


# Indications and Counterindications for Electronic Music Technologies in a Pediatric Medical Setting

Music and Medicine  
3(3) 154-162  
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sagepub.com/journalsPermissions.nav  
DOI: 10.1177/1943862111409241  
http://mmd.sagepub.com  


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## Abstract

Over the past 10 years, electronic music technologies have developed and become more accessible to music therapists and their clients. Music therapists are changing their clinical practices to incorporate these expanding technologies, which may include music software, electronic instruments, MP3 players, music-based video games, and a myriad of other options. These devices are growing popular in the music therapy field; however, a review of the literature results in little information about the indications and counterindications for the use of electronic music technologies in a medical setting. This article presents guidelines for the use of electronic music technologies in music therapy practice in pediatric medical settings. Clinical interventions and counterindications for using electronic music technology are examined.

## Keywords

music therapy, music technology, software, video games, medical, children, teenagers

## Introduction

Like many other arenas where music therapy is practiced, electronic music technologies (EMTs) have augmented the clinical practice in medical settings as well. Electronic music technologies offer new and innovative ways to meet the needs of patients in pediatric medical settings. When researching the use of EMT-based interventions, the authors found very few articles that describe how and when to use interventions based on EMTs and no information on their use in medical music therapy. In the absence of published guidelines or detailed descriptions, the authors will present procedures for the clinical use of EMTs in pediatric medical music therapy. The guidelines are not hard rules but generalities noticed over the past 4 years since the introduction of multiple EMTs into music therapy practice at the hospital. It is the hope of the authors that other music therapists will build upon these general guidelines, furthering the clinical use of EMTs in music therapy sessions.

Although the literature focusing on EMTs in clinical use is limited, recording and editing music and the use of electronic instruments has been explored by music therapists for the past few decades. Krout,<sup>1,2</sup> Henderson,<sup>3</sup> and Montello and Coons<sup>4</sup> discussed the use of electronic music recording, editing equipment, and CD burning technology in music therapy practice. A number of authors<sup>5-14</sup> explore the applications of electronic music instruments in music therapy practice including electric guitars, drum machines, and electronic keyboards. These interventions are applied in many populations but mainly

in school settings with children who have developmental disabilities. Krout<sup>11</sup> discusses the use of software programs for composition in music therapy sessions. In the literature described, no guidelines for the application of EMTs in music therapy practice exist.

More recently, music therapy researchers have explored the use and barriers to the use of EMTs in clinical practice and music therapy education. Crowe and Rio<sup>15</sup> found music therapists neither determined which EMTs were applicable to their practice, nor were music therapy students receiving adequate education on the use of EMTs in the practice of music therapy. Magee and Burland<sup>16</sup> explored how music therapists use EMTs in clinical practice, focusing on the use of input devices that triggered a musical instrument digital interface (MIDI). The data from the interviews illuminated indications and counterindications for the use of EMTs in individuals with complex needs. Magee and Burland<sup>17</sup> continued this line of research, finding music therapist employ EMTs to facilitate active music making and to increase the individual's ability to express musically and listing further indications and counterindications.

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**Table 1.** Developmental Considerations for EMTs Interventions

Age	EMTs Device
0-21	MP3 players
2-21	Recording live music
3-10	QChord
4-12	DJX-II Scratch Mixer Box
4-21	GarageBand, iMovie, and iDVD
6-21	Music-based video games
2-21	iPod Touch Apps
2-12	TouchXylo, Virtuoso, Drum Kit, Cat Piano, Drum Pad, Bongo Lite
4-21	Tone Pad, Melodica
6-10	MixMeister Scratch
6-21	Guitar Toolkit, Simon EVO Lite, Soundrop
12-21	GrooveMaker, DJ Mix Tour, Rock Band, Dance Dance Revolution, NLog Synth, Rhythm Racer

Although there are some similarities within the populations served by the music therapists surveyed by Magee and Burland, these indications and counterindications are not fully applicable to pediatric medical settings. The need for guidelines for the use of EMTs in pediatric medical music therapy still exists.

At Shriners Hospitals for Children-Boston (SHC-Boston, Massachusetts), a pediatric burn hospital, music therapy is employed with patients in managing pain and anxiety, encouraging self-expression, attaining physical goals, facilitating adaptive coping strategies, and enhancing social development, as well as other areas. Electronic music technologies may be used in conjunction with traditional music therapy methods, augmenting the potential for the intervention and meeting patients' complex needs. They are integrated into the preexisting practice, used with both acoustic and electronic instruments. The EMTs that are currently in use include Apple computer music software, MP3 players, electronic instruments, music-based video games, and music application (apps; see note 1) on an iPod touch (see note 2) by Apple. The iPod touch combines access to an ever-expanding database of music-based apps with the ease of portable size and a touch screen.

When using EMTs with children, music therapists must take into account the patient's developmental stage. The developmental stage can impact the child's ability to manipulate the technology device. Coordination, ability to concentrate on a task for an extended period of time, ability to do multistep tasks, hand-eye coordination, ease of successful music production, and dexterity are a few developmental considerations that the music therapists use as they choose interventions with EMTs. The authors also considered the content of words, images, and sounds as they make clinical decisions about different EMTs. Table 1 delineates the appropriate developmental age for the different software, electronic instruments, music-based video games, and apps.

A child's hospitalization is likely to have a profound impact on typical development. Children who have experienced prolonged illness often suffer delays or regression. Gerik<sup>18</sup> states hospitalized children may simply be too ill to practice necessary developmental skills. In conjunction, hospitalization often

has a negative impact on coping. While traditional music therapy is certainly of benefit in addressing developmental deficits and building positive coping skills, the use of EMTs can help work toward such goals.

The use of EMTs may increase the accessibility and appeal of music therapy interventions among certain age groups. For example, with some assistance from the therapist, very young children are capable of creating complete songs of their own using pre-recorded loops (see note 3). This gives them a sense of mastery and empowerment in an environment in which they may often feel helpless. On the opposite end of the spectrum, teens often use preferred music as a means of resonating with their own identity. Hallam<sup>19</sup> found adolescents who had a relationship with music might be more self-aware, emotionally attuned, and socially effective. In the context of hospitalization, teens may be able to learn positive coping/pain management through the use of various EMTs.

As the music therapy program at SHC-Boston began to integrate EMTs into the preexisting practice, the authors explored the different therapeutic applications for these devices. When reflecting on the use of EMTs, the authors noted 3 global treatment foci: pain management, psychosocial, and physical. The music therapists have developed the following guidelines for using EMTs.

## Pain Management

One frequent focus of treatment in medical music therapy is pain management. Similar to traditional music therapy, EMTs can be an effective tool in the reduction of pain. Like traditional interventions, there are times when EMTs are either indicated or counterindicated.

A frequent intervention music therapists employ to address mild-to-moderate pain is to provide the patient's preferred music to listen to in her or his room. Music therapists teach the patient how to independently use music to reduce pain. As technology has advanced, a transition to MP3 players from CDs is a relatively simple way for music therapists to introduce EMTs to their program. Loading specific music onto MP3 players is more time efficient and cost effective than burning specialized CDs for each patient. Additionally, even MP3 players with the smallest amount of memory can allow the music therapist to provide the patient with a larger selection of music as well as greater freedom to change the music selection. One feature to consider is the presence of speakers on the player. If a patient has had surgery, injury, or illness that affects the ears or the head, wearing headphones or ear buds may not be an option. Speakers allow even the youngest of patients to use MP3 players including toddlers and babies. Although the sound quality from the small MP3 player speakers is not the highest quality, it is suitable for music therapy interventions. Additionally, speakers allow the child to share her or his music with family members, a friend, or a roommate, thus decreasing the child's isolation. When choosing MP3 players, consider the radio features as it may be of benefit to the patient. The radio features allow the patient greater freedom to engage in music recreation

activities with her or his preferred music. Two drawbacks of using MP3 players are the need to recharge the MP3 player and that they can easily be lost due to their small size. Despite these drawbacks, MP3 players are well worth the financial investment as they have several advantages over using CDs.

Electronic music technologies can be effective in addressing mild-to-moderate pain. Music composing programs, such as GarageBand (see note 4), require focus from the patient to compose the song, which can reduce the amount of pain information to which the brain is attending. Similarly, music-based video games and music apps require focus on sensory information including sound, visual, tactile, and kinesthetic (especially in Wii games, see note 5). This focus on sensory information works within the pain management theory called the Neuromatrix Theory. The brain chooses to attend to sensory information rather than pain information.<sup>20</sup> Music-based games and apps need to be engaging and interesting enough to sustain the patient's attention. Playing electronic instruments such as the QChord (Suzuki Corporation, Santee, CA; see note 6), DJX-II Scratch Mixer Box (Yamaha, Buena Park, CA; see note 7), and keyboards can reduce pain perception in the same way. However, it is the music therapist's responsibility to use these interventions effectively. By modifying the parameters of the game, app, or instrument, the patient attends to the intervention, rather than focusing on the pain she or he is experiencing.

When a patient is experiencing pain that is moderate to severe, these active forms of EMTs are counterindicated. At these times, using traditional music therapy intervention of live preferred music is indicated. The music composing programs, music-based video games, music apps, and electronic instruments require a solitary focus. When a patient is experiencing moderate-to-severe pain, such as during a medical procedure, her or his ability to maintain this level of focus is affected. Without this focus, the intervention becomes unsuccessful and frustrating for the patient. This can negatively impact the emotional/affective pain she or he is experiencing. Additionally, EMTs often require the patient to play an active role in the music making. When a patient is in moderate-to-severe pain, she or he may not be able to actively participate in music making. Active or passive listening may be all she or he is able to successfully do. Traditional music therapy interventions such as live music listening are better suited for the needs of children experiencing acute pain.

At this time, traditional music therapy interventions are indicated. Similar to the EMTs interventions, traditional music therapy interventions send sensory input to the brain including sound, visual, tactile, and kinesthetic. The music therapist has full control over all music elements and can modify them immediately as dictated by the patient's needs or experiences. Electronic music technology interventions are not as flexible and require time to adjust to the ever-changing needs of a child in acute or severe pain especially if the music therapist is not well versed in using the EMTs. The severity and type of pain should always be considered when choosing between EMTs and traditional music therapy interventions for pain management.

## Psychosocial

Pediatric medical music therapists often address the psychosocial needs of the patients. Adding EMTs to music therapy practice has augmented the ways the authors are able to reach the needs of patients while incorporating the patient's preferred music and music activities. The psychosocial goals may address anxiety, self-expression, connecting to loved ones/friends, self-image, socialization, and termination.

### Anxiety

When children are hospitalized, many experience anxiety, especially when they are awaiting surgery and before and during procedures. Electronic music technologies add more tools that the music therapist can use to help children express their anxiety and channel it into a productive, positive experience. Depending on the developmental age and the music interests of the child, there are a variety of interventions available using EMTs. Younger children may express their anxiety physically through activity. When choosing traditional music therapy interventions, music therapists often employ interventions such as playing instruments, which channel this anxiety to a creative outlet. Similarly with EMTs, music therapists use devices that employ energetic music and have movement as a key feature to making music. The DJX-II Scratch Mixer Box and QChord are electronic devices that can give children an accessible and dynamic means of expressing their emotions. The DJX-II Scratch Mixer Box contains over 100 different songs with 10 different loops for any given song. It also has a scratch pad with over 70 different scratch sounds (see note 8). The patient can choose the loops (one theme, 5 variations on the theme, and 4 transitional phrases), scratch sound, tempo, and add different effects like wah-wah (see note 9), distortion, and phaser (see note 10). By pressing one button, the patient can create successfully a song and scratch to it. When using the DJX-II Scratch Mixer Box with a child who is experiencing greater amounts of anxiety or stress, the child will often choose the transitional phrases more than the theme or variations on the theme. These transitions contain more dissonance and remain unresolved and appear to musically symbolize the children's anxiety.

Todd, a 5-year-old, was awaiting surgery. He was very anxious and unable to focus for more than 2 minutes on any traditional music therapy intervention. The music therapist introduced the DJX-II Scratch Mixer Box and explained how to use it. Todd quickly made the choices for scratch sound and the melody. Within one minute, he switched to one of the transitional phrase loops. He kept it on the transitional phrase loop and scratched to it. The music therapist was playing with him. First, she modified the effects on the sound. He laughed at the modified sounds and said he liked it. She then changed from the transitional phrase loop to the main theme loop. Within 45 seconds, Todd expressed his anxiety via the transitional phrase for 5 minutes then changed it to a variation on the theme loop. Todd let that stay for one minute and then changed back to the transitional phrase loop. It can be concluded that music

elements contained within the transitional phrase loop along with the scratch sound expressed Todd's anxiety.

Teenagers will typically experience emotions including anxiety internally. Programs like GarageBand and apps like Groove Maker allow the teens to express their anxiety through composing songs. By choosing the different loops that reflect the teen's thoughts or emotions, the patient can create a song with or without words that shares how she or he is feeling. Depending on how long and complex the song is, patients can complete a composition and burn it to a CD within 10 to 45 minutes. The patient will have a concrete outcome from the session, which can help to boost the teen's feeling of mastery when in an environment where she or he has little control. Additionally, engaging in composing helps the teens to use or learn healthy coping strategies.

Arianna, a teenager from Canada, was nervously awaiting surgery. Recalling previous surgeries, she was focused on the pain she had previously experienced and was worried she would have lots of pain after this surgery as well. The music therapist used GarageBand with Arianna to write a song. Having traveled to the hospital by car with her mother, she chose to write a country song about traveling. Using acoustic guitar picking loops and a simple drum loop, she added the sound effect of cars driving by. As she worked on the song and added layers to the composition, she opened up first about her trip to the hospital and then about how worried she was for the surgery. Next, she started talking about the funny adventures they experienced on the way to the hospital. Through the completion of the composition and the therapeutic processing of the journey to the hospital, she became more relaxed and stated she was ready for surgery.

Waiting for surgery is a very anxiety-provoking situation for children and teens. At times, traditional music therapy interventions may not be successful. Turning to alternative interventions, like music-based video games and music apps that are similar to activities the patient regularly engages in, can be quite successful in reducing anxiety. First, the patient has preexisting associations with happy feelings when engaged in playing video games or apps. Next, these games employ visual, auditory, tactile, and kinesthetic sensory information, which can help the patient to focus on the game rather the room, medical equipment, and visual reminders of the upcoming surgery. Finally, the games can help the player to project herself or himself into the game temporarily leaving the stress and anxiety of the present preoperative situation, thus helping the patient to let go of the current worries.

Enrique, an 8-year-old boy from Dominican Republic, was very nervous prior to his surgery. The music therapist and his mother tried to get him engaged in conversation, listening to music, playing instruments, composing songs on GarageBand, and other interventions to no avail. He sat with his arms crossed, his body rigid, staring at the wall, and shaking his head no at every attempt to engage him. The music therapist pulled out the iPod touch and showed Enrique the different music apps and games. Enrique played with every app for 5 to 10 minutes each. As he did, his shoulders relaxed and he began to engage

in conversations with the music therapist about each app. When the surgical team came to take him to the operating room, Enrique smiled and thanked the music therapist as he returned the iPod touch. Even though the iPod touch apps were not the most interactive therapeutic tool, they allowed Enrique to focus on something other than his worries about surgery while opening the door for therapeutic support. His anxiety level visibly reduced and remained so as he went to the operating room.

When treating anxiety, technology devices that require intense focus or have delayed gratification may be counterindicated. When children and teens are under stress, their ability to cope with delayed gratification and frustration tolerance is limited. If the program requires too many steps or the game is too difficult, the patient may become frustrated and experience a sense of failure. Frustration and failure will increase the patient's anxiety level, thus negating any benefits of the music therapy session. It is important for the music therapist to quickly gauge how much frustration tolerance the child has and how much delayed gratification they can tolerate. Similarly, when patients are under stress, they may not be able to follow multistep processes in music or games. The music therapist needs to assess for the individual's ability to engage successfully in multistep interventions. If an intervention has been started and the patient is displaying frustration or is not able to focus on multiple steps, the music therapist needs to adapt the intervention to make it more successful or change to a different intervention. As with traditional music therapy methods, the music therapist needs to constantly assess the effectiveness of the intervention and modify or change it if the patient is too frustrated or unsuccessful.

Another counterindication for EMTs with a child or teenager in a hospital is active symptoms of acute stress disorder or posttraumatic stress disorder, hallucinations, delirium, and disorientation. The stimulus and content of EMTs can increase the likelihood of unexpected or adverse reactions when patients are in a dissociative state, altered states of consciousness, experiencing hallucinations, or disoriented. Traditional music therapy interventions are more flexible to respond to the patient's change in the moment. The music therapist has full control over content, music elements, tempo, volume, key, and length of songs. Additionally, traditional music therapy interventions provide human-to-human connection that is so vital in treating trauma and providing reality orientation. Electronic music technologies can be less flexible, create a barrier between the music therapist and the patient, and have elements that can be disorienting.

### *Self-Expression*

Often, a life-altering event has occurred to bring the child to a hospital. To facilitate adjustment to the changes in the child's life, music therapists turn toward providing opportunities to express thoughts and emotions through interventions that may include lyric analysis, improvisation, singing, or drumming, to name a few. Music-based technology interventions can facilitate the expression of emotions and thoughts. Electronic music

technologies allow the music therapist and patient to create music in the style of popular genres that may be difficult to impossible to produce on acoustic instruments such as rap, reggaeton, or techno. Using music programs like GarageBand, apps including GrooveMaker (see note 11), and instruments such as the DJX-II Scratch Mixer Box, the music therapists can provide opportunities for the patient to compose music by assembling loops, importing other songs or sections of songs, and/or recording her or his own music.

Pablo, a 13-year-old boy, came to the hospital from Mexico by himself as his family was unable to accompany him to the hospital. He presented with a flat affect and was disengaged in music therapy as well as with the other hospital staff. The music therapist brought in GarageBand and proposed writing a song. The patient first assembled loops to create a moderately paced song with acoustic guitar, piano, and drums. Once that was completed, he wrote lyrics to the song about his pueblo (town). While writing the song, recording it, and later listening to it, the patient opened up and talked about how much he missed his home, his family, and his friends.

### *Connecting to Loved Ones*

Being in the hospital environment, removed from the familiarity of their lives and homes, can have a very deep impact on a child. Children are often separated from other family members or beloved friends. Song-creating EMTs, like GarageBand and Groove Maker, as well as CD burning technology can be used in music therapy interventions to help the child connect to her or his loved one. The child can create a tangible gift of a song or a mix CD (see note 12) to be given to the individual. When using GarageBand and similar programs, the music therapist can modify the level of difficulty based on the child's developmental stage, physical ability, ability to focus, ability to communicate, and tolerance for frustration. Depending on assessment variables, these interventions can take place during one session or may be carried out over many sessions. The song writing programs are adaptable and the child can create a song using the loops within the program, record live music or lyrics, or import samples. Using CD burning technology, the music therapist can assist the child in creating a mix CD that contains the favorite songs of the loved one, songs the patient likes, or songs the patient chose for the loved one with a specific intention to share how she or he feels. The patient can also record personalized messages to the loved one that are included on the CD. If the patient is well enough, she or he can decorate the CD or CD case. These interventions can also address self-expression goals, mood modulation, fine motor skills, language and communication goals, pain management, and cognitive goals.

Hospitalization may prevent the patient and family from connecting to their family members in familiar ways. Illness or injury can prevent the patient from participating in basic tasks like card making or letter writing that children may traditionally use to express appreciation for all their caregivers do for them in times of illness or otherwise. Electronic music

technologies can assist the patient in connecting with their loved one and caregiver through accessible music therapy-based interventions.

Jorge, a 4-year-old boy from Puerto Rico, had been hospitalized for many months. Through that time, his mother was always at his side. One afternoon, at the regularly scheduled time, the music therapist met Jorge. He was quite upset and did not want to participate in music therapy. When asked, he stated it was his mother's birthday and he did not have a gift for her. The music therapist helped him to write a song using GarageBand. He chose one guitar loop, one piano loop, and 2 percussion loops. The music therapist then recorded Jorge saying "feliz cumpleaños" (happy birthday) and "te amo" (I love you). After mixing the 2 phrases with the loops Jorge chose, the music therapist provided Jorge with a copy of the CD to decorate and give to his mother. He smiled with pride as he presented it to her. His mother became teary as she received the gift at the end of the session.

Teenage years can be filled with self-consciousness and insecurity. If a teenager is also dealing with issues related to hospitalization or physical differences, direct traditional music therapy interventions like singing or playing instruments may not be successful or even welcomed into the session by the teen. These interventions may be seen as too socially threatening or just "uncool." By engaging teens in music-based video games, music therapists can address goals that focus on socialization, self-expression, and self-image. When using music-based video games with multiple players, the music therapist can adapt the intervention for individual sessions, dyads, or even groups. If working one-on-one with a teen using music-based video games, music therapists can play with the patient and engage in conversations about the game, thus building rapport. As the therapeutic relationship is established through cooperative playing, the music therapist can move the conversation toward the greater issues the teen is facing. While engaged in the game, sitting facing parallel toward the screen, a teen may be more able to open up and talk about what is troubling her or him than when sitting facing the music therapist. This emulates ways teenagers play and engage and can create an environment where the teen feels more comfortable sharing.

John, a 15-year old from New York, was sitting alone in the playroom. The music therapist was aware of how John was bullied at school. She approached him and asked whether he wanted to play Rock Band (see note 13). John agreed and chose to play the drums, while the music therapist played the guitar. After completing the first song, the music therapist began to talk with John about the game. John was reluctant at first to talk but as the next song completed, he began to engage in the conversation. The music therapist played with John for 45 minutes and as the session progressed, he was able to talk about how he felt at school. As the session ended, the music therapist proposed meeting the next day to write a song about his experiences. John smiled and agreed to meet.

If the goal is to help the teenager socialize with peers, again using music-based video games that are cooperative and inclusive is a useful music therapy intervention. During the game, if

needed, the music therapist can facilitate the conversation between the teens to focus on the socialization goals. Playing games together like this is a normative activity as well as a way to create bonds between patients.

### *Self-Image*

Electronic music technologies offer ways for a patient to create music within a few moments without any formal music education. In addition, the music may sound more like the music she or he listens to as compared to traditional acoustic music therapy. Creating a song through assembling loops and then recording it to a CD gives the child a tangible outcome for their work in the session that they can listen to or share with others. Children and teens are often very excited to emulate their favorite musician and to have recorded a CD.

Josie was an 8-year-old from Massachusetts. Her dad was a heavy metal musician. When she first started receiving music therapy, she was anxious and disengaged. However, she expressed an interest in playing a heavy metal song. The music therapy intern brought in an electric guitar tuned to a D chord. This tuning allowed Josie to strum the guitar and have a successful music experience immediately. Josie strummed the guitar and began to sing lyrics that the music therapy intern transcribed. Next, using GarageBand, the music therapy intern recorded Josie singing the song while playing the electric guitar. Finally, the music therapy intern recorded the song to a CD, which Josie proudly played for her dad when he next visited. Josie expressed how excited she was to be a rock star like her dad. Her self-image switched from feeling disempowered to feeling successful and powerful.

By employing EMTs, music therapists have a broader range of tools to address the self-image needs of pediatric patients. Many of the children the authors work with have visible scars and some have significant, visible disfigurement. By creating songs that address the issues associated with changes in physical appearance, the child can reflect on her or his process of accepting who she or he is now after the accident/surgery.

### *Transitions and Terminations*

Terminations, especially after a long hospitalization, can be difficult for children. Saying good-bye to the staff members who have cared for the child through some of the most difficult days of the child's life can be overwhelming. Music-based technology interventions can offer children ways to say good-bye to many staff members and give them a gift of the song.

George, a 4-year-old from the Tennessee, had been hospitalized for nearly 6 months. As his discharge date approached, he appeared more distracted and disengaged in his interactions with staff. The music therapist spoke with him about saying good-bye and how he could do it with a song. George was familiar with using GarageBand so he composed a song with a variety of loops he had used on previous compositions. The music therapist recorded George saying "See you later,

alligator, in a while crocodile" and "bye." He then chose to end the song with the sound effect of a plane taking off (which was the way he was returning home). George was specific, listing whom he wanted to give copies of the song to. The music therapist copied the CD and helped him distribute it. George was able to say good-bye to the staff to whom he felt close and give them a gift of his appreciation.

Similarly, Jeff, a 12-year-old from Connecticut, was being discharged after a long hospital stay. Throughout his admission, Jeff struggled with depression and was not fully invested in his recovery and rehabilitation. During the final interdisciplinary team discharge planning meeting, many members of the team expressed concern about the challenges Jeff would face when he returned home where he would not have the near constant support of the team members. The music therapist met individually with all the team members (including nurses, physical and occupational therapists, school teachers, recreation therapists, and child life specialists) and using GarageBand, recorded supportive messages for Jeff. Mixing the messages with different pre-composed music selections on GarageBand and connecting each section with knock-knock jokes (Jeff's favorite), the music therapist composed a 10-minute song filled with the staffs' encouragement and support for Jeff to use when he felt sad or alone at home. This strength-based interdisciplinary intervention helped him with a difficult phase of his care by giving him a concrete transitional therapeutic tool to use when he went home to remind him of the support of the staff. Additionally, this EMTs intervention gave closure to the staff members who had invested so much in his care at the hospital.

### **Physical**

The final global treatment focus is gross and fine motor goals using interventions that employ EMTs. Music-based video games, music apps, and electronic instruments offer a variety of normative and motivating ways to facilitate controlled motor movement.

Video games that simulate playing instruments offer many options for fine and gross motor movement as well as hand-eye coordination, sequencing, and synchronized movement. For example, playing the simulated guitar or bass addresses wrist flexion, fine motor movement, hand-eye coordination, sequencing, and synchronized movement. Similarly, the drums address grasp, wrist and elbow movement, ankle flexion, endurance, hand-eye-foot coordination, sequencing, and synchronized movements. Singing into a microphone for these games can address grasp, elbow flexion, endurance, oral motor function, and pulmonary function.

Janice was a 17-year-old teen with limited function in her hands and arms due to the severity of her injury. She had limited motivation to play traditional instruments or engage in traditional occupational and physical therapy activities. The physical and occupational therapists and the music therapist discussed exploring new ways to motivate her to use her hands

and arms. The music therapist proposed using a Rock Band drum to motivate Janice to work on her grasp and extending her arms. Janice expressed feeling excited to play Rock Band again. She needed adaptations to play the drums including wrapping coban, a self-adherent, elasticized wrap, around the drum sticks to increase the diameter so she could successfully grasp it. The occupational therapist assisted by playing the bass drum. Janice used her hands to play the drums for a greater amount of time than when she engaged in traditional exercises or music therapy interventions in previous sessions. Additionally, the cooperative nature of the game facilitated a team feeling between Janice and her therapists, which extended beyond the sessions using Rock Band.

Wii games, including Samba de Amigo and Wii Music, provide opportunities for music therapists to use music-based games to address physical goals as well. These games often require the player to shake, point, or extend their arms while holding the controller. These actions can address grasp, gross motor movements in the wrist, elbow, and shoulder, sequencing, hand-eye coordination, endurance, and synchronized movement. The games are adaptable to the patient's current physical functioning as each can be played sitting, lying, or standing. If the patient stands for the game, the music therapist can also address goals of endurance for standing, balance, and strength building in the legs. By adding the Riiflex dumbbells, a dumbbell sheath that fits over the Wii remote and adds 2 pounds to the remote, the patient can work on endurance and strength while engaging in music-based video games. These games have some flexibility for meeting different abilities through adaptive ways to grasp the remotes, hand over hand assistance, or splitting the remotes between the patient and the music therapist.

Dance games are an excellent game used to work lower extremity function. The games allow the music therapist to address gross motor leg function, balance, sequencing, strength building, and endurance. Unfortunately, many of these games are not easily adapted to limited leg function or slow motor planning.

Music apps, on devices like the iPod touch or iPad (see note 14), offer new ways to work with patients on hand fine motor skills, sequencing, hand-eye coordination, and grasp. When a patient has limited strength, movement in her or his fingers, or is reluctant to move, these devices are great to provide motivation to engage in music play using her or his hands. The amount of movement and pressure needed to engage in an app is less than that needed for most electronic keyboards, thus providing a way to bring success and mastery to patients who have impaired function or decreased strength due to their injury, illness, or surgery.

Kathy, an 8-year-old child from Haiti, was deconditioned due to her long recovery from her injury as well as repeated complicating factors. Her hand, arm and core strength were greatly decreased, limiting her ability to engage in playing traditional music therapy instruments. For example, she was able to play the Chiquita maraca for 10 seconds before tiring,

which limited her ability to participate in active music making. The music therapist brought the iPod touch and used the TouchXylo app with Kathy. Kathy was able to hold the iPod touch and play the xylophone app for 5 minutes. Toward the end of the session, the patient's guardian came into the room. Kathy called her to the bedside, showed her guardian that she was playing this instrument, and smiled. Not only did the intervention focus on her fine motor skills and her endurance, the success and mastery the intervention enhanced her self-esteem.

Computer music programs can address fine motor skills and reluctance to use hands. Larry sustained an electrical burn to both hands that limited his ability to move his fingers. Despite vigorous rehabilitation in occupational therapy, Larry remained reluctant to use his hands for his activities of daily living. The music therapist was working with Larry using traditional music therapy interventions when he expressed an interest in writing a song. The music therapist taught Larry how to use GarageBand and then instructed him to use both his hands to manipulate the program. He was reluctant at first, asking for help, but as he explored the program, he was motivated to use both of his hands to create his song. By the end of the session, Larry was independently composing songs on GarageBand, with the music therapist offering guidance on the more advanced aspects of the program.

When working with hospitalized children and using EMTs, the music therapist needs to remain cognizant of the patient's limitations and adapt the changes in the patient's functioning through the course of treatment. Electronic music technologies are counterindicated when the patient is unable to succeed at the game or use the technology. The music therapist needs to balance the physical goals with the patient's frustration tolerance and the ability for the patient to succeed. If the skill-challenge gap is unequal, the patient will be less likely to engage in the intervention. Similarly, the music therapist needs to match EMTs to the patient's physical functioning ability. For example, if a patient is just starting to stand and walk, or has a severe balance problem, a dance video game is not the best intervention to use. Games that simulate playing music instruments require a certain amount of movement and flexibility in the wrist and hands. Wii games require a level of core and arm strength. If the patient is not able to physically perform the tasks, the game is another reminder of the patient's limited function.

## Conclusion

Electronic music technologies offer a myriad of ways to augment the music therapy services at pediatric hospitals. From pain management to psychosocial needs to physical functioning, music-based video games, music apps, music software, and electronic instruments bring dynamic and fun ways to help the patient attain her or his goals. As technology continues to progress and change, EMTs will present new ways for music

therapists to design interventions that target the patient's needs while building on her or his strengths.

With 22 combined years of clinical practice experience, the authors have developed these guidelines for medical music therapists. The guidelines that the authors set forth in this article are a starting place for the use of EMTs in music therapy interventions. It is the hope of the authors that as more medical music therapists contribute to this growing and developing aspect of music therapy practice, the indications and contraindications will become more refined.

The various fields continued within music technology are experiencing tremendous growth and development. As new technologies are developed and become available to music therapists, the authors hope to incorporate new EMTs that will continue to address the therapeutic needs of this population.

### Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

### Notes

1. App is short for application, or digital program that has one specific function.
2. iPod touch is designed by Apple and is a portable media player. Not only does it play media files, it also can run different apps (applications), which can include games.
3. A loop is a sample, a piece of a song or a recorded instrument that is repeated.
4. GarageBand is a music program made by Apple. The user can create music by assembling pre-recorded loops, recording instruments/voice/sounds, and/or importing loops from CDs.
5. Wii is a video game system made by Nintendo. Using handheld, wireless controllers, the games require movements that are similar to the action in the game.
6. The QChord, also known as an Omnichord, is an electronic auto-harp made by Suzuki with keyboard features including stylistic rhythms, different voices, a keyboard, and pre-recorded song cartridges.
7. The DJX-IIB is a MIDI (musical instrument digital interface) made by Yamaha that produces different rhythms and variations within that rhythm. The box also has a scratch pad, which allows the user to scratch to the music.
8. The scratch sound was originally created by repeatedly moving a record backward and forward quickly repeatedly.
9. The wah-wah is an effect that modifies the sound of an electric guitar or other instrument.
10. The phaser effect splits the audio signal, changes one of the two signals so they are periodically out of phase, causing the frequencies to cancel each other out, creating gaps in the sound.
11. GrooveMaker is an app for the iPhone, iPod touch, or iPad, as well as other smart phones that allows the user to create music by assembling loops.

12. A mix CD is a CD that is comprised of tracks from different artists, sometimes from different genres, chosen specifically for the intended listener.
13. Rock Band is a video game in which the users play the game with controllers that emulate a guitar, bass, drums, and microphone.
14. The iPad is a tablet computer designed by Apple that has a touch screen and utilizes the same operating system as an iPod touch or iPhone.

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