is essential in the care of children undergoing stressful procedures in health promotion (Aydin et al., 2017).

Significance to Healthcare and Nurses: Pain control would allow nurses to perform painful procedures, such as IV starts, immunizations, or lab draws, more efficiently. It would also benefit the nurses' mental health by decreasing the level of pain they are causing the child. The issue of pain control in pediatrics is one that should be addressed to improve children's view of the hospital (now and in the future) and help nurses' do their jobs more effectively. Music therapy is also a more cost-effective management of pain because anesthetic creams and pain medications cost money for each use while music is readily available. As discussed earlier, patients who go through unaddressed pain in childhood may avoid healthcare, leading to serious health issues.

Long term effects of healthcare avoidance results in increased costs for hospitals. Music is an integral part of our lives from the fetal stage of life and this connection is why music is believed to soothe and calm people during stressful periods (Beh et al., 2017). In pediatric patients, can music therapy decrease pain levels and distress during painful procedures?

Objectives

Objectives of this study are to determine the following:

- If music therapy increases nurse effectiveness and efficiency during painful procedures by decreasing distress and discomfort in the child.
- If music therapy is effective for pain management and distraction.
- If one type of therapy (active or passive) is more effective as a viable pain control measure.
- To promote further utilization of music therapy into painful procedures in children's hospitals.

Definitions

Painful procedures will be defined as any event or procedure a child undergoes in relation to healthcare that cause distress. Examples include intravenous catheter placement (IV placement), phlebotomy procedures, dentist appointments, administering oral medications, administering lotions or creams, eye drop administration, wound care, etc. Passive music will be defined as listening to music with the child during the procedure. Child's music preference should be considered. Active music will be defined as participating with the music in the form of singing along or dancing. Pain is defined by the International Association for the Study of Pain as "an unpleasant sensory and

emotional state and behavior that originates from any region of the body, depends on existing or possible tissue damage or can be identified with this damage, and is affected by past experiences of the individual” (Aydin et al., 2017, p. 164). Pain is commonly measured with the Wong Baker FACES scale and a numeric rating scale in pediatrics, dependent upon age. This study will define pain as behavior, emotional state, or sensory perception that results in unpleasantness.

Summary

The researcher is interested in learning and studying if music therapy can help assist lowering stress and pain levels. Health settings and patient care would benefit from improved pain and distress levels by increasing patient satisfaction. Improved health outcomes could also include enhanced mental health. Through the duration of this project, a literature review will be performed to determine a basic understanding of the effects of music therapy; evidence-based practice interventions will be shared; and results of project implementation will be evaluated.

Chapter II. Review of the Literature

Distraction as a Form of Pain and Distress Relief

Live Music Therapy as an Active Focus of Attention for Pain and Behavioral Symptoms of Distress During Pediatrics Immunization utilized live music therapy during immunizations of children to reduce distress, pain, and physiologic measurements in the child and parents. Length of crying was measured along with a Modified Behavior Pain Scale assessment taken. Blood pressure and pulse of the parents was taken before and after the immunization. Parents completed the Modified Behavior Pain Scale based upon their child’s distress and pain level on a scale of 1-10. Subjects were children under 18

months and could not have hearing issues. The description given of the music therapy provided included exposure “to singing and musical instrument playing along with visual aids (hand puppets and finger puppets)” (Sundar. S., 2016, p. 746). Results showed statistically insignificant change in parent’s blood pressures and heart rates but had statistical significance on pain perception and distress of the child. Results were determined through independent and paired *t* test calculations. The Modified Behavior Pain Scale had three domains that were observed, and all were improved within the experimental group ($P < .05$).

Blood pressures and heart rates were lowered slightly in the parents holding their child within the experimental group, although not significantly. Limitations to this study include unreliability of parent pain and anxiety rating due to lack of training.

A study done by Aydin and Sahiner (2017) researched different types of distraction as a method of pain relief. Having blood drawn is a difficult process for many children because of the pain associated with it. 200 children between the ages of 7 and 12 were studied and placed into four different groups. The four groups were distraction cards, music, music and distraction cards, and a control group. Children included were a random group of 200 children ages 7-12 who required blood tests at a hospital in Turkey. Exclusion criteria included children who had a neuro-developmental delay, verbal difficulties, hearing or visual impairments, use of analgesics within the last six hours, children with a history of syncope during blood draws, and children who could not undergo a phlebotomy procedure (Aydin. D., 2016, p. 165). Researchers gathered measurements using the Child and Family Information Form, Wong-Baker FACES scale, Children’s Fear Scale, distraction cards, and a tablet personal computer. The distraction

cards used were 5 by 8 cm cards that had pictures and shapes on them. The children studied them then were asked what they could all see by the researcher. Examination of the cards started right before the procedure began. The music group received a tablet allowing them to “choose one of 20 Turkish pop fast songs stored in a tablet pc, which was then played throughout the phlebotomy process” (Aydin. D., 2016, p. 165). The combined group received both interventions. The control group utilized normal healthcare standards, which include having a family member nearby. Results showed that pain and anxiety levels were decreased in the intervention groups compared to the control groups; however, no statistical significance was found in the improvement of pain and anxiety between pre-procedural anxiety through self-reported numbers, parent-reported numbers, and observer reported numbers. Limitations include lack of inter-rater reliability. No training of data collection was discussed, leading to concern of differences in rating between parents of children. Knowledge of classifications provides another limitation. The nurse providing the interventions also rated scores, leading to nonblind testing and possible bias.

To summarize Sundar and associates’ study, results showed music therapy does influence pain perception and crying duration but does not significantly improve physiologic parameters of parents holding their child. In summary of Aydin and Sahiner’s (2017) research, results of the study determined through the Chi-square test, Student’s *t*-test, and pain level were compared by one-way analysis of variance (P was set at <0.05) showing that music and distraction cards could be utilized to decrease anxiety and pain during phlebotomy procedures, although there was not statistical significance.

Researchers determined that more studies should be performed to determine exact significance. (Aydin D., 2016).

Van der Heijden, M. J. E., Mevius H., Van der Heijde, N., Van Rosmalen, J., Van As, S., Van & Dijk, M.. (2019) wished to study various distraction methods in their effect on pain and distress management during painful procedures. Researchers chose procedures in the emergency room due to their high rate of pain and distress, such as IV insertion. Children were aged 3 to 13 “undergoing: venepuncture; IV placement; application of a temporary splint or plaster cast; injection of local anesthetics; wound dressing; and suturing of open wounds” (Van der Heijden, M. J. E., Mevius H., Van der Heijde, N., Van Rosmalen, J., Van As, S., Van & Dijk, M., 2019, 1152). Patients were excluded if they had hearing or developmental disability, no response to stimuli, or if staff felt the situation was too delicate to be involved in the study. The study lasted from March 2014 to September 2014 at a surgical hospital and medical emergency room in South Africa. Patients were randomly assigned to the music listening group, cartoon watching group, or control group. Randomization was done using opaque envelopes classified by an unrelated researcher and a randomized number generation table. One researcher assessed all the video footage, while three separate researchers assessed the video footage for each respective group. Outcomes were measured through videotaping of procedures and analyzing using the Alder Hey Triage Pain Score (AHTPS) and the Observational Scale of Behavioral Distress-revised (OSBD-r). The AHTPS is a validated scale to measure pain in the ER setting for all age groups. The OSBD-r is a validated scale for use to measure distress levels in pediatric ERs. Heart rate was gathered by researchers before and after the procedure. Heart rate is considered a valid physiologic

measure of pain and distress. Participants older than 4 years old rated pain on the Faces Pain Scale-Revised. “Three researchers assessed the video footage for primary and secondary outcome...[b]y scoring the video material at a later time, we avoided having to assess observed pain and distress at the moment” (Van der Heijden et al., 2019, p. 1153). The patients in the music group listened to specially composed music to eliminate negative connotations with known music. Music was played from a speaker at a set volume from the start of the procedure until the end. The cartoon group watched Disney’s *Chip and Dale* throughout the duration of their procedure. Any child could request the intervention be turned off at any time. The control group underwent standard ER protocol. Start of the procedure included the first placement of cotton padding or cleaning site and the end of the procedure was defined as “placing tape or after the last injection” (Van der Heijden et al., 2019, p. 1153). 194 children were included with 76 in the music intervention group, 63 receiving cartoon interventions, and 58 using standard protocols. 191 patients followed up, 75 being from the music group, 62 being in the cartoon group, and 57 in the control group. Researchers stated each dropout reason. Interrater reliability was determined to be good with correlation at 0.94 for the AHTPS, 0.76 for the OSBD-r, 0.90 for the OSBD-r during the procedure, and 0.89 for the after procedure OSBD-r.

The pain rating outcome assigned by the AHTPS had statistical significantly decreased ratings for the music intervention group as compared to the other two groups (“ $B=-1.173$, 95% confidence interval $-1.953, -0.394$, $p=.003$ ” (Van der Heijden et al., 2019, p. 1155)). No statistical significance was found between the pain and distress levels measured by the Faces Pain Scale-Revised (FPS-R) or the OSBD-r scale for any of the groups—before, during, or after the procedure. Heart rates between each group had no

statistically significant difference. In summary, researchers found that playing music during an ER procedure showed statistically significant decrease in pain scores made by observers through the AHTPS rating system. Ratings given by patients through the Faces Pain Scale-Revised and OBSID-r tool showed no differences. Watching cartoons had no effect on pain levels.

This study is limited by the inability to blind researchers giving ratings and generic interventions that are not specific to each child. Older children most likely did not enjoy the same cartoons as the younger children. Another limitation is the unequal number of painful procedures, with casting occurring most often. Casting was considered the least painful procedure so data may have been skewed. A low level of pain and distress before the procedures led to a lack of space for improvement through interventions. Researchers labeled filming as a limitation because of the instinctive behavior that may have occurred. Because patients could see they were being filmed, behavior may have been altered. This study falls into the second highest level on the evidence hierarchy and has a moderately strong rating for study strength due to the limitations.

Music as Distress Relief

Music Listening Intervention vs Local Anesthetic Cream for Pain Management in Infants Undergoing Venipuncture: A Collaborative Trans-Disciplinary Research was a studied performed in 2017 by Wen Fen Beh and associates to determine if listening to music during venipuncture procedures could be utilized to reduce pain in infants as compared to anesthetic creams. Infants have been shown to receive inadequate pain management; therefore, any pain management techniques might be helpful for long-term

effects of pain on children. This study included 30 children between the ages of two to 24 months who required blood work. FACES Pain Scale and the Modified Behavioral Pain Scale were the measurement tools that were used. Children in nurseries in Malaysia were assigned a group through a randomized computer generator and then visited. Music genre was determined by the style of the nursery school, including nursery syllabus and interviews with teachers. Genres included rhythm and blues, western, classical, Malaysian folk songs, and blues. Songs from the various genres were played during school days and voted on by the children through a hand raise to determine the most-liked genre. Researchers working with a music therapist determined that the young subject group would best be helped through simple songs. Infants who had a neurological diagnoses or syndrome, multiple congenital abnormalities, failed oto-acoustic emissions, automated auditory brainstem response on neonatal hearing test, delayed speech and language development, and infants who received analgesics before the procedures were excluded. One group of randomized patients was given EMLA anesthetic cream on the intended venipuncture site 60 minutes before the procedure. They also received headphones with no music playing. The music listening group received a placebo cream and began listening to music five minutes before the procedure through headphones. Oxygen saturations and heart rates were measured ten minutes before the procedure. Procedures were recorded and analyzed to determine accurate FACES and Modified Behavior Pain Scale (MBPS) rankings. Researchers analyzed the results through the IBM SPSS computer program that determined by a two-way repeated measure ANOVA and a Bonferroni test ($\alpha=0.05$). Analysis of heart rate, SpO₂, the FACES scale, and MBPS rankings were done in three stages. The stages included pre, post, and follow-up times to

the procedure. Malaysian folk songs were the most popular with the children. Results showed that children who were younger than one year of age benefitted more from the music than did the older infants. Analysis also showed that if the patient recognized what was happening (had undergone a venipuncture procedure before), music did not have as great of an effect. Limitations for this study include study only focused on venipuncture procedures instead of other painful procedures. In summary, music listening was found to reduce pain levels in hospitalized infants in levels comparable to EMLA cream due to various factors such as increased wait time for the cream, rubbing off the cream, and needing to reapply cream if the first attempt is unsuccessful. Beh et. Al. believe that music therapy should be utilized and encouraged more frequently by doctors regarding painful procedures.

Millet and Gooding hoped to study the effects of different types of music therapy on preprocedural anxiety. They utilized a randomized controlled trial to study their goal of comparing two distraction-based music interventions as anxiety relief for patients and caregivers undergoing ambulatory surgeries. Participants were age 0-5 and undergoing ambulatory services through the urology, ophthalmology, otolaryngology, dentistry, or other types of surgery at a university-affiliated surgery center. Patients could not be older than five, have a primary language other than English, or have a caregiver younger than 18 years old. These criteria allowed for 40 patients to be randomized with 19 patients in the active music therapy group and 21 patients in the passive music therapy group. Patients and caregivers were randomly placed into either the active music group (music alternative engagement—MAE) or passive music group (music-assisted relaxation—MAR). Only the principal investigator knew the group assignments. A research assistant

entered each room after consent was given to administer a Modified Yale Preoperative Anxiety Scale (m-YPAS) and the State-Trait Anxiety Inventory Y-6 Item (STAI-Y6). The m-YPAS rates activity, emotional expressivity, state of apparent arousal, vocalization, and parent use to measure anxiety. A higher score correlates to higher anxiety. The STAI-Y6 scale measure six items by patient rating with higher scores correlating to higher anxiety. The patient and parent rate each item on a scale of 1-4. Questions relating to feelings of calmness are scored with 1 meaning not calm at all and 4 meaning very much. Question relating to anxiety are scored inversely, such as answering 1 means very much and 4 meaning not at all. After the pretest is administered, participants received 15-minutes of either passive or active music therapy. Passive therapy involved the PI bringing a guitar and electronic music system into the room. Participants stated preferred music, which was then played. Participants often began to dance and sing along with the music, but it was not encouraged. Active therapy involved the PI bringing a guitar, electronic music system, and a cart of various instruments into the room. Preferred music was played while children were encouraged to play the instruments along with the music. The research assistant (who was blinded to intervention types) reentered the room and performed the m-YPAS and STAI-Y6 on each child and parent duo. Limitations to this design include a lack of comparability due to no control group, small sample size lending itself to Type II error and inability to make widespread generalization, researchers not gaining consent until check-in was complete led to a decreased number of participants since some patients were brought back to the surgical area immediately, timing in relation to different points in care of the therapy, and inter-rate reliability was not able to be measured so ratings may not have been equal.

Results were first analyzed using the one-way analysis of covariance (ANCOVA) to show “scores did not differ significantly as a function of the intervention for pediatric patients...or their caregivers” (Millet & Gooding, 2017, p. 470) between the two groups’ posttests. Then, a paired *t*-test was used to analyze the differences between the pretest and the posttest. “There was significant difference in m-YPAS scores in pediatric patients for pre-music therapy intervention levels or preoperative anxiety (M=46.54, SD=17.70) and post-music therapy intervention levels of preoperative anxiety (M=37.29, SD=13.36)” (Millet & Gooding, 2017, p. 471). Paired *t*-test also found “significant difference in STAI-Y6 scores in caregivers of pediatric pre-surgical patients for pre-music therapy intervention levels of pre-operative anxiety (M=14.13, SD=3.82) and post-music therapy intervention levels of preoperative anxiety (M=12.15, SD=4.14)” (Millet & Gooding, 2017, p. 471). Effect size was greater than “Cohen’s convention for moderate effect size” with “pediatric patient (d=.572) and caregiver (d=.644) anxiety” (Millet & Gooding, 2017, p. 471). In summary, patients and caregivers were found to have reduced preoperative anxiety levels following music-therapy interventions with active and passive methods showing no statistical significance. Researchers found that it did not matter which type of music-therapy was used, each method reduced anxiety. More research is needed with more consistent data collection, timing of intervention, a larger sample size, and a control group for comparison. Due to study type, this is a level two study on the evidence hierarchy. This study is moderately strong due to its high number of limitations and lack of control group.

Summary

Evidence shows a use for music therapy within pediatric populations undergoing painful procedures. Van der Heijden, M. J. E., Mevius H., Van der Heijde, N., Van Rosmalen, J., Van As, S., Van & Dijk, M.. (2019) and Millet, C. F., & Gooding, L.F. (2017) found significant results in their research to support the use of music therapy. Aydin, D. & Sahiner N. C. (2016); Beh, W. F., Hashim M. N., Tan, W. J., & Latiff, Z. A. (2018); and Sundar, S., Ramesh, B., Dixit, P. B., Venkatesh, S., Das, P., & Gunasekaran, D. (2016) also found evidence supporting the use of music listening during painful procedures, although none of these studies had statistically significant results.

Millet, C. F., & Gooding, L.F. (2017) were most interested in preprocedural anxiety, while Aydin, D. & Sahiner N. C. (2016) looked at pain and anxiety during phlebotomy procedures. Van der Heijden, M. J. E., Mevius H., Van der Heijde, N., Van Rosmalen, J., Van As, S., Van & Dijk, M.. (2019) studied pain and distress during various ER procedures and Beh, W. F., Hashim M. N., Tan, W. J., & Latiff, Z. A. (2018) investigated music therapy versus EMLA cream as pain management during venipuncture procedures. Finally, Sundar, S., Ramesh, B., Dixit, P. B., Venkatesh, S., Das, P., & Gunasekaran, D. (2016) wished to learn if music therapy could decrease pain and behavioral symptoms of children undergoing immunizations. Each study measured slightly different outcomes, different ages, and different procedures. These differences gave this researcher a wider picture of uses for music therapy and its specific effects.

All the research gathered showed benefits of utilizing music therapy—active or passive—as a form of pain and anxiety management in pediatric populations undergoing painful procedures. From this data, nurses should be encouraged to utilize some type of

music listening during procedures with children. Music listening is a cost-effective pain management technique that should become a more integral part of treatment for children. More research should be done to find more evidence into positive or negative effects of music therapy within painful situations.

Ethical and Legal Considerations

Ethically, the project could deviate parents and patients from utilizing pain management techniques for more severe pain that require more intensive treatments than music therapy. Not treating pain sufficiently in childhood is the problem to be addressed through this study and allowing children to be in more distress is unethical. Addressing this issue in the presentation can decrease the risk of this ethical concern. Legally, plagiarism is the greatest cause of concern. Correct APA citations will eliminate the risk of plagiarism. Nothing needed to be submitted to the IRB.

Budget

Due to an increase in technology, the cost of the project will include paper and printing for surveys. Since costs are minimal, the researcher will cover them.

Appendix A

Table I

Hierarchy of Article Strength

Levels of Study	Aydin, D. & Sahiner N. C. (2016).	Beh, W. F., et al. (2018).	Sundar, S., et al. (2016).	Millet, C. F., & Gooding, L.F. (2017).	Van der Heijden, M., et al. (2019).
Level 1: Systematic Review or Meta Analysis					
Level 2: Randomized Controlled Trial	√	√	√	√	√
Level 3: Controlled Trial without Randomization					
Level 4: Case-control and Cohort Studies					
Level 5: Descriptive and Qualitative Study					

Level 6: Opinions of Authors and Reports of Experts					
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*Note: This table displays the strength of studies done by researchers used in this submission. All studies were found to be at a level two in strength on the hierarchy with level one articles being the strongest. All studies were found to have relatively strong reliability.

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