

**Music Technology and Music Therapy Practice: A Survey of Current Practice with
Recommendations for Future Research**

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Abstract

The purpose of this study was to learn what technology is currently being used by music therapists. The data was collected via a one-time online survey. The participants were 153 board-certified music therapists who use technology within clinical practice. Survey results were analyzed, revealing that the most common type of technology reported among respondents was Interactive Apps on iPads (n = 93). Survey results discuss technology use with music therapy methods. iPad (n = 93) and electrical instruments (n = 51) were the most commonly used technology among respondents. Respondents reported using GarageBand the most across all four music therapy methods with 15.28% of respondents using GarageBand for improvisation, 16.67% using it for recreative methods, 65.38% using GarageBand to compose, while 2.78% use it for receptive methods. The need for inclusion of technology in music therapy education as well as recommendations for future research are discussed.

Keywords: Music Therapy, Technology, Survey

Chapter One: Introduction

There is an increasing need for the use of technology in clinical music therapy practice. The use of technology in clinical practice allows individuals who may not be able to use traditional instruments or whose music preferences are related to electronically created beats and sounds to actively participate in creating music. Music technology applications have been developed for all aspects of music making and listening, including recording, composition, and learning. Technology in music has become more popular as the use of computers becomes more mainstream within the music industry. Instrument technology, such as electric pianos that can access over 100 different sounds using one instrument, as well as equipment for recording and composition, have seen a rise in popularity as well. The increased availability of music technology offers music therapists a variety of options to make music listening, composing, improvising, and creating accessible to clients. Whitehead-Pleaux and Spall (2014) explain, “Electronic music technologies have changed how music therapists listen to and store music, how it’s created and recorded, and how we define what a musical instrument is” (p. 133). As technology evolves, using it within clinical practice can change a music therapist’s approach. Therefore, the purpose of this study is to explore contemporary views of technology in music therapy clinical practice.

Music Therapy

Music therapy has been defined as “a reflexive process wherein the therapist helps the client to optimize the client’s health, using various facets of music experience and the relationships formed through them as the impetus for change” (Bruscia, 2014, p. 36). Music therapists engage their clients in both active and receptive music experiences. Active music

experiences involve the client in creating, improvising, or re-creating music vocally or instrumentally. Receptive experiences involve listening and responding to either live or pre-recorded music. Technology can assist clients in both active music making and listening. The increased accessibility of music listening devices as well as electronic instruments allows therapists and clients to more easily access genres of music or adapt instrument playing to facilitate ease of use for the client.

The American Music Therapy Association (AMTA) is responsible for setting educational standards which inform the music therapy curriculum. The AMTA offers two sets of competencies which educators use to develop coursework and assignments: the Professional Competencies guide the development of the bachelor degree curriculum, and the Advanced Competencies guide the masters and degree curriculum. However, in these competencies the term *technology* is not defined or elaborated for students to properly understand the usage and value of technology in their music therapy practice. Both these documents include competencies related to music technology that educators must incorporate into the curriculum (See Table 1 and Table 2).

Table 1

AMTA Professional Competencies

(10.6) Use of current technologies in music therapy assessment, treatment, evaluation, and termination.

(13.14) Maintain a working knowledge of new technologies and implement as needed to support client progress towards treatment goals and objectives.

Table 2*AMTA Advanced Competencies*

(5.2) Utilize current educational resources in music therapy (e.g., equipment, audio-visual aids, materials, technology).

(8.9) Identify new applications of technology or develop new technologies for use in music therapy practice.

Music Technology

There is not an official definition for music technology in music therapy. A survey of the literature offers two options. Hadley et al. (2014) define the use of music technology in clinical practice as “the activation of, playing of, amplification of, recording of, and transcription of music through electronic/digital means” (p. 26). Crowe and Rio (2004) broadly define technology in music therapy clinical practice as “any equipment, devise [sic], or method that systematically fosters independent functioning, including the production of or response to music, is used for music therapy practice, research, and education” (p. 288). The definitions differ in terms of focus. The first focuses on the output, meaning the actual music product, whereas the second focuses on the hardware. However, it is important to note that electronic and digital music devices have expanded greatly since both of these definitions were published. To understand current technology’s role in music and clinical practice, it is helpful to look at the beginnings of the hardware and its various uses.

Electronic music began in the 1900s after a boom of instrument inventions inspired by World War II (Pinch & Trocco, 2002, foreword). Music listening technology evolved from phonographs, through various iterations such as and vinyl records, cassette tapes, and CDs to the current use of MP3s. The ways in which music is consumed evolved with changes in music recording. Recording technology took off with the invention of magnetic audio tape in the 1940s.

Magnetic audio tape allowed for the recording of sounds and subsequent modification of tape that created the early electronic music termed *Musique Concrète*, in France, Germany, and Japan (Holmes & Pender, 2012). The manipulation of magnetic audio tape transformed as musicians explored new ways of making music, eventually bringing synthesizers to the foreground of music technology by 1964 with the introduction of Moog synthesizers (*120 Years of Electronic Music*, n.d.). Moog and other competitor's synthesizers drastically changed the music being heard around the world. The use of electronics continued to gain prevalence throughout the 1970s as the commercial accessibility of recording technology increased, changing the ways in which musicians had access to use synthesizers, drum machines, and turntables in the creation and reproduction of their music. These electronic music styles were now able to be recreated in people's homes, no longer needing access to a studio or lab. Music charts reflected this change with the emergence of disco, synth-pop, hip-hop, and trance music. In the mid 1980s, the emergence of musical instrument digital interface (MIDI) changed the way musicians created and recorded sounds. Recording and playback technology has evolved through many popular iterations, including phonographs, reel to reels, vinyl, digital audio tapes (DATs), and compact discs (CDs) (Holmes & Pender, 2012).

One important electronic music composer, Pauline Oliveros, made a significant contribution to music technology with the creation of the application AUMI, short for Adaptive Use Musical Instrument. Throughout her life, Oliveros was a musician who embraced the eccentric sides of music. She started in childhood on the accordion and moved to tape music using found sounds in her environment which she recorded (Pinch & Trocco, 2002). Eventually she became the director at the Tapes Center in San Francisco, where there was a concentration of electronic musicians looking to push boundaries in their music. Known for her creative use of

oscillators, Oliveros carved a niche for herself in electronic music. The years spent within the electronic music community pushing boundaries reflects in the AUMI instrument design with its customizable features that help make music-making more accessible for individuals.

The use of personal computers, which included word processing capabilities, in clinical music therapy was first reported in 1988 by Krout and Mason. The availability of word processing aided in documentation and other record-keeping. Music therapists have been using computers for data storage since the 1980s, e.g., to store electronic records (Krout & Mason, 1988). Krout and Mason discuss the use of computers, rhythm machines, and music composition software, exploring methods of use within clinical practice, including client exploration. This process involves the music therapist to demonstrate using the technology, modeling with the technology, encouraging client performance, returning to modeling, the client providing feedback on use, and data collection on the experience (p. 115). This model can be easily taught within music therapy education programs to introduce music therapy students to ways of incorporating technology into their clinical practice. Additionally, Krout and Mason noted the use of drum machines, computers, and software, allowed for their clients to explore various facets of the music experience, such as notation, rhythm, harmony, melody, and various instruments (p. 118).

The ease and accessibility of recording technology as well as playback technology has dramatically increased over time. For example, with the advent of smart phones music therapists have more sophisticated music recording and playback options readily available. Music therapists are now able to carry a handheld device that can include streaming services, instrument applications, and production software like GarageBand, a digital interface for music

creation and recording. Increased accessibility however does not mean that music therapists are competent and confident in using the technology in clinical settings.

The literature on the use of technology in music therapy clinical practice is limited, but growing. As noted above, Krout and Mason (1988) wrote one of the earliest articles on the use of computers in music therapy clinical practice. *Music Therapy Perspectives* reported on the use of and advances in technology for music therapy clinical practice in a recurring column “*Integrating Technology*” which subsequently ran from 1990-1997. “*Integrating Technology*” recounts Krout’s experiences using various types of technology, as well as clinical implications and contraindications that could impact the therapeutic process. Recently, the AMTA developed an online library of resources to help music therapists incorporate technology into their clinical practice (see https://www.musictherapy.org/new_benefit_for_members_amta_tech_stop/.) Technological advances will require music therapists to increase their knowledge of and ability to use both electronic devices and the accompanying software programs. Attitudes and beliefs towards technology are constantly evolving, and technology’s relevance is dictated by the time period in which it is being used.

Krout (2014) and his colleagues have categorized ways they use technology within their practice. The list breaks down technology into five categories: 1) music-making/creating devices; 2) software for composition, arranging, notation, improvisation, and sequencing; 3) music recording devices; 4) music listening devices; and 5) additional technology. Categories are organized in a simple manner and definitions are concise but broad enough to allow new technology to fit within their categorization. This breakdown of use will assist the music therapist in determining when it is most appropriate to use each type of technology. When clear intentions are set, music therapists can connect the use of technology and clinical goals

seamlessly into their clinical practice. An additional benefit of this classification system is that educators and clinical supervisors will have guidance on ways technology can be incorporated into clinical practice. Table 3 describes the various categories describing the use of software and hardware are used in music therapy clinical practice.

Table 3

Categorization of Technology within Clinical Practice from Krout (2014)

Music-Making/Creating Devices: electronic keyboards, drum/rhythm machines, devices used with computer/other MIDI controllers (including assistive devices via MIDI), single-use switches with MIDI, iPads

Software for Composition, Arranging, Notation, Improvisation, and Sequencing: music composition, arranging, and notation software, and music improvisation and sequencing software

Music Recording Devices: recording devices that store sounds internally, recording devices that store sounds externally, computers

Music Listening Devices: iPods and other digital music listening devices

Additional Technology: Game-oriented systems, music learning software, CD/DVD-ROMs

Chapter Two: Review of Literature

Crowe and Rio (2004) investigated the use of technology in music therapy clinical practice by reviewing the published literature and surveying music therapy educators and clinical training directors. Several findings from their study seem to be significant for consideration. First, they noted the articles reviewed were published from the mid 1980s to the mid 1990s. Their results indicated that music therapy education related to clinical applications of technology was not keeping up with current practice. The results of their research suggest that the use of technology was a growing aspect of clinical practice at that time, but may not have been fully embraced in music therapy training.

When broadly defined, technology can be applied to various aspects of music therapy, including practice, research, or education (Crowe & Rio, 2004). The use of technology allows music therapists to facilitate clinical goals in a variety of areas as well. As an example, Crowe and Rio identified six different categories of technology used in music therapy practice: adapted musical instruments, recording technology, electric/electronic music instruments, computer applications, medical technology, assistive technology, and healing practices (p. 291). Categories were delineated by the unique purpose technology serves in music therapy practice.

Cevasco and Hong (2011) compared the use of technology in clinical practice between board-certified music therapists and music therapy students in their clinical fieldwork. Board certified music therapists (MT-BCs) and music therapy students and interns from all seven regions of the AMTA responded to the survey. MT-BCs reported a greater use of computers for clinical application compared to the students. Yet, both groups reported using their computers in similar manners: for internet access, word processing, CD burning, emailing, and music/storage listening. Students reported having greater access to recording equipment and software. The

overall results of the survey suggest that students had greater accessibility to technology compared to MT-BCs, however they are not using the technology in their sessions as much as the MT-BCs. Cevalasco and Hong suggest that students may not have had the understanding and competency of how to incorporate technology within clinical applications, or they are in the process of maturing clinically and currently acquiring the skills for technology use (p. 71). Finally, connections between how the groups use technology in clinical practice establish evidence for the inclusion of technology training in music therapy education.

Further, Crowe and Rio (2004) asserted that music therapy educators were not incorporating coursework related to the use of technology in clinical practice due to their inexperience or unfamiliarity. This can contribute to a lack of or even fear of use of technology among students when going into clinical training. Additionally, technology is rapidly evolving, making it difficult for educators to incorporate current applications of technology into the curriculum. One suggestion offered by Crowe and Rio (2004) to aid music therapists and music therapy students with technology is to create consistent guidelines for technology in music therapy educational programs (p. 305). This was later supported by Cevalasco and Hong (2011) in their recommendation to increase the technology used in music therapy education programs to better prepare students for their future in clinical practice (p.72).

Magee (2006) surveyed British music therapists to learn about their use of and attitudes about the use of electronic technologies in clinical music therapy practice. Results indicated music therapist's attitudes toward music technology in clinical practice are based on physical ability and need for adaptive technology (p. 143). Respondents also indicated reasons for not using technology, including: lack of training and skill, technology conflicting with therapeutic process, and client lacking skills that would indicate use of technology (p. 142). Respondents

also indicated that they were not aware of what technology may provide clients. Magee concluded that music therapists need more education on how to incorporate technology into clinical practice to meet therapeutic needs. Therefore the music therapy curriculum should include coursework related to electronic music making hardware and software. Professional music therapy clinicians are using technology for various purposes, whether it be to create, record, or playback music. Thus, they should have a basic knowledge of how to use technology all available when entering the workforce.

Werger et al. (2020) completed a narrative review of the published literature on the use of electronic instruments, software, recording devices, and other electronic devices for receptive or active music. Results suggest that product and process of technology played a role in achieving goals within the therapeutic process (p. 76). The technology in sessions added a supportive quality to the therapeutic process. As the authors processed their experience using technology in their practice they noticed that despite humans interacting with digital devices on an everyday basis, “the integration of such devices into a therapeutic process is still far from intuitive” (p. 74). Werger et al. (2020) findings suggest that collaborations with an interdisciplinary team of professional aids will increase music therapists’ comfort level when using technology is indicated (p.75).

Crooke (2018) analyzed the use of technology in music therapy with special attention to how beatmaking traditions impact music therapy clinical practice. Crooke recommended using a client’s preferred music aesthetic and the technology that creates those sounds when appropriate and clinically indicated. If the client’s preferred music genres include technology use, the aesthetic experience would be lacking if only explored through acoustic instruments within sessions. Crooke and McFerran (2019) noted this technology has not been incorporated into

music therapy education. They are the first to outline the beat-making process within clinical context.

As noted in the literature reviewed thus far, music therapists are incorporating technology in their clinical practice at varying levels. There is a need for more information on how people are using technology to help those now interested in including technology into their practice but are unsure how. There is a need to address this technology knowledge gap more thoroughly within education programs.

Clinical Applications of CDs

Pre-recorded music can be accessed using streaming services on a computer, iPad, or MP3. CDs are frequently used as a means of extending opportunities to use music and music related coping skills outside of the clinical setting. Current literature shows that pre-recorded music can be used across populations. Clients are often given pre-recorded music on CDs by their music therapist. As an example, Batt-Rawden et al. (2005) provided clients with music as a coping tool. One participant expressed in an interview she found the CDs to be empowering, the music listening forced her to create time for herself, allowing her to relax and create a relaxation routine (Batt-Rawden et al., 2005, p.132). Music listening allowed for the meaningful associations that the listeners make, developing meaning making and memory.

Sadnovik (2014) created CDs with clients consisting of the music created during the treatment process. Sadnovik used the process of guided decision-making to create CDs as a means for creating connection between the therapist and clients. The CDs were a meaningful and carefully crafted product that the clients could later use as a transitional object within the therapeutic context, as well as a means of communication with family and friends.

Kulkarni et al. (2012) used CDs and headphones during medical procedures. In a research study, the group of participants who listened to music on CDs during their procedures needed significantly smaller doses of sedation, as well as significantly smaller doses for analgesics compared to the control group who did not listen to music. Fewer people in the music group required sedation compared to the control group (p. 1061).

Clinical Applications of MIDI

Musical Instrument Digital Interfaces (MIDI) are devices that connect music software to electronic devices that can be used as instruments. MIDI set-ups typically involve a computer with MIDI software downloaded, five-pin MIDI to USB cables, and the MIDI device (Krout, 2014). MIDI controllers have the ability to trigger MIDI data from other connected devices that can give the musician freedom to explore non-traditional sounds. Switches can be connected to MIDI devices as well and can be used to increase accessibility of mainstream instruments.

Clinical Applications of Recording Studios

Recording technology is the means by which music therapists can bring recording practices commonly used in the music industry to clinical practice. One commonly used program is GarageBand. Street (2014) described the use of GarageBand for recording and composition. Recording technology can include a laptop with GarageBand and any instruments or equipment necessary for the song being recorded. Street found that using GarageBand facilitated a wider range of possibilities during composition and recording, allowing for the use of multicultural instrument sounds into the session. Technology also made these instruments more easily accessible through MIDI trigger, so the therapist or client did not have to be technically skilled on these instruments. The use of electronics can help address issues of cultural identity and self-constructs within the session (Street, 2014 p. 221).

Street (2014) and Sadnovik (2014) both discussed the importance of having access to a recording studio set up in their clinical practice. Sadnovik was working in Brooklyn, NY, and recognized the large role that culture played within the program, as well as how these diverse cultures called for technology, including a studio set up that was similar to a traditional rapper's environment. Thus, Sadnovik implemented technology within clinical practice to address cultural needs of the clients within sessions. The idea of working toward a product in a studio setting motivated clients (Sadnovik, 2014 p. 256). GarageBand allowed the clients and therapist to create loops using samples and live recordings which opened new doors for musical expression within the sessions. Using GarageBand also allowed for the recording process to be more user-friendly, providing more clients with new roles to fill using the recording technology within the therapeutic context. Sadnovik (2014) found an additional use for recording technology with clients with speech deficits to transform the recording process to meet their speech and language needs. Making an activity that could traditionally be perceived as out of reach accessible helped increase clients' self-esteem and self-awareness.

Sadnovik (2014) identified three purposes for including a recording studio within clinical music therapy practice. First, process-oriented recording typically records the entire session. The client is aware of the recording and the recordings are then used as a resource for their client and themselves to review. The second type of recording identified is product-oriented recording. Product-oriented recording involves the client and therapist working together to channel creative expression into "an aesthetic work of art" (p. 250). Recordings fuel therapeutic goals and create an art-driven focus within the sessions. Recordings are reviewed within the session to enhance self-esteem and self-awareness. The third reason for using recording technology within a session

is to create a CD or end product that the client can use as a transitional object out of the therapeutic context.

Beat-making

As beat-making becomes more mainstream within music culture and the use of beat-making equipment becoming more easily available, the use of beats and beat-making has become more relevant within music therapy clinical practice. Crooke and McFerran (2019) outlined the process of working with music therapy graduate students creating beats to see how to streamline the process for clinical use. The therapist identified preparation and management of beats and styles as an important aspect of the process. Crooke and McFerran identified several challenges of using technology in clinical practice. One challenge identified was the significant set up time it took to facilitate such musical experiences, not only physically arranging the technology but also preparing the clients to improvise on instruments and transition to the electronic music technology. Technical glitches were experienced throughout the process and were aided by clinician proficiency with the equipment (p. 60). Attention to users or clients was cited as a challenge within the therapeutic context of using electronic music equipment in a group setting. In reference to the improvisational approach, “This reduced interaction often resulted in long solo improvisations that needed to be facilitated independently of other group members” (p. 61). The reduced interaction would pose a challenge in the music therapy group setting: “Therefore, this procedure either occurred in sessions when only one participant was present or required one of us to engage the other participants in alternative activities” (p. 61). Dedication of time to learning equipment, confusing or non-intuitive programming, and facilitator or multiple facilitators appeared to be common themes and challenges among the multiple explorations of beat-making procedures. Overall, beat-making using electronic music

technology can benefit clients if the therapist is comfortable and knowledgeable facilitating therapy using the equipment.

Looping Technology

Magee (2014) emphasized the use of looping technology, an essential aspect of beat-making technology, to keep a steady rhythm, freeing the music therapist from the “holding” role in the music, thus allowing them to be in the present musical moment with their clients (p. 91). With this freedom from the “holding” role in the music, there is more opportunity for the client and therapist to connect within the musical structure, and the therapist is better able to meet emergent clinical needs.

Viega (2018) identified three purposes for using beat-making technology within clinical practice. The first purpose is identifying sonic metaphors that help clients express themselves fully in the songwriting experience: “a songwriter might present as timid when approaching the microphone, and reverberation (sonic space) might be used as a container so that one’s voice can emerge safely” (p. 152). The second reason identified was to explore the full extent of the aesthetic experience in which the client is engaging. The use of electronic instruments allows the client to explore aesthetics that could not be fully realized through the use of acoustic instruments. The third reason identified is to explore cultural narratives that are embedded in the process of the use of technology within sessions.

Clinical Applications of iPad

Krout (2014) explored the use of iPads and applications with young people with Autism Spectrum Disorder (ASD). He saw that there were clients he worked with who would not respond to traditional instruments but were “fascinated and drawn to the iPad” (p. 182). Additionally, he found the iPad to be “extremely intuitive to use” (p. 183) within clinical

practice. Krout noted the screen serves two purposes, one being the input device that the client interacts with, and the other being a visual display screen to ease communication deficits, encouraging communication between the client and therapist. The true power Krout found in the iPad was the versatility due to the functionality of the applications as well as the large number of them. The large selection of applications allows the therapist to individualize iPad use with each client. Another important facet of the iPad and apps is that the software is constantly evolving, and unlike other electronic instruments, applications have a relatively low cost. Once purchased, the software can be updated for free and continued to be used on the same hardware, saving the therapist money and allowing for an easier time in keeping their technology up to date.

Engelbrecht and Shoemark (2015) researched the feasibility of using iPads with older adults. They compared two older adult music therapy groups, one using traditional instruments and the other using iPads. There were some similarities and some differences between the groups. The theme of learning was emphasized in both groups based on an analysis of participant journals. Both groups engaged in the learning process whether it be with instruments or technology. Further, they identified with the process of learning a new instrument when reflecting on their experiences. Findings show older adults can successfully use technology in music therapy sessions if they are willing and able. Both groups in the study exhibited themes of well-being, where music developed a sense of cohesion and group identity, as well as the group members experiencing increased confidence, a sense of achievement and mastery. The authors found all of the participants in the study expressed desire to work with iPads. This indicates that the use of iPads with older adults can be as successful as traditional musical instruments in therapeutic contexts.

Whitehead-Pleaux and Spall (2014) used iPads and various electronic instrumental applications (e.g., Bebot-a singing robot; Dub Selector-a loop based app), editing applications (e.g., GrooveMaker, ZOOZbeat, and Garageband), and recording applications (Songify) in their work with pediatric patients on a burn unit. iPad applications were used to address various clinical goals within physical, emotional, cognitive, communicative, and spiritual domains (p. 137). Whitehead-Pleaux and Spall noted the ability of technology to more fully address patient needs than traditional acoustic instruments.

Adaptive Use Musical Instrument

The Adaptive Use Musical Instrument (AUMI) is a free application for Apple products. The AUMI, created by Leaf Miller and Pauline Oliveros, is a software program that can turn any hardware into a software instrument. Dvorak and Boresow (2019) studied the use of the AUMI with adolescents with various diagnoses. As they studied how people interacted with the application, they found that features of the AUMI that allowed for connection within the session. For one client, the lock screen feature was important. This allowed the therapist to prevent the client from changing the screen while engaging with the sounds using an iPad which enhanced the music therapy session. Another client began reading the application menu choices aloud as he was exploring the AUMI. This confirmed that he was able to read, which doctors had previously thought but were unable to confirm. This client's immersive experience with the AUMI increased his concentration and opened up new possibilities for him (p. 4).

Soundbeam and Somatron

The Soundbeam as an adaptive instrument with MIDI technology, which makes creating music further accessible for individuals with severe disabilities. When using an adaptive instrument like the Soundbeam, physical movements are tracked using sensors. These sensors are

able to follow the movements and assign parameters to them. For example, the sensors can monitor an individual's hand moving up or down, forward or backward, and the velocity of the individual's movements. Sensors are programmed to trigger the MIDI Instrument and change according to the hand movements. The Soundbeam device can connect to a variety of switches to allow triggering to be accessible and individualized for each client. Movements can control or modify volume, timbre, and pitch. This is all without touching an instrument. Four sensors and eight switches can be connected at once, which makes this technology ideal for individual or group use. Lindeck (2014) used the Soundbeam in adolescent hospice and describes using the instrument with individuals with profound physical disabilities. The Soundbeam appropriately amplified small fine motor movements with enhanced musicality acoustic instruments could not achieve.

Clark et al. (2015) described using the Soundbeam during music therapy sessions to allow individuals with physical disabilities to independently create music (p. 28). Additionally, Clark et al. (2015) used the somatron, a machine which converts music into tactile information via a mat, chair, or other surface. The somatron was used to decrease pain, anxiety, and muscle tension (p. 23).

MIDI with Specific Populations

Chong et al. (2014) collected data on various aspects of the hand function while playing keyboard in adolescents with brain damage. The researchers studied hand rehabilitation with adolescents with brain damage. The researchers used a MIDI keyboard, a MIDI interface, and a program that analyzed MIDI sequencing to collect data including pressing force. Participants were also given grip and pinch tests by certified occupational therapists to check the validity of

pressing force data. The use of technology allowed the researchers to collect data which could be used to describe how instrument playing can restore or improve hand function.

Studying the impact of technology with an individual in a minimally conscious state, Lancioni et al. (2012) studied the use of switch technology with a 53 year old woman in an emerging phase post coma. Researchers sought to facilitate alertness, promote arousal, and reduce withdrawal and sensory deprivation using switch technology. Responses showed development of some level of adaptive engagement. Findings showed that use of switch technology complimented physical rehabilitation. Using a microswitch, researchers were able to track small movements of music engagement using touchpad technology. The ability to track learned engagement through touchpad technology is significant, allowing for further insight tracking the rehabilitation progress within sessions and across sessions.

Garageband with Specific Populations

The Apple application GarageBand has streamlined the recording process making the use of recording within the clinical context more widely accessible for various client populations. Weissberger (2014) used the application GarageBand with adults and older adults, using the looping features to create music for a CD. Weissberger used technology to facilitate active music making with Hispanic older adults participating in a music therapy support group. Participants who used technology reported an increase in communication with family members of different generations due to increased knowledge on current technology (p. 281).

Weissberger (2014) used GarageBand for supportive rhythmic beat loops, offering clients a variety of options at a variety of tempos to find the one that fit their desired mood best. He noted the benefits of Garageband such as multi-tracking vocal parts, employing track layering

techniques, exploring transposition, and offering the clients the opportunity to make decisions during the editing process such as leaving in or cutting out mistakes. Using the Loop Extension feature of GarageBand allowed the therapist to accommodate clients who may need extra time to perfect their part, while addressing group and individual goals at the same time. The use of loops also allowed for a consistent beat which frees the therapist to engage clients in other means, such as passing out instruments for individual use, adding harmonic accompaniment, or other instruments into the loop, creating a fuller and richer music experience (p. 288).

Weissberger (2014) was able to configure a cart which made a keyboard, mixer, amplifier and laptop portable. The increased accessibility of the technology allowed for in the moment recording and reproduction of creative ideas. Easily accessible technology creates space for exploration and creativity by minimizing user error, citing that when using technology clients were more inspired to explore possibilities and express themselves (p. 281). Weissberger (2014) found the use of technology specifically useful with clients that were experiencing a variety of cognitive and physical disabilities struggling to engage with acoustic instruments.

Clark, et al. (2015) described their use of Garageband within a children's hospice center music therapy program. Technology based recording using Garageband was used in treatment for songwriting to address pain and anxiety as well as create gifts for family and friends. Composition using Garageband also creates opportunities for self-expression (p. 24).

Street (2014) discusses the importance of setting up Garageband before the session begins work with the client can begin immediately, rather than wasting session time setting up the interface. Her sessions involve time for planning and organizing followed by the exploration of creative ideas. This streamlined process allowed her client to accomplish creative and imaginative thinking, problem solving, and communication about their needs within the session

as well as process the experience at the end of the session. The client can also work towards goals in executive functioning and monitoring progress and outcomes during the recording session. The client is able to walk away having completed a short piece of music they can either expand upon in the following session or leave as a short composition. Either way, the client can leave feeling accomplished and use that experience of resilience and capability and use it as motivation for experiences outside of the therapeutic context.

Crooke and McFerran (2019) used drum machines, synthesizers, samplers, MIDI controllers, audio interfaces, desk mixers, and studio monitors in their improvisational music therapy sessions (p. 56). Crooke and McFerran's preferred digital audio workstation is Ableton Live, a competitor to Apple's GarageBand (p. 60). The use of technology within their clinical practice allowed them to more easily access hip hop styles.

Electronic Instruments

Viega (2018) discusses the therapeutic possibilities when using technology in therapeutic songwriting techniques. He identifies using GarageBand (Apple Loops, a feature in GarageBand), drum machines, and synthesizers such as the Korg EMX1, Korg ESX1, MicroKORG, and the Korg Kaossilator Dynamic Phrase Synthesizer within his practice. The use of technology such as drum machines and synthesizers are sonically important if the client's preferred music involves such sounds, which cannot be re-created by traditional music therapy instruments (p. 152). Viega also notes that technology allows clients to participate in music therapy sessions under their own power. Technology allows the client and therapist to explore agency and selfhood together in the music. The electronic music-making process gives the client the opportunity to express autonomy and identify with the part of themselves that is the artist or creator in this process. The writing and recording process increases opportunities for emotional

expression and increasing perception of self which is made more accessible to the client through the use of technology. Creating and sharing music in a digital world is reflective of today's times and the culture in which younger clients are digital natives (p. 153).

Crooke and McFerran (2019) identify the use of various technologies within clinical practice and give a basic explanation of the technology. Crooke and McFerran use turntables, drum machines, sequencers, synthesizers, sample pads, and DAWs (p. 56) in their beat-making studio for clinical practice. The beat-making studio was explored in an improvisational music therapy setting with adolescents.

Playback Equipment and Listening Devices

CDs with client-preferred music can be used for multiple purposes within clinical practice. As an example Batt-Rawden et al. (2005) describe the creation of CDs for clients to use outside of the music therapy session. One participant interviewed and reported that the CDs were empowering, the music listening forced her to create time for herself, allowing her to relax and create a relaxation routine (p.132). Music listening allowed for the meaningful associations that the listeners make, developing meaning making and memory (p.132).

Kulkarni et al. (2012) used CDs and headphones during medical procedures. The group listening to music on CDs during their procedures needed significantly smaller doses of sedation, as well as significantly smaller doses for analgesia compared to the control group not listening to music. Fewer people in the music group required any sedation compared to the control group (p. 1061).

Cevasco (2014) used iPods and Logitech portable speakers for music playback with neonates in NICU music therapy (p. 118). Equipment needed for the recording process includes

microphones, microphone cables, and music editing software (p. 123), as well as decibel meters for monitoring volume when playing music for the neonates (p. 125).

Whitehead-Pleaux and Spall (2014) used MP3 players, Apple music software, internet-based technology and external hard drives in their music therapy practice working on a pediatric burn care unit (p. 137). The use of portable MP3 players and external hard drives facilitates music listening and relocating files to provide clients with personalized music on their MP3 players (p. 137).

Clark, et al. (2015) use iPods as portable MP3 players in their practice. iPods are customized with client's preferred music and given to them. Clients have the opportunity to use their iPods and are encouraged to listen to music to reduce pre-surgery anxiety (p. 24).

Telehealth

Telehealth technology provides individuals who would not otherwise be able to access healthcare services. Music therapy sessions can be held between a client and therapist in two separate locations using video conferencing software. Levy et al. (2018) studied the use of video-based programs to provide creative arts therapy services for veterans. The Department of Veterans Affairs (VA) was able to provide at home services for veterans using the Cisco Jabber video call program. Veterans were supplied with a tablet, or device to access Cisco Jabber, and an art supply kit to participate in the creative arts therapy sessions (p. 21). Technology is a tool used in the therapeutic process in this situation, however is not a main function of the telehealth therapeutic process.

Lightstone et al. (2015) also studied the impact of remote telehealth music therapy services for Canadian veterans. The study used the Ontario Telehealth Network for video conference software. Lightstone et al. (2015) identified using amplification for instruments as

well within their telehealth practice (p. 129). Sessions were scheduled for the veteran, music therapist, and psychologist to all attend via telehealth. In this study, technology provided the opportunity for a veteran to access music therapy.

Considerations for the Use of Technology

Whitehead-Pleaux and Spall (2014), Magee (2014), and Cevasco (2011) explain important considerations when choosing to use electronic music technology in clinical practice, such as addressing a patient's developmental level, educational level, cognitive abilities, physical limitations, level of anxiety, and socioeconomic level. Magee (2014) and Cevasco (2011) found that the use of technology that is not within a client's skill level can have a negative impact on the therapeutic relationship. Table 4 provides a summary of common issues that may impede a client's ability to use technology successfully.

Table 4

Contraindications for using Technology in Clinical Practice

Visual impairments or fine motor skills: The use of small screens is contraindicated with clients with visual impairments or fine motor skills. (Magee, 2014)

Gross motor impairments: (contraindicated) Inconsistent movements, instrument and client positioning, and client's ability to repeat movements are contraindicated. Some motor disorders can be triggered by repetitive movements, in which case technology may be contraindicated (Magee, 2014).

Communication disorders: Clients with communication disorders seeing emerging abilities can be contraindications for technology use as the technology can diminish progress in goal areas. Technology is contraindicated when the client does not understand cause and effect (Magee, 2014).

Social-emotional disorders: Technology can distract individuals with social-emotional disorders, or can be used to self-stimulate, in which case it is contraindicated (Magee, 2014).

Individuals with physical disfigurement: Individuals with physical disfigurement should avoid technology with camera visuals. Individuals with physical disfigurement may not want to see their appearance, in which case it is contraindicated (Magee, 2014).

Anxiety Disorders: If the process of using technology over-complicates the music experience, it could overwhelm the client and therefore technology is contraindicated (Magee, 2014).

Culture and socioeconomic status: Technology is not always accessible to clients either due to culture or socioeconomic status, in which case the technology is contraindicated (Magee, 2014).

Neonatal overexposure: If babies are overexposed, the benefits of music diminish, and the stress can cause an increase in length of hospitalization. Cevasco (2011) recommends a four-hour time block of music listening for NICU infants (Cevasco, 2011).

Knight and LaGasse (2013) noticed that the generations entering the workforce are digital natives and can thrive with electronics compared to past generations (p. 90). This suggests that the coming generation of music therapists will have the ability to use technology in clinical practice. There are benefits to using technology in clinical practice beyond increasing client access to interactive music making. Using applications can also decrease the need for paper music and lyrics in sessions, which is environmentally friendly (p. 90). Applications can allow for documentation to be accessed more easily across treatment teams (p. 193). There are some technical drawbacks as well including signal delays and syncing issues. Another issue music therapists have to take into consideration given the expected increase in the provision of music therapy via telehealth is access to devices and reliable high-speed internet.

Need for Study

The most recent literature review of music therapy technology literature was conducted in 2004. Although helpful when looking for a large overview of existing literature, the information in current context can be considered outdated. There is a need for more accurate literature about the current uses of technology, especially given the fact that technology is a field that is constantly updating and upgrading both external hardwares and internal softwares. Research like this is not the first of its kind, but can provide valuable current information and also provide a

template for future researchers looking to update the information on technology in clinical music therapy practice.

Problem Statement and Research Questions

A survey was sent to all available participants from the American Music Therapy Association to address the need for current information on music technology in clinical practice. The survey asked for information on each clinician's use of technology within their practice. The survey addressed the follow research questions:

What technology is currently being used in clinical music therapy practice?

How is this technology being used within clinical practice?

Chapter 3: Method

Design

This study used a researcher-developed survey to gather information on current uses of technology. Survey questions were developed based on the AMTA workforce analysis, music therapy and previous survey literature (e.g. Cevasco & Hong, 2011, Crowe & Rio, 2004, and Magee, 2006). This survey for this study was administered through Qualtrics, which allowed for survey customization, data analysis, sample selection, and maintenance of confidentiality and privacy. This study was approved by State University of New York at New Paltz Human Research Ethics Board (See Appendix A).

The purpose of the survey was to collect data to create an informed opinion on the current attitudes towards technology use within clinical practice to allow for clear and concise recommendations for music therapy education. Technology was defined as “equipment used to achieve goals that in the past, using traditional instruments, were harder to meet or unable to meet. This includes computer-based software, electronic devices that produce sound with minimal movement or skill, recording and listening equipment.” This definition was created based upon the current definitions in existing literature.

Participants

Participants in this study met the following inclusion criteria: 1) be a current board-certified music therapist (MT-BC) in the United States; 2) be working full-time, part-time, or per-diem as a music therapist in the United States; 3) agree to informed consent. The initial questions of the survey reflected the inclusion criteria and if met, they could continue with the survey. Voluntary completion of the survey represented consent to participate in the study.

Participants were recruited through an invitational e-mail based on a list provided by the Certification Board for Music Therapists (CB-MT). A total of 8,616 email invitations were sent.

Measures

A questionnaire was distributed to potential participants that included demographic information such as age, populations worked with, work settings, and level of education, and uses of music technology within clinical practice. The researcher analyzed results for mean, median, mode, and percentages. The researcher then analyzed results in relation to currently published data.

Procedures

The researcher contacted the Certification Board for Music Therapists to obtain emails of potential participants. The invitational email sent to these participants included a detailed explanation of the study, an explanation of the survey process, and the time frame in which the survey must be completed (See Appendix B). The invitational email also included the rights of the participants and provided a platform for informed consent. After participants agreed to informed consent, the participants filled out the questionnaire by clicking on the link provided. The survey took approximately 20 minutes to complete and the participants were able to complete the survey in one sitting. The survey was active for two weeks. A reminder email was sent a week after the initial email to encourage survey response.

Chapter 4: Results

In total, there was a 1.7% response rate ($n = 153$). Of these, 92.91% of respondents reported using technology within their clinical practice ($n = 131$). Ten respondents (7.09%) do not use technology within clinical practice. Respondents who indicated they did not use technology in their clinical practice were redirected to the end of the survey. 100% of respondents read and comprehend English ($n = 153$). All together 95.36% of respondents reported being a music therapy clinician, ($n = 144$) and 4.64% of respondents said they were not ($n = 7$). Respondents who indicated they were not clinicians were redirected to the end of the survey.

Therapist Demographics

A majority of survey respondents were women (83.57%; $n = 117$). Age, race, gender, education and number of years in the field are reported in Tables 5, 6, 7, 8, and 9. Out of the people that responded, a majority were between the ages of 25-30 ($n = 49$) identified their race as White. A majority of respondents received a bachelor's degree in music therapy (63.63%; $n = 45$).

Table 5

Demographics- Gender of Respondents

Gender	Number of Respondents
Male	22
Female	117
Transgender	0
Gender non-binary	0
I don't identify with any of these	1

Table 6*Demographics- Age of Respondents*

Age	Number of Respondents
18-24	7
25-30	49
31-35	18
36-40	10
41-45	7
46-50	10
51-55	10
56-60	11
61-65	11
66-70	6
70 & over	1

Table 7*Demographics- Level of Education of Respondents*

Level of Education	Number of Respondents
Bachelor's	58
Master's	79
Doctoral	4

Table 8
Demographics- Ethnicity of Respondents

Ethnicity	Number of Respondents
White (not Hispanic or Latino)	118
White (Hispanic or Latino)	8
Asian or Asian American	4
Asian-Pacific Islander	1
Black or African American (non-Hispanic or Latino)	1
Native American	0
Multi-racial	4
Other	4

Table 9
Demographics- Length of Practice of Respondents

Length of Practice	Number of Respondents
0-5 years	45
6-10 years	35
11-15 years	10
16-20 years	15
21-25 years	6
26-30 years	8
30+ years	21

Workplace Settings

The majority of respondents (67.86%) reported working full time. The remaining 32.14% reported working part time. Table 10 lists respondents' work settings. Most of the respondents worked in settings that aligned with the AMTA workforce analysis, however, three respondents indicated alternate workplaces. These alternate workplaces include working with children whose families are experiencing homelessness, palliative/chronic care, and working with adolescent sex offenders and teens at risk of becoming sex offenders.

Table 10
Workplace Settings

Workplace Setting	Number of Respondents	Workplace Setting	Number of Respondents
Adult day services/ day care	13	Inpatient psychiatric unit	26
Child/adolescent treatment center	6	Military base	2
Children's day care/preschool	3	Nursing home/assisted living	18
Children's hospital unit	10	Oncology	8
Community based service	14	Other	8
Community mental health centers	5	Outpatient clinic	8
Correctional facility	1	Partial hospitalization	3
Drug/alcohol program	7	Physical rehabilitation	2
Early intervention program	4	Private music therapy agency	26
Forensic facility	5	School (K-12)	19
General hospital	10	Self employed/private practice	19
Geriatric facility (not nursing)	7	State institution	5
Group home	8	Support groups	1
Home health agency	2	University/college	8
Hospice/bereavement services	22	Veteran's Affairs	3
Intermediate care facility (DD)	7	Wellness program center	3

Client Demographics

Respondents report working with clients of all ages, with a majority working with clients 21-25 years and 56-70 years. The most common populations among respondents are: autism spectrum disorders, intellectual disability/developmental disability, and mental health. See Table 11 for all populations reported.

Table 11
Populations Served

Population	Number of Respondents	Population	Number of Respondents
Abused/sexually abused	21	Other	4
AIDS	5	Learning disabled	35
Alzheimer's/dementia	52	Medical/surgical	18
Autism Spectrum Disorders	64	Mental health	60
Behavioral Disorder	52	Multiply disabled	32
Bereavement/grief	27	Music education college students	3
Cancer	29	Music therapy college students	12
Chronic pain	25	Neurologically disabled	37
Comatose	6	Non-disabled	8
Intellectually/developmentally disabled	63	Parkinson's	20
Dual diagnosed	36	Physically disabled	34
Early childhood	29	Post traumatic stress disorder	33
Eating disorders	13	Rett Syndrome	7
Elderly persons	39	School age population	41
Forensic	8	Speech impaired	37
Head injured	28	Stroke	29
Hearing impaired	20	Substance abuse	28
Hospice/palliative care	35	Terminally ill	25

Music Therapy Clinical Practice

Respondents reported instrumental improvisation, songwriting, receptive music for relaxation, and song discussion as the most used methods in their clinical practice. When asked which methods incorporate technology, the most popular responses were compositional songwriting (8.30%), receptive song discussion (8.19%), receptive music for relaxation (7.96%), and instrumental improvisation (7.27%). See Table 12 for further information on music therapy methods and technology reported.

Table 12
Music Therapy Methods in Clinical Practice

Method	Number of Respondents	Number of Respondents using technology to facilitate client participation
Improvisation		
Instrumental improvisation	115	63
Vocal improvisation	71	22
Song improvisation	73	36
Mixed media improvisation	38	38
Body improvisation	46	13
Re-creative		
Instrumental re-creation	87	53
Vocal re-creation	96	30
Performance	53	34
Musical production	41	41

Conducting	13	5
Compositional		
Song transformation	76	31
Song writing	104	72
Instrumental composition	45	42
Notational activities	22	21
Song collage	21	15
Receptive		
Music for relaxation	117	69
Entrainment	75	25
Music for pain management	63	29
Action Listening	79	46
Song reminiscence	87	52
Song discussion	114	71
Projective listening	32	20
Imaginal listening	51	37

iPad and electrical instruments were the most commonly used technology among respondents. See Table 13 for more information on technology used in clinical practice. GarageBand (21.73%) was more popular than Digital Audio Workstation (3.93%) This result is atypical. The researcher thinks this could be attributed to survey language.

Table 13
Technology Used in Clinical Practice

Technology	Number of Respondents
Interactive apps on iPad	93
MIDI controllers	20
Drum machines	20
DAWs	15
25 key small keyboards	16
Virtual instruments in DAWs	15
Digital drum pad	24
Mixer with sound monitors	14
Electrical instruments	51
Ableton Push 2	5
NPC sampler	2
Korg Sampler	5
Scratch pad for DJ set up	3
Chaos pad	6
Apps that act as MIDI processor (Skoog/Air Jams/ Photonic)	10
GarageBand	83

Table 14 shows how technology is to help facilitate client participation in improvising, re-creating, composing and listening experiences. Results indicate that music therapists use a wide variety of technology to engage clients in active music making experiences. The use of technology to facilitate receptive or listening experiences is restricted to playback devices. Respondents reported using GarageBand the most across all four music therapy methods with

15.28% of respondents using GarageBand for improvisation, 16.67% using it for recreative methods, 65.38% using GarageBand to compose, while 2.78% use it for receptive methods.

Table 14
Technology and Music Therapy Methods

Instrument	Improvisation	Recreative	Compositional	Receptive
DAWS	4	1	11	0
Launch Key	2	1	3	0
Small 25 key MIDI keyboard	7	1	6	3
Mixer with studio monitors	2	4	2	3
Digital drum pad	14	4	3	0
Electrical Instruments	26	15	0	4
Ableton push 2	3	0	1	0
NPC Sampler	2	0	0	0
Korg Sampler	1	2	1	0
Scratch pad for DJ set up	3	0	0	0
Chaos pad	6	1	0	0
Apps that act as MIDI processor	9	2	0	1
GarageBand	11	12	47	2

Chapter Five: Discussion and Conclusion

The purpose of this study was to update previous surveys on the use of technology in music therapy practice. More specifically, board-certified music therapists were surveyed to learn how music technology is currently being incorporated into their music therapy clinical practice. A total of 153 people responded to the survey, and of those 131 (85%) completed the survey. The results of this study support the results of previous studies investigating the use of technology (e.g., Cevasco & Hong, 2011, Crowe & Rio, 2004, Magee, 2006). This survey also included items related to newer technology that has been introduced into the marketplace since Cevasco and Hong's 2011 study.

Types of Technology Used in Music Therapy Clinical Practice

The most common type of technology reported by respondents ($n = 93$) was Interactive apps on iPads. These results differ from those reported by Crowe and Rio (2004), Magee (2006), and Cevasco and Hong (2011) as the use of iPads was not reported by respondents. This may be due to the fact that the iPad was released in 2010 and was not as accessible at the time those studies were conducted. According to (Valishery, 2021) the iPad reached peak sales during the year 2014 which could be related to the increased use as more people gain access to the device.

Survey results indicate that GarageBand is the most popular Digital Audio Workstation (DAW) used in music therapy practice. Eighty-three respondents indicated they used GarageBand in their clinical practice. These results are similar to those reported by Cevasco and Hong (2011), who found that GarageBand was the most reported software used by those responding to their survey (p. 71). Additionally, several music therapists have written about their use of GarageBand to engage client in active music making (e.g., Clark, et al. 2015; Sadnovik, 2014; Street, 2014; Weissberger, 2014; Whitehead-Pleaux & Spall, 2014). The popularity of

GarageBand may be related to the fact it comes pre-loaded into all Macintosh products including the iMac computer, iPad third generation and newer, and iPhone 4s and newer. The use of other DAWs was underwhelmingly reported (n = 15) in this study.

Electrical instruments including amplified electric and bass guitars, powered keyboards, and any other instruments that use electricity to work were the third most reported group of technology used by respondents (n = 51). Crowe and Rio (2004) define electric/electronic instruments as “electric guitars with amplification, drum machines, and electric versions of acoustic instruments such as the suzuki Q-chord” (p. 293). The authors also differentiate the electrical instruments that need amplification from the MIDI instruments that require a DAW. These types of instruments can be used together or independently in music therapy clinical practice. Results are similar to Crowe and Rio in sample size and despite the large amount of time between research. The contents of the results are similar including identifying the use of “recording technology, electric/electronic instruments, and computer applications” (p. 291).

Electrical instruments are mentioned less frequently in the literature. Respondents in the current study reported the use of electrical instruments in improvisation (n = 26), re-creative (n = 15), and receptive methods (n = 4). No respondents reported using electrical instruments for compositional methods. It is difficult to speculate why the use of electrical instruments is not as common as other types of technology. It may be that respondents do not consider electrical instruments to fall within the category of technology, concerns of availability, accessibility, and skill. A combination of factors may be contributing to the lack of use of technology in clinical practice.

Technology Used to Facilitate Music Therapy Techniques

Results from this survey indicate that technology was most commonly used to facilitate song discussion (n = 71), followed by music relaxation (n = 69), and instrumental improvisation (n = 63). Cevalasco and Hong (2011) as well as Crowe and Rio (2004) found that technology was used for music assisted relaxation. The use of technology for song discussion is new in comparison to previous surveys. Previous surveys reported the use of technology for songwriting and making musical choices (Cevalasco & Hong, 2011; Crowe & Rio 2004; Magee, 2006). Respondents to this survey did not report using technology for songwriting.

Technology used to facilitate Music Therapy Methods

The music therapy method variations that were found to be commonly used with technology include: mixed method improvisation, notational activities, and imaginal listening. Every respondent who reported using mixed method improvisation (100% of respondents) reported using this method with technology. Fewer respondents used technology every time they used notational activities (95.5% of respondents) and technology use with imaginal listening (72.5% of respondents), The use of technology notational activities is new since the most recent survey (Cevalasco & Hong, 2011). It is interesting to note the existing literature in the areas of notational activities and technology, mixed method improvisation and technology, and imaginal listening and technology are limited given the frequent use.

GarageBand was reported to be used most commonly in compositional and re-creative methods, as well as with improvisational and receptive methods. DAWs were most used with improvisatory, re-creative, and receptive methods. Further research exploring specific DAWs and their strengths for clinical practice could benefit the music therapy field.

The use of MIDI controllers (n = 20) and drum machines (n = 20) were equally reported by respondents. MIDI controllers were reportedly used across all four music therapy methods. Survey results indicate they are most commonly used with improvisation methods (n = 7), followed by compositional (n = 6), receptive methods (n = 3), and recreative (n = 1). These results are still low when compared to the number of respondents, therefore it is important to note music therapists are not readily using these methods with technology. According to respondent answers MIDI controllers, mixers with studio monitors, and small 25 key MIDI keyboards appear to be the most versatile across methods. Werger et al. (2020) describe MIDI as “a communication protocol between the hardware and software” (p. 76). Crooke and McFerran (2019) describe their use of MIDI controllers and drum machines in their beat-making studio within their clinical practice.

Technology and Populations

Respondents reported that technology was most commonly incorporated in music therapy treatment with individuals diagnosed with autism spectrum disorder (n = 64), followed by intellectual/developmental disabilities (n = 63), and mental disorders (n = 60). Previous surveys did not ask respondents to identify clinical populations. Participants were not asked about the impact of technology on goals and objectives, however trends of common uses of technology are shown in survey data and the literature review.

The use of technology was reported by respondents working with individuals diagnosed with Alzheimer’s disease and dementia as well as mental illness. Technology such as iPads were found to be used overwhelmingly. iPads were reported to be the most common technology used in clinical practice with individuals diagnosed with autism spectrum disorder. These findings are similar to those reported in the literature. For example, Krout, (2014) discusses the use of iPads

with individuals with autism spectrum disorder. Engelbrecht and Shoemark (2015) describe the use of iPads and older adults. Hallas and Cleaves (2017) describe the use of technology with individuals who have mental health issues.

Recommended Training for Music Therapists

The final question of the survey was an open response question asking for any final thoughts on technology. Responses listed the following as important aspects of technology: technology in relation to the pandemic, asked about Continuing Music Therapy Education courses (CMTE) and technology, augmentative and alternative communication technology, lack of access to technology and lack of access to funding for technology, and comments on the survey. The most common topic identified in the final question responses was the lack of technology use in the educational experiences of respondents.

Music therapy education is rigorous throughout undergraduate and graduate programs, however, there appears to be an agreement between the literature and survey respondents that additional training in technology functions and application for clinical use could improve a clinician's base level of knowledge. In a field where the main literature on the subject claims that the profession is "clearly open to applying electronic technology in clinical work" (Magee, 2006 p. 143) it does not seem as though clinicians are receiving as much training on technology as they would like. An increase in education on various technologies and indications/contraindications could increase clinician use of technology.

Magee (2006) notes that music therapists should be careful about introducing technology into clinical practice, stating music therapists should carefully "discriminate about when and with whom to use technology" (p.144), which is a skill that could be developed throughout the educational process. The ability to develop such skills are only available if the technology is

available to the student either in the learning environment or in the clinical setting. If music therapy educators take the responsibility of understanding and then teaching the indications and contraindications for the use of technology related to music creation within clinical practice, their students may feel more prepared when entering the workforce.

Limitations and Directions for Future Research

The response rate of the survey (1.7%) is a limiting factor, so the data most likely is not representative of the use of technology within music therapy clinical practice. This is different to other surveys about the use of technology in clinical practice. This difference may have been a result of nonresponse bias, which is defined as a phenomenon when people do not respond to a survey due to an identified or unidentified influencing factor. According to Groves and Peytcheva (2008) the nonresponse bias may also be due to the fact that the survey was delivered via technology, discussing technology, under the assumption of an understanding of technology (p.184). Other possible reasons for lack of response are technical errors with the survey link, with an error message displayed when clicking on the link in the original recruiting email, as well as workplace and or screen time burnout. This survey was delivered in the summer of 2020 during the COVID-19 pandemic, a time of great uncertainty and anxiety (Crawford et al., 2021). These factors may have impacted the survey response rate. Cevasco and Hong (2011) reported a 12% response rate, Magee (2006) reported a 23.8% response rate, which are both significantly higher than this survey's findings.

While there is a significant amount of information gathered on the use of technology from this survey, more questions are raised and provide direction for future research in this area. This study did not address or focus on defining technology or specific technologies, how technology is used to reach goals in music therapy sessions, the education and training of music

therapists, and understanding how people explore and adapt to their environment through music technology. Future research could include creating a list of common-language technology terms to more easily discuss technology in the academic setting, building upon the existing work of Krout (2014).

Krout (2014) considers technology to be adaptive equipment used to assist people with disabilities participate in music therapy sessions. However, this definition of technology does not encompass other types of technology such as DAWs. Broad applications and definitions allow for the flexibility of a clinician, but can complicate a researcher's position. Clear definitions and strong boundaries of what the researcher does and does not consider technology could be useful for conducting future research on the topic.

Conclusion

The purpose of this study was to add to the limited research on the use of technology in music therapy practice. This limitation was expressed by Cevasco and Hong (2011), Crooke (2018), Krout (2014); and Magee and Burland (2008). The researcher hopes music therapists can capture the spirit of curiosity, such as that of Pauline Oliveros (Pinch & Trocco, 2002), a creator of the AUMI and prominent historical electronic musician, that could lead to the use of technology to assist others. It is the embrace of the ideas that challenge societal norms, especially with the use of technology in clinical practice, that creates opportunities for clients that would otherwise not be available and enrich their lives in such ways that were unimaginable without technology.

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Appendix AA

SUNY NEW PALTZ Human Research Ethics Board Approval



Human Research Ethics Board
Sponsored Programs & Research Compliance
800 Hawk Drive, New Paltz, NY 12561
Old Main B120

STUDY EXEMPTION

April 24, 2020

[Elena Rothenberg](#)
5162205119
Rothenbe1@hawkmail.newpaltz.edu

Dear [Elena Rothenberg](#):

On 4/23/2020, the Human Research Ethics Board (HREB) approved the following submission:

Type of Review:	Initial Study
Title of Study:	Use of Music Electronics in Music Therapy Clinical Practice: A Survey
Investigator:	Elena Rothenberg
IRB ID:	STUDY00002308
Funding:	None
Grant ID:	None
Documents Reviewed:	<ul style="list-style-type: none"> • Survey Final Draft, Category: Recruitment Materials; • Elena Rothenberg HREB approval, Category: IRB Protocol;
Exemption	104 (d) (2)

The Human Research Ethics Board (HREB) has considered the submission for the project referenced above and determined it to be Exempt under one of the categories specifically waived under Section 104 (d) (1-6) or 101(i) of the Code of Federal Regulations (45 CFR 46).

IRB exemption is given with the understanding that the most recently approved procedures will be followed and the most recently approved consenting documents will be used, if applicable. If modifications are needed, those changes may not be initiated until such modifications have been submitted to the HREB for review and have been granted approval.

As principal investigator for this study involving human participants, you have institutional responsibilities as follows:

1. Ensuring that no subjects are enrolled prior to the study's approval date.
2. Ensuring that the HREB is notified via PACS IRB module of:
 - All Reportable Information in accordance with the "Reportable New Information" Smart Form.
 - Project closure/completion by the "Continuing Review/Modification/Study Closure" Smart Form in PACS.
3. Ensuring that the protocol is followed as approved by the HREB unless minor changes that do not impact the exempt determination are made.
4. Ensuring that the study is conducted in compliance with all HREB decisions, conditions, and requirements.
5. Bearing responsibility for all actions of the staff and sub-investigators with regard to the protocol.
6. Bearing responsibility for securing any other required approvals before research begins.

If you have any questions, please contact the Human Research Ethics Board (HREB) at either (845) 257-3282 or by email:

HREB Chair: hrebchair@newpaltz.edu
HREB Secretary: hrebsecretary@newpaltz.edu

Appendix B

Email to the Potential Participants

Subject: Invitation to Participate in as Survey on the Use of Technology in Music
Therapy Clinical Practice

Hello,

My name is Elena Rothenberg and I am a graduate student at SUNY New Paltz. I am conducting a study via survey about the use of music technology in clinical practice. The study will include an online survey and should take no more than 20 minutes of your time. Your responses will be completely anonymous. Participation is voluntary and you may terminate the study at any time. This study has been approved by the New Paltz Human Research Ethics Board. There will be no compensation. To continue to the survey, please click the link:

Appendix C

Survey Questions

1. Do you read and comprehend english?
 - Yes
 - No
2. Are you a music therapy clinician?
 - Yes
 - No
3. Do you use technology within your clinical practice? Technology can be defined as equipment used to achieve goals that in the past, using traditional instruments, were harder to meet or unable to meet. This includes computer-based software, electronic devices that produce sound with minimal movement or skill, recording and listening equipment.
 - Yes
 - No
4. What is your age?
 - 18-24 25-30 31-35 36-40 41-45 45-50
 - 51-55 56-60 61-65 66-70 70 & over
5. What is your gender identity?
 - Female Male tTransgender Gender Non-binary I don't identify with any of these
 - I prefer not to say
6. What is your ethnicity?
 - White (not Hispanic or Latino) White (Hispanic or Latino) Asian or Asian American Asian-pacific islander black or African American (non-Hispanic or Latino)
 - Native American Multi-racial other

7. What is your bachelor's degree in?

- music therapy other

8. What is the highest level of education you have completed?

- undergraduate masters doctoral

9. How long have you been practicing MT?

- 0-5 6-10 11-15 15-20
 21-25 26-30 30+

10. Are you working full time (32 hours or more) in a clinical setting?

- yes no

If no, how many? _____

11. How would you describe your work setting?

- | | | | |
|--|--|---|---|
| <input type="checkbox"/> Adult Day Services/
Day Care | <input type="checkbox"/> Adult Education | <input type="checkbox"/> Child/Adolescent
Treatment Center | <input type="checkbox"/> Children's Day
Care/Preschool |
| <input type="checkbox"/> Children's Hospital
or Unit | <input type="checkbox"/> Community Based
Service | <input type="checkbox"/> Community Mental
Health Centers | <input type="checkbox"/> Correctional Facility |
| <input type="checkbox"/> Day
Care/Treatment
Center | <input type="checkbox"/> Drug/Alcohol
Program | <input type="checkbox"/> Early Intervention
Program | <input type="checkbox"/> Forensic Facility |
| <input type="checkbox"/> General Hospital | <input type="checkbox"/> Geriatric Facility (not
nursing) | <input type="checkbox"/> Geriatric
Psychiatric Unit | <input type="checkbox"/> Group Home |
| <input type="checkbox"/> Home Health
Agency | <input type="checkbox"/> Hospice/Bereavement
Services | <input type="checkbox"/> Intermediate Care
Facility (DD) | <input type="checkbox"/> Inpatient
Psychiatric Unit |

- | | | | |
|---|---|---|--|
| <input type="checkbox"/> Military Base | <input type="checkbox"/> Music Retailer | <input type="checkbox"/> Nursing Home/Assisted Living | <input type="checkbox"/> Oncology |
| <input type="checkbox"/> Other | <input type="checkbox"/> Outpatient Clinic | <input type="checkbox"/> Partial Hospitalization | <input type="checkbox"/> Physical Rehabilitation |
| <input type="checkbox"/> Private Music Therapy Agency | <input type="checkbox"/> School (K-12) | <input type="checkbox"/> Self Employed/Private Practice | <input type="checkbox"/> State Institution |
| <input type="checkbox"/> Support Groups | <input type="checkbox"/> University/College | <input type="checkbox"/> Veteran's Affairs | <input type="checkbox"/> Wellness Program Center |

11a. If other, please explain

12. What is the age of the client population are you currently working with?

- | | | | |
|--------------------------------|--------------------------------|--------------------------------|------------------------------------|
| <input type="checkbox"/> 0-5 | <input type="checkbox"/> 6-10 | <input type="checkbox"/> 11-15 | <input type="checkbox"/> 15-20 |
| <input type="checkbox"/> 21-25 | <input type="checkbox"/> 26-30 | <input type="checkbox"/> 30-35 | <input type="checkbox"/> 36-40 |
| <input type="checkbox"/> 41-45 | <input type="checkbox"/> 46-50 | <input type="checkbox"/> 51-55 | <input type="checkbox"/> 56-60 |
| <input type="checkbox"/> 60-65 | <input type="checkbox"/> 66-70 | <input type="checkbox"/> 71-75 | <input type="checkbox"/> 76 & over |

13. What populations do you work with?

- | | | | |
|---|--|---|--|
| <input type="checkbox"/> Abused/Sexually Abused | <input type="checkbox"/> AIDS | <input type="checkbox"/> Alzheimer's/Dementia | <input type="checkbox"/> Autism Spectrum Disorders |
| <input type="checkbox"/> Behavioral Disorder | <input type="checkbox"/> Bereavement/Grief | <input type="checkbox"/> Cancer | <input type="checkbox"/> Chronic Pain |
| <input type="checkbox"/> Comatose | <input type="checkbox"/> Intellectually/Developmentally Disabled | <input type="checkbox"/> Dual Diagnosed | <input type="checkbox"/> Early Childhood |
| <input type="checkbox"/> Eating Disorders | <input type="checkbox"/> Elderly Persons | <input type="checkbox"/> Forensic | <input type="checkbox"/> Head Injured |

- | | | | |
|--|---|---|---|
| <input type="checkbox"/> Hearing Impaired | <input type="checkbox"/> Hospice/Palliative Care | <input type="checkbox"/> Learning Disabled | <input type="checkbox"/> Medical/Surgical |
| <input type="checkbox"/> Mental Health | <input type="checkbox"/> Multiply Disabled | <input type="checkbox"/> Music Education College Students | <input type="checkbox"/> Music Therapy College Students |
| <input type="checkbox"/> Neurologically Disabled | <input type="checkbox"/> Non-Disabled | <input type="checkbox"/> Other | <input type="checkbox"/> Parkinson's |
| <input type="checkbox"/> Physically Disabled | <input type="checkbox"/> Post Traumatic Stress Disorder | <input type="checkbox"/> Rett Syndrome | <input type="checkbox"/> School Age Population |
| <input type="checkbox"/> Speech Impaired | <input type="checkbox"/> Stroke | <input type="checkbox"/> Substance Abuse | <input type="checkbox"/> Terminally Ill |
| <input type="checkbox"/> Visually Impaired | | | |

13. a. If other, please explain

14. What music therapy methods do you use within your clinical practice?

- | | | | |
|---|---|--|--|
| Improvisation Methods | Re-creative Methods | Compositional Methods | Receptive Methods |
| <input type="checkbox"/> Instrumental Improvisation | <input type="checkbox"/> Instrumental Re-creation | <input type="checkbox"/> Song Transformation | <input type="checkbox"/> Music for Relaxation |
| <input type="checkbox"/> Vocal Improvisation | <input type="checkbox"/> Vocal Re-creation | <input type="checkbox"/> Song Writing | <input type="checkbox"/> Entrainment |
| <input type="checkbox"/> Song Improvisation | <input type="checkbox"/> Performance | <input type="checkbox"/> Song Writing Instrumental | <input type="checkbox"/> Music for Pain Management |
| <input type="checkbox"/> Mixed Media Improvisation | <input type="checkbox"/> Musical Production | <input type="checkbox"/> Instrumental Composition | <input type="checkbox"/> Action listening |
| <input type="checkbox"/> Body Improvisation | <input type="checkbox"/> Musical Games | <input type="checkbox"/> Notational Activities | <input type="checkbox"/> Song Reminiscence |
| | <input type="checkbox"/> Conducting | <input type="checkbox"/> Music Collage | <input type="checkbox"/> Song Discussion |
| | | | <input type="checkbox"/> Projective Listening |
| | | | <input type="checkbox"/> Imaginal Listening |

15. Which of the following music therapy methods incorporate technology?

- | | | | |
|---|---|--|--|
| Improvisation Methods | Re-creative Methods | Compositional Methods | Receptive Methods |
| <input type="checkbox"/> Instrumental Improvisation | <input type="checkbox"/> Instrumental Re-creation | <input type="checkbox"/> Song Transformation | <input type="checkbox"/> Music for Relaxation |
| <input type="checkbox"/> Vocal Improvisation | <input type="checkbox"/> Vocal Re-creation | <input type="checkbox"/> Song Writing | <input type="checkbox"/> Entrainment |
| <input type="checkbox"/> Song Improvisation | <input type="checkbox"/> Performance | | <input type="checkbox"/> Music for Pain Management |
| | <input type="checkbox"/> Musical Production | | |

- Mixed Media Improvisation
- Musical Games
- Instrumental Composition
- Action listening
- Conducting
- Notational Activities
- Song Reminiscence
- Music Collage
- Song Discussion
- Projective Listening
- Imaginal Listening

16. What types of technology do you use within your clinical practice?

- interactive apps on iPad
- midi controllers
- drum machines
- DAWS
- 25 key small midi keyboards
- virtual instruments in DAWS
- digital drum pad
- mixer w/ sound monitors
- electrical instruments (please specify)
- Ableton Push 2
- NPC Sampler
- Korg Sampler
- Scratch Pad for Dj set-up
- chaos pad
- apps that act as midi processor (Skoog/ air jams/ photonic)
- garage band

17. Please identify what technology you use with each music therapy method

	Improvisation	Re-creative	Compositional	Receptive
DAWS				
Launch Key				
Small 25 key MIDI Keyboard				
Mixer with studio monitors				
Digital drum pad				
Electrical instruments				

Ableton Push 2				
NPC Sampler				
Korg Sampler				
Scratch Pad for DJ set up				
Chaos Pad				
Apps that act as MIDI processor				
Garage Band				

18. How do you assess a client's need for technology?

19. On a scale of 1-10, 1 being the least important and 10 being the most important, how important do you think technology education should be in music therapy programs?

20. Do you have any final comments on music therapy and technology in general?
