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Music Therapy Interventions and their Outcomes on Hematology and Oncology Patients, and Outpatient Groups

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Abstract

There is a variety of research published about the use of music therapy interventions and their outcomes for the pediatric hematology-oncology and outpatient groups, however the research is not combined to put together a description of the most effective interventions utilized in one place. This scoping review addressed the questions of what music therapy interventions are used in the pediatric hematology/oncology and outpatient settings, and what the outcomes of music therapy were respectively. Inclusion and exclusion criteria were established to determine what articles to include in the review. Three databases including Google Scholar, WMU Library, and PubMed were searched to identify articles related to music therapy in the pediatric hematology/oncology and outpatient settings between 2012 and 2022. Coded material included source, title, research design, research questions, data source, measures, method, and outcomes. Of the 1,278 articles initially identified for the pediatric hematology/oncology setting, 1,271 articles were excluded while seven clinical studies were included. Of the 319 articles initially identified for the pediatric outpatient setting, 316 articles were excluded while three clinical studies were included. Music therapy interventions used within these settings included receptive, recreative, creative, and improvisational interventions. Within the pediatric hematology/oncology setting, the most frequently used interventions were receptive and improvisational and promoted the use of patient-preferred music and patient choice. Within the pediatric outpatient setting, all four interventions were utilized to promote creativity and self-expression. The research suggests that music therapy interventions demonstrate positive outcomes on both physiological factors such as heart rate, blood pressure, pain, and oxygen saturation levels, and psychological factors, including mood and anxiety. Further research is needed to determine the efficacy of music therapy interventions in both the pediatric

hematology/oncology and outpatient settings. More research also needs to be conducted on the outcomes of music therapy in pediatric populations such as substance abuse, outpatient surgeries, and mental health care.

Keywords: music therapy, pediatric, hematology/oncology, outpatient

Introduction

Pediatric Medical Setting

Pediatrics is the branch of medicine that deals with the health and medical care of infants, children, and adolescents from birth up to age 18 (Mandal, 2019). Known as the "father of pediatrics," Abraham Jacobi developed pediatric medicine in the mid-19th century. Within pediatric medicine, conditions that are treated and diagnosed include injuries, infections, genetic and congenital conditions, cancers, and organ diseases and dysfunctions. Pediatric medicine can be provided at a physician's office, a hospital outpatient clinic, a community health center, or a school-based clinic (Healthy Children Magazine, 2015).

Pediatric medicine is practiced with characteristics that define its difference from adult medicine. These include: (a) "the smaller body of an infant or neonate child is drastically different from that of an adult, (b) congenital defects, genetic variance, and development issues are of greater concern in pediatric patients, and (c) children are minors and cannot make decisions for themselves" (Mandal, 2019, p.2). Guardianship, privacy, legal responsibility, and informed consent are considered in every pediatric procedure to make the best possible decision for the patient. Within pediatric medicine, the child/adolescent is still developing compared to adults who are already fully developed. Because of this, there is a greater focus on normalizing the environment to try to limit adverse reactions.

Subspecialties

Pediatric Hematology-Oncology. Hematology is the study of the blood's physiology, while oncology is the study of cancer. Combined, hematology-oncology medicine diagnoses and treats cancerous blood disorders and cancers (Regional Cancer Care Associates, 2019). According to the National Cancer Institute, "It is estimated that 15,590 children and adolescents

ages 0-19 will be diagnosed with cancer…among children ages 0-14 it is estimated that in 2021, 10,500 will be diagnosed with cancer" (2021). Cancer occurs in 1 in every 200 older adolescents (15 to 19 years old) and young adults (Cleveland Clinic, 2022). Among children and adolescents in the United States, the most common types of cancer include leukemia, brain, and Central Nervous System tumors, lymphoma, neuroblastoma, kidney tumors, malignant bone tumors, thyroid cancer, and gonadal germ cell tumors (National Cancer Institute, 2021). Most pediatric cancers are treated with surgery, chemotherapy, or radiation (Yale Medicine, 2022). Chemotherapy and radiation therapy may be facilitated in a hospital, clinic, or doctor's office, as well as at home or in a hospital's outpatient infusion center (American Cancer Society, 2022).

Pediatric Outpatient. Outpatient care, also known as ambulatory care, includes services that do not require hospitalization. Outpatient services can include bloodwork and other lab tests, x-rays and other types of imaging, mammograms, chemotherapy and radiation treatment, consultations with a specialist physician, and rehabilitation services (American University of the Caribbean School of Medicine, 2022). Services may be delivered in a variety of settings including the patient's home, a physician's office, primary or urgent care clinics, community health centers, and ambulatory surgery centers. Outpatient services can also be utilized to treat adolescent mental health disorders. In 2020, 17% of 12-to-17-year-old experienced a major depressive episode (MDE), while 12% experienced a MDE with severe impairment as indicated by higher scores on the Sheehan Disability Scale (SAMHSA, 2022).

Music Therapy

As defined by the American Music Therapy Association (AMTA), "music therapy is the clinical and evidenced-based use of interventions to accomplish individualized goals within a therapeutic relationship" (AMTA, 2005). To practice music therapy, one must

have a bachelor's degree or its equivalent, and must hold the Music Therapist Board-Certified (MT-BC) credential or other certification. According to Bruscia (2014), generally there are four types of music-based methods a music therapist utilizes: receptive, recreative, compositional, and improvisation. "Receptive methods are when clients listen to live or recorded music and often involve some type of verbal, musical, or nonverbal response. Recreative methods involve client singing, instrument playing, learning, or performing an existing musical work. Compositional methods are when the client is writing songs, lyrics, instrumental works, or another type of musical product. Lastly, improvisational methods occur when the client is playing or singing a new musical work (Brescia, 2014, p. 57).

Music therapy is used with a variety of populations which can include but are not limited to children, adolescents, adults, the elderly, mental health, developmental, intellectual and/or learning disabilities, Alzheimer's disease, substance abuse, brain injuries, physical disabilities, acute and chronic pain, as well as emotional and behavioral disorders. Music therapy can be practiced in psychiatric hospitals, rehabilitative facilities, medical hospitals, outpatient clinics, day care treatment centers, senior centers, nursing facilities, hospice programs, correctional facilities, schools, and private practice (AMTA, 2005).

Music Therapy in the Pediatric Medical Setting

Music therapy is becoming more prevalent in the pediatric medical setting. Across America, 250 pediatric facilities and units have pediatric music therapists (Knott et. al., 2020), with "All of the US News World Report's Best Children's Hospitals having established music therapy programs" (AMTA, 2021). Within the hospital setting, music therapy is used to promote healthy coping and safeguard the child's psychosocial well-being during inpatient and outpatient medical treatment (Ghetti, 2012). Common goals addressed within the pediatric setting include

but are not limited to developmental support, decreased pain perception or anxiety, increased emotional expression, emotional processing, opportunities for social interaction, or sensory stimulation, development of positive coping skills, procedural or bereavement support, legacy building, and normalization of the hospital environment (AMTA, 2021). To accomplish these goals, music therapists use a variety of interventions to promote the client's needs. Common interventions used within the pediatric hospital setting can include active music engagement, music assisted relaxation, music-alternate engagement, music listening, music-facilitated dramatic play, therapeutic singing, therapeutic music instruction, songwriting, and recording projects (AMTA, 2021). Interventions utilized and their outcomes vary based on client need and diagnoses. There is a variety of research published about the use of music therapy interventions and their outcomes for the pediatric hematology-oncology and outpatient groups, however the research is not combined to put together a description of the most effective interventions utilized in one place. The purpose of this scoping review is to examine music therapy in the pediatric medical setting and will answer the following questions:

1. What music therapy techniques and/or interventions are used with pediatric hematology and oncology patients, and pediatric outpatient groups?
2. What outcomes result from music therapy provided with pediatric hematology and oncology patients, and pediatric outpatient groups?

Method

This scoping review examined music therapy techniques and/or interventions used with hematology and oncology patients, and outpatient groups, to determine what outcomes resulted from receiving music therapy. The following criteria were used to determine what articles and information were to include in the scoping review.

Inclusion Criteria:

- Research focus on music therapy in the outpatient and hematology/oncology settings.
- Research on patients under the age of 18.
- Music therapy provided in research was facilitated by a board certified or internationally credentialed music therapist.
- Research published between 2012 and 2022.
- Studies in English.

Exclusion Criteria:

- Research focus on music therapy in adult medicine.
- Studies not in English.
- Research focus on settings outside of outpatient and hematology/oncology.
- Reviews and book chapters as a study was not conducted.
- Research published before 2012.

Search Strategies

To identify potentially relevant documents, the following databases were searched, for published research from 2012 to 2022: WMU Library, Google Scholar, and PubMed. The search strategies were refined through discussion with the thesis chair. Search terms included *outpatient music therapy and adolescents, outpatient music therapy and children, outpatient music therapy, oncology music therapy and adolescents, oncology music therapy and children, oncology and music therapy, hematology music therapy and adolescents, hematology music therapy and children, hematology and music therapy.* For example, a search on Google Scholar database searched for "'outpatient music therapy' and 'adolescents'" with limits set for being published beginning in 2012. The initial search yielded 12 entries published between 2012 and 2022.

Data Charting Process

A data table was developed to capture the relevant information for the scoping review. The researcher independently read all articles and placed the information into the table. For each source in the initial search, the author(s), title, year, type of study, whether it was included or excluded, reason for exclusion, exclusion code, search engine, and search term were recorded. The articles were grouped by the type of medical setting music therapy was facilitated in (oncology/hematology, outpatient), as well as by the age range of participating clients (children, adolescents). This would allow the reviewer to determine which variables to include and extract in the overall scope review. Articles that involved music therapy with adult clients, music therapy facilitated without a credentialed music therapist, and were published before 2012 were not included in the scope review. Once the initial search had taken place to help eliminate duplicates, book chapters, and publications that were not related to children and adolescents, the next round of reviews took place for the included sources. For each included source, the title, research design, research question, data source, measures, method, and outcomes were recorded in an Excel spreadsheet. To eliminate bias, all articles provided from a search were reviewed and determined whether to be included based off the inclusion and exclusion criteria.

Results

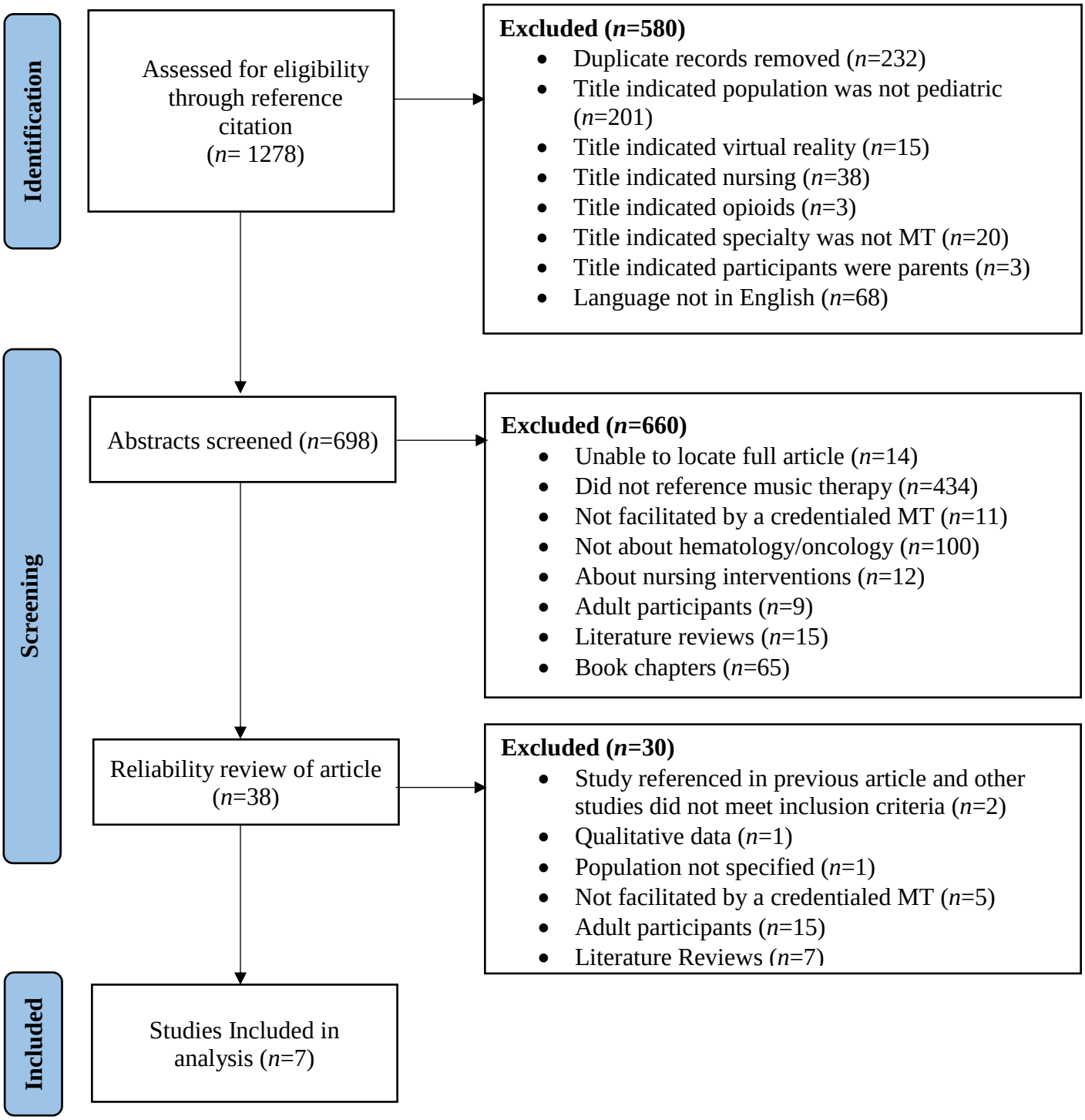
Music Therapy in Pediatric Hematology/Oncology Search

The initial search for relevant articles published between 2012 and 2022 yielded 1278 entries related to music therapy in pediatric hematology and oncology. After a review of the reference titles, articles were excluded due to title duplications (*n*=232) and titles referencing "adults," "virtual reality," "opioids," "nursing" or a specialty that was not music therapy such as occupational therapy, dentistry, and physical therapy (*n*=348). Next, abstracts were screened

based on inclusion/exclusion criteria. Articles were excluded for not referencing music therapy (*n*=434), not being about hematology/oncology (*n*=100), discussing nursing interventions (*n*=12), had adult participants (*n*=9), and others were book chapters (*n=65)*, unable to be located (*n*=14), or were not literature reviews (*n*=15). This left 38 articles for full-text review, which was done independently by the researcher. After review, excluded articles included studies that were literature reviews (*n*=7), had adult participants (*n*=15), were not facilitated by a credentialed MT (*n*=5), and the research data was qualitative (*n*=1). Seven articles met full inclusion criteria. Two studies (Giordano et al.,2021; Uggla, 2019) were excluded due to the results already being in an included study, and the remainder of the studies meeting exclusion criteria (See Figure 1). One study (Chivington, 2016) was excluded due to the population not being specified in the research.

Figure 1

Hematology/Oncology Prisma Flow Diagram



Note. MT=Music Therapy/Music Therapist.

What music therapy interventions are used with pediatric hematology/oncology groups?

Seven studies described music therapy interventions and techniques used in pediatric hematology/oncology groups (Chami, 2015; Giordano, 2020; Kobus et al., 2022; Mangas, 2019; Uggla et al., 2016; Wong et al., 2021; Zhang et al., 2022) and are summarized in Table 1. Study types included one prospective clinical trial, two observational studies, two randomized clinical trials, three randomized control trials, and one quasi-experimental with a single group pre and posttest design.

Interventions used in music therapy sessions included receptive interventions which involved the client listening to music played by the music therapist, recreative, compositional, and improvisational where the client improvised with vocals and instruments. One intervention consisted of the music therapist playing patient preferred music that matched the child's current energy levels and needs during a catheterization procedure (Zhang et al., 2022). The music therapist utilized music entrainment to match a child's physiological rhythm and reflected pain level and feelings by translating their description of pain and emotional status in the musical parameters of rhythm, timbre, pitch, and intensity. The music therapist would then gradually change the music in the desired the direction of mood and energy level (Zhang et al., 2022). Another intervention that used patient preferred music involved the music therapist providing the patient with an iPad with a list of different songs to choose from. The patient chose two to four songs which were then implemented during the session (Chami, 2015). Techniques utilized by the music therapist within the music therapy interventions included matching, reflection, and taking on different roles such as soloist, follower, or providing accompaniment (Mangas, 2019). In the studies designed by Giordano et al. (2020) and Uggla (2019), an improvisation model was used that developed from free improvisation therapy. Within this approach, both active and

receptive techniques were used, using instruments, free improvisation, singing and songwriting, and creating and listening to playlists.

What are the outcomes of music therapy approaches used with pediatric hematology/oncology patients?

Seven studies described the outcomes of the music therapists' interventions used with pediatric hematology/oncology patients (Chami, 2015; Giordano, 2020; Kobus et al., 2022; Mangas, 2019; Uggla et al., 2016; Wong et al., 2021; Zhang et al., 2022) and are summarized in Appendix A. The impacts of receptive versus recreative, compositional, and improvisational music therapy were also described on measures of heart rate, oxygen saturation, blood pressure, anxiety, pain, goal achievement, and mood.

In a study by Kobus et al. (2002), music therapy involved receptive music therapy in which the patient listened to music provided by the music therapist, or improvisational music therapy in which the patient had the option of improvising with instruments or their own voice, alone or together with the music therapist. Following music therapy, participants experienced an overall decrease in heart rate of 18.1 beats per minute as well as a 2.4% increase in oxygen saturation. Decreases in systolic and diastolic blood pressure were also observed after music therapy. When looking at receptive versus improvisational music therapy, Kobus et al. (2022) found an overall decrease in heart rate and increase in oxygen saturation to be slightly greater with receptive music therapy.

In a study by Chami (2015), the music therapist provided the patient with an iPad that held a list of different songs to choose from. The patient then chose two to four songs to recreate with the music therapist. Results indicated that children who were in music therapy had significantly decreased heart rates and significantly increased oxygen saturation levels compared

to children in the control group who received standard care. There was a slight decrease in anxiety in the music therapy group compared to the control group, however the results were not statistically significant. There also were no significant differences on the effects of music therapy on pain between the music therapy and control groups. Overall increases in mood were also noted, with 79% of children reporting being happy after music therapy while 46% of control group members reported being happy after standard care (Chami, 2015).

In Uggla's (2016) study, music therapy consisted of improvisational music therapy, with the patient being invited to sing and play various musical instruments, as well as listen to music with the music therapist. The music therapy group demonstrated significantly reduced heart rate during the day, while the control group heart rate increased during the same period. Lower saturation levels were observed in the morning of the music therapy group compared to the control group, while evening levels were similar. No significant differences in saturation levels were observed between morning and evening periods in the two groups.

In a study by Giordano et al (2020), music therapy consisted of free improvisation, singing, and songwriting together with the choice of creating and listening to playlists with the music therapist. Patients could also listen to songs with headphones or audio speakers. Sessions occurred prior to procedures and lasted until sedation was administered. When looking at the effects of music therapy on anxiety, Giordano et al. (2020) found a significant reduction in patients' anxiety levels who were in music therapy versus those who were not.

In a study by Mangas (2019), music therapy consisted of musical games with instruments and free improvisation play using piano, guitar, maracas, tambourines, and shakers where the client and therapist had different roles that included soloist, follower, and accompaniment. Participants experienced an overall improvement in their perceived subjective pain as well as

significant improvement on the Scale for Mood Assessment (EVEA) scores which reported from an increase in happiness and a decrease in fear, sadness, and anger (Mangas, 2019).

In a study by Zhang et al. (2022), music therapy consisted of the music therapist playing patient-preferred music according to current energy levels and clinical needs and used song discussions to evoke positive experiences and memories. The music therapist matched the child's physiological rhythm and reflected their pain level and feelings by translating their description of pain and emotional status through rhythm, timbre, pitch, and dynamics. The therapist would then gradually change the music in the desired direction. As a result, pain scores were less in the music therapy group and the overall median difference in pain scores was significantly less for the music group than the control group. They also found sedative medications were used less for the group receiving music therapy, with only 4.35% of participants in the music therapy group using sedatives while 91.85% of the control group used sedatives. Zhang et al. (2022) found emotional scores from the Mann-Whitney U test improved more in the music therapy group and the overall median difference was significantly greater than the control group.

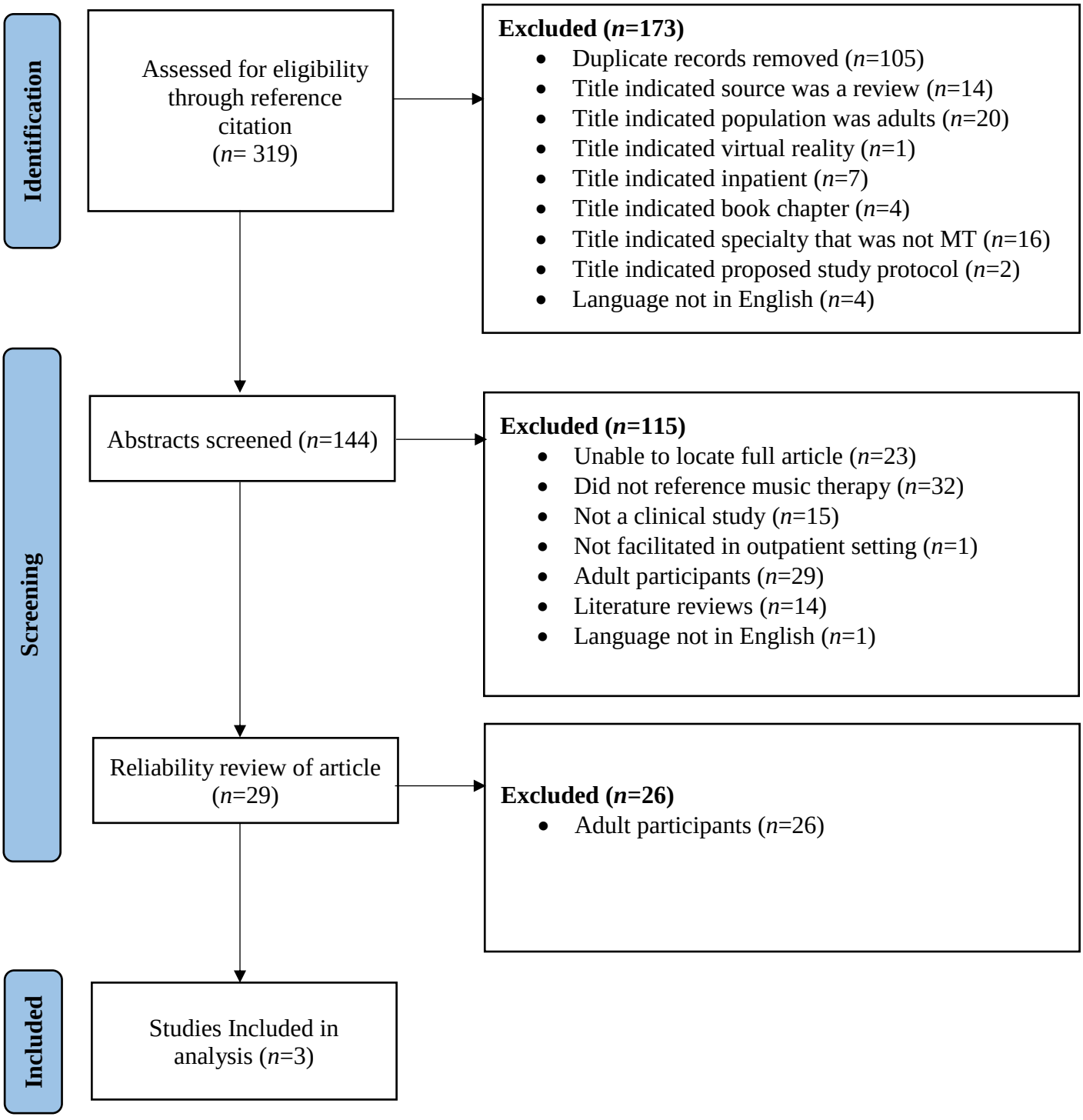
In a study done by Wong et al. (2021), receptive, creative, and improvisational interventions were used. Music therapy involved the use of guitar, keyboard, percussion instruments, and technology that allowed the playing or creating of recorded music. Engagement in music therapy was found to help participants achieve 33 out of 37 goals related to body functions/impairments, and participation/activity limitations and restrictions. Goals included regulating children's mood and morale as well as enhancing interactions between children and nursing staff/other therapists, maintaining daily routines, handling stress, managing behavior, education, work, engaging in play, and community/social activities and recreation/leisure (Wong et al., 2021).

Music Therapy in the Outpatient Setting Search

The initial search for relevant articles published between 2012 and 2022 yielded 319 entries relating to pediatric outpatient music therapy. After a review of the reference titles, articles were excluded due to title duplications (*n*=105), the title referencing "adults," "virtual reality," or a specialty that was not music therapy (e.g., art and dance therapy) (*n*=58) titles stating they were literature reviews and book chapters (*n*=20), the study protocol not being in English (*n*=6). Next, abstracts were screened based on inclusion/exclusion criteria. Articles were excluded that were unable to be located (*n*=23), did not reference music therapy (*n*=32), were not clinical studies (*n*=15), were not an outpatient setting (*n*=1), included adult participants (*n*=29), were literature reviews (*n*=14), and were not in English (*n*=1), excluding 115 articles in total. This left 29 articles for full-text review that was done independently by the researcher. After review, three articles met full inclusion criteria (See Figure 2).

Figure 2

Outpatient Prisma Flow Diagram



Note. MT=Music Therapy/Music Therapist.

What music therapy interventions are used with pediatric outpatient groups?

Three studies described music therapy interventions and techniques used in pediatric outpatient groups (Geipel et al., 2022; Sundar et al., 2016; Twyford & Watters, 2016) and are summarized in Appendix B. Study types included one prospective, single-arm repeated measures design, one single experimental group, and one study with experimental and control groups.

Interventions utilized in the studies included receptive MT with client-preferred music as well as listening to sounds and other pre-recorded music to provide sensory focus for group participants (Geipel et al., 2022; Twyford & Watters, 2016). Other interventions involved instrument exploration, therapeutic songwriting, performing songs, and creating playlists. Another intervention involved recreative music therapy where patients were given the opportunity to sing and play musical instruments while using visual aids such as hand and finger puppets (Sundar et al., 2016) and musical role play (Geipel et al., 2022). A session within Twyford and Watters' study (2016) consisted of an original song written for the group to incorporate key concepts they were addressing in their session, and improvised songs used to motivate, focus, and promote group awareness and cohesion. Geipel et al. (2022) also used both referential and non-referential improvisations for processing mood, emotions, and emotional events during sessions as well.

What are the outcomes of music therapy approaches used with pediatric outpatient groups?

Three studies described the music therapists' outcomes of interventions used with pediatric outpatient groups (Geipel et al., 2022; Sundar et al., 2016; Twyford & Watters, 2016) and are summarized in Table 1. The outcomes of receptive, recreational, compositional, and improvisational music therapy demonstrated effects on depression symptoms, emotional

regulation, pain and distress, positive interactions, task behavior/completion, and overall self-satisfaction.

In a study by Geipel et al. (2022), music therapy sessions consisted of three different modules: sensory modulation, affect regulation, and interpersonal regulation. Sensory modulation involved instrument exploration and mindful listening to sounds and music. Affect regulation involved receptive music therapy with client preferred music; referential improvisations for processing mood, emotions, and emotional events; therapeutic songwriting and song performing; and creating playlists. Interpersonal regulation involved non-referential improvisations and musical role plays. After treatment, the overall satisfaction of music therapy treatment was rated "good" by both patients and the music therapists. Depression symptoms lowered in severity immediately after the music therapy treatment cycle, however three months after treatment, an increase in depression severity was observed. When clients were asked to self-report their emotion regulation strategies, a more frequent use of adaptive behaviors and a less frequent use of maladaptive behaviors was reported. Means of all dimensions of health-related quality of life also improved over the course of treatment.

Sundar et al. (2016), conducted a study in which the experimental group received a music therapy intervention where they were exposed to singing and musical instrument playing with visual aids such as hand and finger puppets during an immunization procedure, while the control group received standard care. Three domains of facial expression, crying, and movements showed significant improvement in the experimental group. Pain and distress levels also improved, though were not statistically significant. The mean duration of crying spells was significantly lower in the experimental group compared to the control group.

Research by Twyford and Watters (2016) involved music therapy sessions that consisted of original songs written for the group to incorporate key concepts, the improvising of songs to motivate, focus, and promote group awareness and cohesion, and the availability of musical instruments for group use such as handheld percussive instruments and a large gathering drum. All children showed positive outcomes on the Goal Attainment Scale (GAS) at post-test. The Individualized Music Therapy Assessment Profile (IMTAP) illustrated general positive trends for most children across all areas, while the School Function Assessment (SFA) showed slight improvement in raw scores for "positive interactions," and no change in "task behavior/completions," and "following conventions." The Canadian Occupational Performance Measure (COPM) indicated a positive outcome on improvement in the occupational performance of goals for three children while four children achieved a positive outcome indicating an improvement in overall satisfaction of occupation performance.

Discussion

The goal of this scoping review was to identify music therapy interventions used in the pediatric hematology/oncology and outpatient settings, and outcomes gained through engaging in music therapy. Despite the increased frequency of music therapy in the pediatric medical setting, there are no scoping reviews combining these two topics with music therapy in the existing literatures.

Music Therapy in Pediatric Hematology/Oncology

This review included seven articles relating to pediatric hematology/oncology that discussed interventions used and analyzed the overall impact of music therapy for pediatric patients with a cancer diagnosis. Overall, the literature identified common music therapy interventions used in this setting and supported a positive effect of the use of music therapy on

both physiological (pain, oxygen saturation, heart rate and blood pressure) and psychological (anxiety and mood) outcomes.

Interventions and Outcomes

The research included in this scoping review suggests that the most frequently used music therapy interventions within the pediatric hematology/oncology setting include receptive and improvisational interventions that demonstrated positive outcomes on pediatric and adolescent patients' heart rate, oxygen saturation, pain, anxiety, mood, and goal achievement.

During receptive interventions, the music therapist played patient-preferred music for the patients, and utilized rhythm, timbre, pitch, and dynamic intensity to describe the current emotions and physiological state and/or guide them to a different physiological state through manipulation of the musical elements. Through improvisational interventions, patients utilized instruments such as drums, piano, shakers, harmonica, and vocals to create music as a solo or dyad with the music therapist. These interventions demonstrated positive outcomes on heart rate, oxygen saturation, pain, anxiety, and mood. The use of patient-preferred music and being given choices of music and instruments was relevant in most of the studies referenced in this review suggesting the technique of providing choices is an important and beneficial aspect to providing music therapy in the pediatric medical setting.

Three studies (Chami, 2015; Kobus et al., 2022; Uggla et al., 2016) discussed positive impacts of music therapy on heart rate, blood pressure, and oxygen saturation levels which seems to support the use of music therapy to address physiological needs. The interventions utilized within these studies include both receptive and improvisational interventions. Five studies (Chami, 2022; Giordano et al. 2022; Mangas, 2019; Wong et al., 2021; Zhang et al., 2022) discussed the positive impacts music therapy had on patients' anxiety and mood before, during,

or after procedures which seems to suggest that music therapy can be utilized to distract and ease patients' negative emotions within this setting. Interventions utilized within these studies included receptive interventions where the music therapist musically matched the child's physiological rhythm and improvisational music therapy when the children created their own music.

The research does not suggest the efficacy of one intervention over the other, which suggests that both intervention types (e.g., receptive and improvisation have equal benefits within the hematology/oncology setting. Further research needs to be conducted to further determine the efficacy of different interventions within this setting. On the other hand, the research does suggest that music therapy is mostly used to promote outcomes related to heart rate, oxygen saturation, anxiety, mood, and pain. Despite the body of current research in pediatric medical music therapy, more research is needed to further determine the efficacy of music therapy on each of these areas.

Music Therapy in the Pediatric Outpatient Setting

This review included three articles relating to pediatric outpatient clients that discussed the interventions used and analyzed the overall impact of music therapy within this setting. Overall, the literature identified common music therapy interventions including the use of recreative, compositional, and improvisational interventions, and supported positive outcomes for the use of music therapy on depression symptoms, emotion regulation, pain and distress, and goal outcomes.

During recreative interventions, clients created playlists and performed songs together with instruments and visual aids. Within creative interventions, clients participated in therapeutic songwriting and musical role plays. Lastly, within improvisational interventions, clients

performed referential improvisations of mood, emotions, and emotional events and non-referential improvisation to motivate, focus, and promote group awareness and cohesion. All of these interventions allow the client to be creative and expressive during their treatment, which seems to suggest this is an important factor to consider when planning interventions for outpatient groups to promote positive outcomes in their treatment.

Each of the three articles referenced in this scoping review discussed different outcomes from their research. Geipel et al. (2022) discuss positive impacts on overall depression symptom severity as well as adaptive versus maladaptive behaviors after receiving music therapy sessions that consisted of mindful listening to sounds and client-preferred music, the creating and performing of songs, and improvisational experiences. This can indicate the potential use of receptive, compositional, and improvisational music therapy to promote positive outcomes within the mental health setting, specifically depression symptom management. Sundar et al. (2016) discussed the positive impacts of singing and instrument playing with visual aids on facial expression, crying spell durations, and overall pain and distress levels. These results support the potential use of music therapy on emotion regulation during outpatient procedures. Lastly, Twyford and Watters (2016) discuss the positive outcomes of creating original songs and improvisation experiences on goal achievement, positive interactions, and satisfaction in occupational performance. These results support the use of creative and improvisational music therapy to promote positive outcomes on self-esteem and goal management.

As there are only three articles referenced in this scope review, there is not enough evidence to suggest the efficacy of the different interventions over other interventions, however based off these three articles, music therapy has shown positive outcomes within the outpatient setting. Further research would need to be conducted to further determine the efficacy of

different interventions within this setting as well as expand on the outcomes referenced in this scope review.

Limitations

This scoping review had some limitations. Limitations include access to resources from three search engines/data bases, which limited the amount of available research to review. Another limitation is the number of articles that were identified through the initial search process, but the full text was unable to be located. There were also such a small number of articles that met the inclusion criteria, making it impossible to generalize the results to the overall pediatric hematology/oncology and outpatient populations.

Areas of Further Investigation

Within the last 10 years, there has been limited research on pediatric hematology/oncology and outpatient groups, with most of the research related to adults. To identify more interventions and outcomes and further determine commonalities, more research needs to be done within the pediatric hematology/oncology and outpatient settings, specifically for children under the age of 18. Further investigations on the use of music therapy in the pediatric hematology/oncology setting should look at whether there is a difference in effectiveness for receptive music therapy over creative or improvisational music therapy, and how the use of those interventions can change outcomes within this setting. Regarding outpatient, further investigations should specifically look at different outcomes of music therapy in substance abuse populations, as well as more research on the impacts of music therapy on pediatric outpatient surgical operations and mental health treatment.

Clinical Implications for Practice

Music Therapy in the Pediatric Hematology/Oncology Setting

When working in the pediatric hematology/oncology setting, the interventions most used involve different forms of improvisation while providing the patient the opportunity to decide how the improvisation should occur, and with what instruments. A variety of different instruments should be presented to the patient and allow them to be given a choice as to which instruments, they want to utilize and how. Sanitization of instruments should be considered when providing instrument choices. For example, instruments that require blowing result in needing higher sanitization procedures, which is something to greatly consider within the hospital setting. Timbre should be considered when providing instruments to choose from as well for patients, as they need to be a sound that is not overstimulating in the environment depending on the developmental age or stage of care for the patient. Other interventions frequently used involve receptive music therapy in which the client can pick songs to listen to or the music therapist music pick songs to match the overall mood of the client and intentionally use/manipulate the elements of music such as tempo, instrumentation, melody, and overall rhythmic complexity to work towards the desired outcome for the patient.

Music Therapy in the Pediatric Outpatient Setting

When working in the pediatric outpatient setting, the interventions should promote creativity and control for the clients. Providing clients with an opportunity to express themselves and their creativity can help to promote self-confidence and self-satisfaction. Having control over a situation is also important in pediatric care as children do not often have a lot of choice in their daily lives. Providing different opportunities to make choices and be creative gives a client a sense of control and accomplishment.

Another consideration in the outpatient setting is the importance of group sessions. Group sessions can allow for clients of similar diagnoses or referrals to make friendships and promote bonding to realize they are not alone in their treatment. Group setting also helps to promote social interaction and group cohesion which can greatly impact a clients overall treatment outcome in a positive way.

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Appendices

Appendix A

Source	Title	Research Design	Research Question(s)	Data Source	Measures	Method	Outcomes
Kobus et al. (2022)	Effects of Music Therapy on Vital Signs in Children with Chronic Disease	prospective clinical trial	Examine the effects of music therapy on hospitalized children's vital signs depending on the type of medical care (intensive vs. general pediatric special care) and the kind of music therapy	83 children, age one month to 18 years	pulse oximeter clip for heart rate, oxygen saturation and blood pressure documented before and after session, electronic patient files, intensive care files	Music therapy performed 2-4 times a week in clinically stable patients from admission to the clinic until discharge. Timing of each music therapy session coordinated by music therapist, patients, nursing staff and parents. MT session carried out in patients' room directly next to bed and consisted of individual conducted MT by the music therapist. Patient's received active or receptive MT. In receptive MT, the children listen to music played by the music therapists. In active MT, the patient has the option of improvising with their own voice, with instruments along, or together with the music therapist.	**Music Therapy:** Overall decrease in heart rate after MT of 18.1 beats per min in all patients. Increase of 2.4% for all children when comparing values of oxygen saturation before and after MT. Decrease in systolic blood by 9.2mmHg and in diastolic blood by 7.9mmHG. **Active vs Receptive:** overall decrease in heart rate at the SCU (16.6 bpm active, 19.6 bpm receptive) and at the ICU (18.9 bpm receptive) after MT. Overall increase in oxygen saturation at SCU (2.2% active, 2.7% receptive) and at the ICU (2.1% receptive MT). Decrease in systolic and diastolic blood pressure at the SCU after active and receptive MT, non-significant decrease at ICU.

Giordano et al. (2020)	The influence of music therapy on preoperative anxiety in pediatric oncology patients undergoing invasive procedures	observational study w/ control and MT group	Evaluate the influence of MT as a complementary/non-pharmacological intervention to reduce preoperative anxiety and promote more compliant behaviors during anesthesia induction.	Children ages 2-13 with cancer, 29 in MT group, 19 in control group	Modified Yale Pre-operative Anxiety Scale (m-YPAS) used to evaluate behavior of child in hospital and operating room. Consists of 22 items divided into 5 categories: activity, emotional expressivity, state of arousal, vocalization and use of parents. Score ranges from 23 to 100 w/ higher scores indicating greater anxiety. Administer by psychologist in morning of the day of the procedure	15-20 minute MT session provided bedside in hospital room prior to the procedure by MT-BC, w/ collaboration of a psychologist. Interactive relational approached developed from model of "free improvisation therapy" used. Approach included active and receptive techniques, using variety of instruments, free improvisation, singing and songwriting, together with the choice, creation of listening to play lists with the MT-BC. Children could listen songs w/ headphones or w/ audio speakers. MT-BC tailored music to each child based on results of assessment. Volume identical for all patients (70dB). Parents could participate in session if child agreed. MT-BC accompanied children and parents to operating room where active/receptive MT continued until	Analysis suggests the benefit of the MT treatment utilized. Differences in anxiety levels found between two data points of treatment. Significant reduction in anxiety levels in Group 1 patients from datapoint T1 to T2. Significant differences in anxiety between Groups 1 and 2, MT group having lower anxiety than standard care group.

and in the operating room just before induction of anesthesia.	analog-sedation administered.

Chami (2015)	The effects of music therapy with sickle cell disease pediatric patients	Randomized control study	1. Will experience significantly lower heart rate and a higher oxygen saturation than patients not receiving MT at the completion of intervention day 1 and day 2. 2. Will experience significantly lower anxiety scores than patients not receiving MT at the completion of the intervention on day 1 and day 2. 3. Will experience significantly lower pain scores than patients not receiving MT at the completion of day 1 and day 2. 4. Will experience significantly increase mood score than patients not receiving MT at the completion of day 1 and day 2.	30 patients, ages 4-14, 15 in music therapy group, 15 in control group	Wong Baker Face scales, heart rate, oxygen saturation	30-minute music therapy session (experimental) w/ pre-posttest and exit survey, or just receiving pre-posttest (control). Music therapy session had three components: hello song, 15-20 minutes of music of the subject's choice, goodbye song. Experimental group: Researcher would begin session w/ hello song, then provide patient with iPad that held a list of different songs to choose from. Patient was allowed to choose 2-4 songs. Once songs were performed, goodbye song was played to end the session. On the second day, the procedure was repeated, and the post test was completed. Control group: received pretest, researcher then left for 30 minutes and came back to administer post-test. Repeated on day 2.	Significant difference between MT and control group (CG) on two dyads of pre and post-tests. **Heart Rate and Oxygen Saturation:** MT group showed significantly decreased heart rates, w/ a decrease of 9 from the means of the pre to post-test compared to children in the control group who showed an increase of 3 on day 1. On day 2, increase of 15 in MT and decrease of 4.67 in CG. Children in MT group showed significantly increased oxygen saturation with an increase of 3.47 from the means of the pre to post-test compared for CG who only increased 1.47 on day 1. On day 2, CG decreased .63 while MT group increased 2.93. **Anxiety:** Children in MT group showed difference on day 1 between pre and post-test of a decrease of 1.6 compared to .34 in CG. Day 2, MT did not show significant

decrease overall compared to control group as they did not reach statistical significance. **Pain:** Showed differences but not significant in MT vs. CT. **Mood:** Day 1 pre-test, majority of MT participants self-reported they were happy (33%) or nervous (26%), while majority of participants in CG were nervous (26%) or sad (20%). Post-test results showed 47% increase in mood as happy (73%) in MT group. 46% happy in CG. Day 2, post-test increased to 79% happy and 7% excited, while CG had 46% happy and 20% excited.

Mangas (2019)	Music Therapy in Children with Cancer	quasi-experimentation w/ pre and posttest design in a single group	Observe and analyze the effect of 5-6 music therapy session on pain and mood of 4 children who are in the diagnostic phase of cancer.	4 children between 2 and 9 years of age with a new diagnosis of cancer	Scale for Mood Assessment (EVEA), Wong-Baker Visual Analog Scale for pain	MT intervention consisted of a cycle of 5 and 6 individual active MT sessions that took place in the child's room. Sessions were between 20-30 minutes long and consisted of an initial verbal greeting, musical game w/ instruments, free improvisation play using piano, guitar, maracas, tambourines, shakers, and closing. Techniques include matching, reflection, taking on different roles (soloist, follower, accompaniment). Data collection before and after MT treatment.	After treatment, all pain scores decreased by the patients. Overall, there was an improvement in the perception of subjective pain. The EVEA mood scale showed a high score in joy, and low perceptions of sadness, anger and fear prior to MT treatment, and improved at the end of treatment. There was an improvement of mood after MT: happiness increased 2.75 points, fear decreased 2 points, sadness decreased 3.25 points, and anger decreased 2 points. Results were significant.

Wong et al. (2021)	The Role of Music Therapy for Children Undergoing Cancer Treatment in Singapore	Observational study that used frequency analysis and correlation to quantitatively explore the benefits of MT services	Explore the benefits of MT for children with cancer and described the profile and common goals of children who required MT while undergoing cancer treatment.	91 children between the ages of 2 and 17	SMART goals written by MT, Goal Attainment Scale (GAS)	MT began by building rapport w/ child and getting to know his/her musical preferences and background. MT would then offer suitable MT interventions based on child's preferences and age appropriateness. Children engaged in 1-3 times a week by attending MT based on clinical needs. Frequency of sessions dependent on treatment schedule and agreed upon MT and child/family. Tools included in MT were guitar, keyboard, percussion instruments, and technology that allowed the playing or making of recorded music.	Overall, 33 out of 37 goals were achieved. Goals included body functions/impairments , and activity and participation/activity limitations and participation restrictions. 16 of 18 goals under WHO-ICF 1 were achieved which included regulation of children's mood and morale. 16 of 19 goals were achieved under WHO-ICF 2, which included enhancing interactions between children and nursing staff/other therapists, daily routines, handling stress, managing behavior, education, work, engagement in play, and community/social activities and recreation/leisure.

Uggla et al. (2016)	Music therapy can lower the heart rates of severely sick children	randomized clinical pilot study	Can music therapy as a psychosocial intervention be evaluated by physiology al parameters in a larger randomized setting of children undergoing HCST by comparing objective measurements in both the mornings and evenings?	24 patients up to the age of 16 undergoing hematopoieti c stem cell transplants (HSCT)	Lansky Play Performanc e Scale, disease severity, nutritional status, biological parameters, heart rate, blood pressure, oxygen saturation measured between 7-8am and 6-8pm.	Music therapy received for approximately 4-6 weeks for 45 minutes twice a week. Method originated from Nordoff-Robbins Creative Music Therapy and Juliette Alvin's Free Improvisation Therapy models. Music therapy was conducted in child's hospital room and is performed in accordance w/ child's wishes and desires based on child's initiative. Child is active and invited to sing, play various musical instruments, and listen to music w/ therapist.	MT group, children's heart rate decreased during day, control group heart rate increased during same time period. MT group significantly lower. Lower saturation levels observed in morning of MT group compared to control group, while evening levels were similar. No significant differences in saturation levels observed between morning and evening periods in the two groups.

Zhang et al. (2022)	The effects of music therapy on peripherally inserted central catheter in hospitalized children with leukemia	randomized control trial	What is the effect of music therapy on the total length of catheterization, the use of sedatives and the changes of pain and emotion before and after treatment?	107 patients enrolled, 50 girls and 57 boys ranging in age from 2 to 15 years	Emotional state recorded by seven faces depicting expressions varying from happy to very unhappy and assigned a score of 1 to 7, pain degree measured by children's choice on scale of 1 to 5 (not painful to very painful), pulse oximeter used to record heart rate, respiration rate, and blood oxygen levels	Music therapy and nurses conduct a music therapy assessment before the operation. During catheterization, music therapist engaged with children musically by playing preferred music according to current energy levels and needs and used song discussions to evoke positive memories/experiences . Music entrainment was applied by a music therapist who musically matched a children's physiological rhythm. Therapist reflected pain level and feelings by translating their description of pain and emotional status in musical parameters or rhythm, timbre, pitch, and intensity and gradually changing the music in the desired direction. After catheter placement, total length of catheterization and use of sedative medications were recorded, and post-	No significant differences found in gender and age characteristics. Operation time of the music group was significantly less than the control group. Sedative medications were less used in the music group; only 4.35% of participants in music group used sedatives while 91.85% used in control group. Increase of pain scores was less in music group; the median difference of pain scores of the music group was significantly less than the control group. Improvement of emotional scores was more in the music group; the median difference of emotional scores of music group was significantly greater than the control group.

intervention data were collected.

Appendix B

Source	Title	Research Design	Research Question(s)	Data Source	Measures	Method	Outcomes

Geipel et al. (2022)	Short-term music therapy treatment for adolescents with depression - a pilot study	prospective, single-arm repeated measures design	(a) To assess the suitable outcome measures; and methods, follow-up rates, time needed to collect data, (b) to test a music therapy treatment plan for young people with depression including their compliance and satisfaction, and © to estimate a potential treatment effect for later planning of sample size	13–17-year-olds who met diagnostic criteria for a depressive episode, dysthymia, or depressive conduct disorder	Mini International Neuropsychiatric Interview for Children and Adolescents, Children's Depression Rating Scale, Beck Depression Inventory II, Assessment of emotion regulation in children and adolescents, KIDSCREEN-52, hair sampling.	12 weekly 50 min MT sessions at music therapy outpatient center. Treatment plan consisted of 3 modules: (1) sensory modulation involved instrument exploration and mindful listening to sounds/music. (2) affect regulation involved receptive MT w/ client-preferred music, referential improvisations of mood/emotions/emotional events, therapeutic songwriting/performing songs, and creating playlists. (3) interpersonal regulation involved non-referential improvisations, and musical role plays. At the last two sessions, the created/performed songs were recorded.	High acceptability of MT treatment, total score of overall satisfaction rated "good" by patients and MT. Lower severity and heterogeneity regarding burden of symptoms of depression immediately after MT treatment. 3 months post treatment, increase of severity and heterogeneity can be observed. Rates of depression severity decline during treatment w/ medium effect size for CDRS-R and large effect size for BDI-II. Post-assessment results of CDRS-R indicated no depression in 6/9 participants. At post-assessment, 7/9 adolescents showed remission of symptoms. Self-reports on emotion regulation strategies showed more frequent use of adaptive and less frequent use of maladaptive emotion regulation strategies. 55% of adolescents showed substandard adaptive emotion

							regulation at pre-assessment compared to 33% after completion of treatment. 44% used excessive maladaptive emotion regulation whereas 22% were still outside standard range of norm values. According to KIDSCREEN, means of all dimensions of health-related quality of life improved over course of treatment.
Sundar et al. 2016)	Live music therapy as an active focus of attention for pain and behavioral symptoms of distress during pediatric immunization	experimental & control groups	Assess effect of live music therapy intervention on pain, distress, and physiological parameters of the parent holding the child during painful immunization procedures in children	100 children < 18 months coming for routine immunization	Modified Behavior Pain Scale, parental ratings from scale of 0-10	Experiment group received MT intervention in which they were exposed to singing and musical instrument playing along with visual aids (hand puppets/finger puppets) during immunization procedure. Control group received standard care.	MBPS for each of the 3 domains (facial expression, cry, and movements) showed significant improvement in experiment group. Pain and distress levels showed improvement in experiment group, but not statistically significant. Mean duration of crying spells in experiment group was 25.02 seconds and 41.66 seconds in the control group, which was statistically significant.
Twyford &	In the groove: an		Investigate the effectiveness of a joint	Seven children	Goal Attainment	As children enter room, pre-recorded music	All 6 children showed positive outcome on

Watters (2016)	evaluation to explore a joint music therapy and occupational therapy intervention for children with acquired brain injury	single experimental group	music therapy and occupational therapy group for children with an ABI that promoted the development of self-regulation skills, with the aim of improving interpersonal skills required for friendships, and to enable new knowledge acquisition within learning environments.	between 5.5 and 10 years old under hospital's ABI or neurology team	Scale, Individualized Music Therapy Assessment Profile, School Function Assessment, Canadian Occupational Performance Measure, 5-point Likert-type self-evaluation scale	played quietly to provide sensory focus for group participants. Each session began with same song/activity and remainder of session was non-linear to respond to group dynamics and perceived need. Original songs written for group to incorporate key concepts, improvised songs used to motivate, focus, and promote group awareness and cohesion, and musical instruments were available for group use and included a small range of handheld un-tuned percussion, and a large gathering drum.	GAS at post-testing. IMTAP illustrated general positive trends for most children across all areas. SFA showed slight improvement in raw score for "positive interactions" and no change was identified in "task behavior/completion" and "following conventions." COPM demonstrated 3 children achieved a positive outcome indication an improvement in occupational performance of their goals. 4 children achieved a positive outcome indicating an improvement in satisfaction of occupational performance. To self-report questionnaire, children's responses suggested a positive experience.