

Music as a Therapeutic Intervention with Autism: A Systematic Review of the Literature

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Abstract: This systematic review of literature is focused on the outcomes of the therapeutic use of music with children living with autism and was written to enhance the practice of using music as a therapeutic intervention by studying program needs and design. Outcomes from the use of music as a therapeutic intervention with children along the autism spectrum disorder included improvement in interpersonal skills, social skills, and cognitive skills. Reported benefits included, but were not limited to increased appropriate social behavior; increased attention to task; increased vocalization, verbalization, gesture, and vocabulary comprehension; increased communication and social skills; enhanced body awareness and coordination; improved self-care skills; and reduced anxiety.

Keywords: *Autism spectrum disorder, therapeutic use of music, children*

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Introduction

Music and its power are not confined by language, culture, gender or ability. Music's ageless influence and its uses are seen throughout history, from classical composer Ludwig van Beethoven who said, "Music can change the world" to modern artist Billy Joel saying, "I think music in itself is healing. It's an explosive expression of humanity. It's something we are all touched by" (Baleson, n.d.). It has been a contributor and area of influence within health care and medical practice for centuries (Lindbaek, 2000).

Research has proven that music produces beneficial outcomes when used with multiple diagnostic groups. Documented benefits include stimulating the brain in multiple areas, improving cognitive, social, physical, and emotional domains (Kunstler & Daly, 2010; Lindbaek, 2000; Molnar-Szakacs, Wang, Laugeson, Overy, Wu, & Piggot, 2009; Simpson & Keen, 2011). The impact upon individuals with autism spectrum disorders (ASD) is no different. Reported benefits of music as a therapeutic intervention for individuals who have autism include the following (Cornhill, 2013; Simpson & Keen, 2011):

- Increased appropriate social behaviors
- Improved attention to tasks
- Increased vocalizations, verbalizations, gestures, and vocabulary comprehension
- Increased communication and social skills
- Enhanced body awareness and coordination
- Improved self-care skills
- Reduced anxiety

Furthermore, studies have shown that individuals with ASD have normal or superior abilities with certain components of music processing, which makes music a potential intervention for this population (Molnar-Szakacs et al., 2009).

The Face of Autism

Individuals with autism spectrum disorders experience life in ways that are unique to this diagnosis. Social deficits present themselves as an obvious and defining trait of individuals with autism. These individuals tend to have a deficit in interpersonal relations, abnormal developmental progress, problems with flexibility, and unsuitable emotional responses (Dempsey & Foreman, 2001). Challenges in speech, eye contact, and communication make it difficult for individuals to persevere socially (Finnigan & Starr, 2010). For those living with autism, music has been shown to impact these areas, enabling the individual to have increased social engagement.

To be diagnosed with autism, the individual must present a lack of social skills, including impairment in the use of nonverbal communication, lack of peer relationship development skills, non-spontaneous interactions with others, reciprocity, lack of imaginative play, and a lack of communicative exchange (American Psychiatric Association [APA], 2013; Finnigan & Starr, 2010). The DSM identifies specific diagnostic criteria: These criteria include impairments in social communication and interaction in different settings such as reciprocal communication, poor nonverbal communication, challenges in making friends, and inability to share emotions or interests. ASD is also characterized by repetitive behavior or interests including repetitive movements, ritualistic behaviors, strong focus on a topic or interest, and over or

under-reactions to sensory simulation. These impairments must be persistent, affect daily functioning, and begin in early childhood (APA, 2013). Additionally, these behaviors cannot be explained by a delay or cognitive disability (Autism Speaks, 2014a).

Autism's prevalence in the United States is one in every 68 children, with boys more commonly affected (Centers for Disease Control & Prevention, 2014a). Although the cause of ASD is unknown, environmental, biological, and genetic issues are cited as primary contributors (CDC, 2014a; Raglio, Traficante, & Oasi, 2011).

Therapeutic Recreation

One profession using music as an intervention for individuals with autism is therapeutic recreation (TR), also known as recreational therapy (RT). TR/RT emphasizes a holistic approach to health which not only includes the absence of illness, but a wellness component that incorporates physical, cognitive, emotional, social, and leisure development. Recreational therapists focus on healthy living as treatment to improve functioning, independence, and quality of life for those served (American Therapeutic Recreation Association [ATRA], 2014).

Recreational therapists use activity and community-based interventions to assist clients in improving their physical, cognitive, social, emotional, and leisure functioning through the development of specific knowledge, skills, and behaviors (ATRA, 2014). When working with clients and their families, outcomes are achieved by using the specific interests of the client and available community resources. The therapist works with the client to facilitate transfer of their knowledge, skills, and abilities learned through

therapy into real-life situations (ATRA, 2014).

Recreational therapists utilize evidence-based practice and research to support selection and implementation of interventions. Evidence-based practice is treatment or interventions that are selected based on research and evidence of efficacy and outcomes (Stumbo & Peterson, 2004). For example, music has evidence to support its impact upon physical functioning including range of motion and fine motor skills; cognitive abilities such as attention span and memory; affective skills like sharing and expressing feelings; and social skills such as cooperation and social interaction (Cornhill, 2013; Kunstler and Daly, 2010; Simpson & Keen, 2011). However, there is limited research within the recreational therapy profession on music as an intervention with individuals who have autism based on searches conducted in therapeutic recreation journals and evidence-based websites dedicated to TR. The use of systematic reviews such as this one provides a beginning to understanding the evidence that is available to enhance recreational therapy practice (Stumbo, 2009).

Purpose

The purpose of this systematic review was to explore existing literature to identify the empirical evidence and proven outcomes that support the therapeutic use of music as an intervention with children on the autism spectrum.

Research Questions

The following research questions were developed for this study:

- What are the evidenced-based outcomes of music when used as an intervention with children on the autism spectrum?

- What genre/type(s) of music work best when used as an intervention with children on the autism spectrum?
- With what severity of autism does music work best?
- What frequency and duration of the intervention is required to result in significant outcomes for children on the autism spectrum?
- What is the most successful environment for administering music as a therapeutic intervention for the greatest benefits for children on the autism spectrum?

Significance of Study

The significance of this systematic review was to improve professional recreational therapy practice by providing insight into the program need and design, as well as the impact of using music as a therapeutic intervention with children on the autism spectrum. The potential outcomes for an individual with autism who participates in music interventions are identified along with the best approaches for implementing a music intervention. Issues such as type of music, length of sessions, and specific activities that the therapist can use to accomplish individualized goals are presented.

Additionally, as a profession, recreational therapy strives to implement evidence-based interventions in the most effective manner as supported by literature and research. Evidence-based practice is used to justify the benefits and outcomes of therapeutic interventions. This research project supports the importance and relevance of music in therapeutic recreation services.

Definition of Terms

The following terms are defined to assist in clearly articulating the research

and outcomes associated with using music as an intervention with children along the autism spectrum.

- **Autism.** Autism spectrum disorder (ASD) and autism are both general terms for a group of complex disorders of brain development. These disorders are characterized, in varying degrees, by difficulties in social interaction, verbal, and nonverbal communication and repetitive behaviors and typically appear within the first three years of life (Autism Society, n.d.; Autism Speaks, 2014c).
- **Child or children.** For the purposes of this study, child/children indicate individual(s) ages 0 to 18 years of age (Oxford Dictionaries, 2014).
- **Intervention.** A program that has as a degree of client behavioral change as its outcome (Stumbo & Wardlaw, 2011).
- **Music as an Intervention.** Using music to stimulate functional areas of the brain during therapy. This is different from music therapy which is “the clinical and evidence based use of music interventions to accomplish individualized goals within a therapeutic relationship by a credentialed professional who has completed an approved music therapy program” (American Music Therapy Association, 2014).
- **Recreational Therapy.** A treatment service designed to restore, remediate and rehabilitate a person’s level of functioning and independence in life activities, to promote health and wellness as well as reduce or eliminate the activity limitations and restrictions to participation in life situations caused by an illness or disabling condition (ATRA, 2014).

Method

Limitations of the Study

The limitations restricting the scope of this study include access to the Grand Valley State University databases available to students, limited access to all relevant literature, and the lack of literature differentiating the therapeutic use of music as an intervention and that of music therapy. Grand Valley strives to provide students with the most current databases but does not have access to each database. The method for gathering literature was limited to only Grand Valley resources and library retrieval through interlibrary loan; this included access to the *American Journal of Recreation Therapy*, the *Annual in Therapeutic Recreation*, and the *Therapeutic Recreation Journal*. While conducting the literature review, articles were not consistently clear if they were providing information regarding music therapy or using music as a therapeutic intervention. Thus, some research articles may have been included in the study when they should not have as well as excluded from the study when they should have been included. This inclusion or exclusion may have an impact on the evidence presented in this review.

Delimitations of the Study

The study focused only on using music as a therapeutic intervention with children on the autism spectrum. In order to be included in the study, the literature had to be reviewing the specific population of pediatrics which was defined as children aged 0 to 18. The scope of the initial student literature review was delimited to those articles published since 2000. The students did not use articles published before the year 2000. Furthermore, studies were excluded that examined children with autism's under-

standing of or the teaching of musical concepts. Further, only articles in peer reviewed journals were included.

The greatest delimitation of the study was restricting the research to music as a therapeutic intervention, specifically excluding interventions identified as music therapy or studies performed or written by a board certified music therapist (MT-BC). In the review of the literature, it was difficult to discriminate between the research that studied the therapeutic use of music and those that were music therapy. By only using articles that referenced the therapeutic use of music, researchers had to limit the amount of studies used. It was assumed that articles written by authors without a music therapy credential were not music therapists and did not administer specific music therapy, but rather used music as a therapeutic intervention.

Database Search

The search for evidence regarding outcomes associated with the therapeutic use of music with children on the Autism Spectrum was initiated through a database search at Grand Valley State University. Table 1 provides the results of the database search. Seventeen databases were used to conduct the search including: CINAHL Plus, Education Research Complete, Health and Wellness Resource Center, Oxford Music, Proquest Medical, and SportDiscus. Various keywords relevant to the area of study were used with each database search including autism, children, interventions, music, and recreational therapy.

Based upon the databases and keywords searched, a considerable amount of results were generated. The search was refined by focusing on outcomes related to the therapeutic use of music, as opposed to music therapy. Another keyword that was focused on was the reference of mu-

Table 1

Database Search of Music as a Therapeutic Intervention for Children with Autism

Database	Keywords	Number of Hits	Usable Hits
CINAHL, Plus with Full Text	Autism, Music; Children	41	5
Education Research Complete	Use of Music, Autism	50	2
Health and Wellness Resource Center with Alternative Health Module	Music, Autism, Children Autism	84 12314	2
Oxford Music Online	Autis* AND Music AND Children	36	1
Proquest Medical Library	Autis* Therapeutic use of music; Children, Autis*, Children OR Pediatrics Autism, Therapeutic use of music; Children OR Pediatrics – only peer reviewed, human subjects	1 444 194	0 1
PubMed	Autism, therapeutic use of music intervention, children OR pediatrics) – only peer reviewed, human subjects; after 12/31/1999	152	4
SportDiscus	Therapeutic use of Music; Autism Music, Children, Autism Recreational therapy; Music; Children	14 3 3	1 1 0
PsychInfo	Therapeutic use of music; Children, Autism	5	1
AthHealth Watch	Music, Children, Autism	2	0
ERIC	Music, Children, Autism	49	3
Physical Education Index	Music, Children, Autism	2	0
PsycArticles	Therapeutic use of music; Children, Autism	49	2
RehabData	Music, Children, Autism Therapeutic music; Children, Autism	8 3	0 0
Ovid	Autism	3	0
National Library of Medicine	Music, Children, Autism	26	0
OT Search	Music, Children, Autism	1	0
OT Seeker	Music, Children, Autism	7	3

Note: Use of the asterisk (*) at the end of a word is used as a root or stem word in a search. A search engine will show any word that begins with the root or stem before the *.

sic being used with children, as many articles discussed music being used as an intervention with adult populations. Numerous articles resulted from the initial search of the databases. Peer reviewed journal articles were the intended source of articles; consequently many articles were disregarded due to inadequate scholarly reviews. A total of 15 unique articles were included in this systematic review.

Evidence from Literature Search

Table 2 details the articles used in this review. The table provides information on investigator's and year of study, subjects, intervention/activity, theoretical foundation, focus, measures, and outcomes. Summaries present details on the publication date, type of research design used in the studies, age of participants, focus of the research, assessment measures used, and the reported outcomes of using music as a therapeutic intervention with individuals who have ASD.

In addition to the specific outcomes of music as a therapeutic intervention, several themes emerged. These included the timing of the publications, research design issues, focus area of research, outcome assessment measures, and reported outcomes.

The first major theme was the publication dates of the studies. All studies were published during the 2000s, which was also indicated as a delimitation of the study. The oldest study used was published in 2001 and the most recent was published in 2014. All studies were conducted by different authors.

Researchers and authors represented a variety of professions. Authors ranged from educators to psychologists to speech

language pathologists to adapted physical educators to physical and/or occupational therapists; recreational therapists were not represented in the authorship of these articles. This lack of ownership by one profession demonstrates the vast use and interest by various professions into the therapeutic use of music with children who have autism. Additionally, these individuals represented a number of countries including the United States, Australia, Great Britain, and Canada.

Another theme was that the use of music as a therapeutic intervention has been studied with primarily single subject or small group designs of no more than 26 participants. The studies primarily used children of various ages ranging from 2 to 19 years old, with the majority of participants being boys.

The fourth theme involved the primary focus of the studies which was on social and communication skills. Most of the studies focused on social skills development to improve communication. The studies also focused on responsiveness to interaction, engagement, improving attention, and understanding and managing emotions.

Additionally, there were a variety of methods used to measure outcomes. The assessment tools most frequently used were The Autism Diagnostic Observation Schedule and the Vineland Adaptive Behaviour Scales. A smattering of other tools, including Mullen Scales of Early Learning, Childhood Autism Rating Scale, Peabody Picture Vocabulary Test, Music Therapy Coding Scheme, and Picture Exchange Communication System were also used: Thus, no one particular assessment tool tends to be used for evaluating social and communication skills for children with autism.

Table 2
Systematic Review of Literature

Investigator/s and Year	Subjects	Intervention or Activity	Theoretical Foundation	Focus	Measure/s	Outcome/s
Camahan, Musti-Rao & Bailey (2009)	Six Caucasian children (five males, one female) with school-based identification of autism and one with other health impairment, ranging from 6 to 11 years, 5 months receiving services in a special education classroom	Use of interactive educational material paired with music to increase engagement	None	Engagement and responsiveness to teacher-led activities	Teacher Postintervention Acceptability and Importance of Effects Survey	Increased engagement. Increased teacher satisfaction.
Dieringer & Porretta (2013)	Two male preschoolers, four years old, diagnosed with autism and off-task behaviors	Compare baseline (no music – A) to intervention (music – B). Physical demo and instruction for gross motor activity with/ without lyrical songs with instruments as music ABAB – 20-23 minutes 3x/wk. x 10 wks.	Behaviorism	Off-task behaviors during gross motor activities	Academic Learning Time in Physical Education (ALT-PE)	Decrease in off-task behaviors when music used
Finnigan & Starr (2010)	A 3-year, 8-month-old Filipino girl with autism.	The use of music as a therapy in an early behavioral intervention program for children with autism.	Developmental theory, Social Theory	Social responses, avoidant behaviors. Improve peer interactions and meaningful play.	Standard Assessment Tools, Mullen Scales of Early Learning, Vineland Adaptive Behavior Scales, Childhood Autism Rating Scale, Autism Diagnostic Observation Schedule	Increase in socially acceptable behaviors. Increase in social responsive behaviors. Decreased social avoidant behaviors.
Francis (2011)	Twelve children aged 9 to 19 years at a residential school for children people with profound and multiple learning disabilities	Use of “The Listening Program” a commercial music auditory stimulation designed to develop listening and processing skills	Tomatis auditory processing theory	Attention to task, concentration, engagement, anxiety level	Profound Education Curriculum profile, family questionnaire, observation	Improvements in levels of concentration and engagement with a person. Increased social engagement by girls in the study.
Gee, Thompson, & St. John (2014)	A 7-year-old female with ASD with auditory sensory over-responsivity	Home based and caregiver provided psycho-acoustically modified classical music (“The Listening Program”) 15 minutes 2x/day x 5 days/wk. x 10 weeks	None	Responsiveness to auditory stimulate and self-stimulating behavior	Sensory Process Measure, Sensory Over-Responsivity Scales	Decrease in negative and self-stimulating behavior.
Kern, Wolery, & Aldridge (2007)	Two boys with Autism ages 3 years, 5 months, and 3 years, 2 months	Individualized greeting songs with lyrics matching the five steps of the greeting routine	None	Using music to reduce the impact of transitions on children with Autism	Picture Exchange Communication System	The songs assisted the children in entering the classroom, greeting the teacher and/or peers and engaging in play easing the morning transition into the classroom
Molnar-Szakacs & Heaton (2012)	20 children, some with ASD and other typical developing at a school	Short sentences, environmental noises (like a door closing) or short excerpts of classical music		Patterns of attention, emotional recognition		Increased response to music when compared to sentences or environmental sounds. More responsive to sounds than typically developing peers.

Table 2 (cont.)

O'Connor & Dieringer (2014)	One 11-year-old male with ASD who displays self-stimulating and self-injurious behaviors, as well as sound aversion and lack of receptivity to social interaction	Behavioral responses when different types of music played (whale songs, didgeridoo, Pink Floyd, tuba and piano, "Old Man River")	None	Increasing physical activity by reducing behaviors	Observational review and data recording from videotapes of sessions	Behavior varied with the type of music. Some music had impact on decreasing self-stimulating and repetitive behaviors, as well as increased engagement and appropriate social behaviors.
Quintin, Bhatarra, Poissant, Fombonne, Levitin (2011)	26 Canadian children and adolescents with a ASD diagnosis, ranging in ages from 10 to 19 years old; three with ASD, 13 with Asperger's, 10 with PDD-NOS	Use music to assess emotional recognition expressed in music	Hill et al. (2004) argument that although individuals with ASD show some degree of insight, there is a dissociation between their experience and their descriptions; Amygdala theory of autism	Understanding and identifying emotions	Social Responsiveness Scale, Social Communication Questionnaire, Digit span and letter-number sequencing scales from Wechsler Intelligence Scale for Children (4 th ed.), Salk & McGill Musical Inventory, Queen's University Music Questionnaire-revised	Adolescents with high functioning ASD able to recognize basic emotions in music such as happy, sad, and scary.
Raglio, Trafficante, Oasi (2011)	Case Study, 7-year-old autistic child diagnosed with autistic disorder	The use of free sonorous-musical improvisation in patient-therapist interactions to build a dialogue to reflect the emotional state of the relationship	Intersubjectivity perspective in which music based upon the use of musical instruments can facilitate expressive or organizational processes and could lead the patient and therapist to a moment of affect attunement	Promoting the regulation of emotional components	Music Therapy Coding Scheme (MTCS)	Physical contact, looking at each other, attuned movement, and approach to each other remarkably increased
Simpson & Keen (2011)	Previous Studies	The presence of music and its use with individuals who have autism	Social Inclusion	Social inclusion, Interaction with peers. Atypical behaviors.	Literature Review	Improved signing skills. Improved engagement in activities. Positive peer interactions. Developing joint attention and positive emotional communication. Experiencing higher levels of joy. Increased eye contact. Increased independent functioning. Reduction of atypical behavior.
Sandiford, Mainness, and Daher (2012)	12 nonverbal children with autism. Ages 5 to 7	Using melodic-based approaches to improve communication	Melodic-Based Communication Therapy	Improving Communication	The Autism Diagnostic Observation Schedule	Gains in verbal attempts and imitative attempts. Significant increase in number of both taught and untaught words used in the home environment. Increased motivation to complete tasks.
Stephens (2008)	Four children (two males, two females) with ASD ages 5 years, 2 months to 8 years, 9 months at a school	Using music, dance, instruments, and vocalizations to increase social interaction	Social behavior and imitation, Milieu interventions	Willingness to imitate and engage spontaneously in a reciprocal social interaction	Childhood Autism Rating Scales, Vineland Adaptive Behavior Scales-Communication	Increased spontaneous actions and word imitations. Joint attention in imitation behaviors within musical play
Vernon, Koegel, Dauterman, Stolen (2012)	Three children with autism diagnosis, ages 2 to 4 years old.	Teaching parents to use everyday items (toys, music, etc.) to increase engagement and interaction	Home-based care, Pivotal Response Treatment	Engagement and responsiveness	Autism Diagnostic Schedule, Autism Diagnostic Interview-Revised	Increased eye contact. Increased positive affect. Increased verbal initiations. Increased parent affect and engagement. Increased child and parent behavior.
Wigram & Gold (2006)	Previous Studies (Review Article)	Music therapy interventions involving active, improvisational methods	None	Music Therapy Interventions	Critical View of Literature	Improvements in communicative behavior, language development, emotional responsiveness, behavioral control. Most notable outcomes included promoting interpersonal communication, reciprocity, and the development of language-building skills

The final theme identified included the outcomes of studies using music as a therapeutic intervention. These outcomes consisted of improved social skills, communication, and behavioral regulation resulting in improved overall functioning. The most notable outcomes included promoting interpersonal communication, reciprocity, and the development of language building skills. Major themes are further detailed in the next section of the manuscript.

In summary, the literature on therapeutic use of music used in this review was written by various authors. No theories were identified that supported the therapeutic use of music as an intervention for children along the autism spectrum. On the other hand, several studies identified similar results in improvements in social and emotional functional areas including increases in appropriate social skills, communication, emotional understanding, and behavioral regulation.

Findings

The following section details the five different outcomes identified for the use of music as a therapeutic intervention for children with autism. These outcomes are: an increase in socially acceptable behaviors, increased social responsive behaviors, increased verbal communication, increased recognition and/or understanding of emotion, and decreased anxiety.

Increase in Socially Acceptable Behaviors

Individuals with autism often display inappropriate behaviors contributing to the lack of social acceptance. These behaviors include inability to follow directions, regulating voice level, and utilizing self-stimulation or repetitive behaviors (Dieringer & Porretta, 2013; Finnigan & Starr, 2010). Self-stimulating behaviors

are often used to compensate for a lack of stimuli or oversensitive reaction to stimuli, and include behaviors such as rocking, using pressure, and chewing on objects (Finnigan & Starr, 2010). As an intervention, multiple studies found that auditory stimulation in the form of music is preferred by individuals with autism and that these individuals tended to engage with music for longer time periods when compared to typical individuals their own age (Simpson & Keen, 2011).

Researchers found changes in self-stimulating behaviors depending on the type of music or sound used. For example, in O'Connor and Dieringer (2014), the study subject displayed less repetitive behavior of chewing or pulling on clothes when listening to a whale song versus listening to a classic rock song which resulted in increased chewing and picking or pinching of the face. In another study, Gee, Thompson, and St. John (2014) found a decrease in negative and self-stimulating behaviors following the use of "The Listening Program," which uses classical music. While one cannot make generalizations to the ASD population due to the extremely limited size of these studies, the studies demonstrate that different types of music and sounds may increase or decrease self-stimulating behaviors.

Additionally, research supports the use of music to increase attention to task, direction following, and task completion. Dieringer and Porretta (2013) specifically focused on using music to maintain attention to task when working on gross motor skills. The researchers found that participants (two male 4-year-olds) stayed on task better when age appropriate music with lyrics and instrumentation were played than when it was not. Francis (2011) studied the effects of a commercial product called "The Listen-

ing Program” upon children with ASD and learning disabilities to determine if the program impacted mood, attention to task or engagement. The researcher found that attention to task improved for children with autism following participation in the program which used classical music with advanced sound processing techniques. Additionally, Carnahan, Musti-Rao, and Bailey (2009) studied the effects of interactive educational materials used with music to increase students with autism’s engagement in group activities. While this study focused on academic engagement, there are still implications for therapeutic recreation in that instruction with music showed increased engagement.

Increase in Social Response Behaviors

Common characteristics of individuals with autism are avoiding eye contact, not looking at objects being pointed to, imitation such as repeating words or phrases, and difficulty relating to or showing an interest in other people (CDC, 2014b). Francis (2011) found that children with autism, particularly girls, showed improvements in social engagement following participation in “The Listening Program.”

Additionally, music improvisation can increase social response behavior. Music improvisation is defined as the free performance of music, typically not planned or written down and made up at the time of the performance (Cambridge Press, 2014; *Encyclopedia Britannica*, 2014). Music improvisation allows individuals with autism to start a musical “dialogue” or “conversation” with the recreational therapist creating a reciprocal nonverbal bond (Raglio & Traficante, 2011). Through this, individuals bond with their therapist and begin to change their internal world: This allows both

individuals to be creative and begin an interactive/response through music playing, creating sounds and melodies. According to the researchers, once this occurred, increased eye contact, approach, and imitative movement followed (Raglio & Traficante, 2011).

Finnigan and Starr (2006) further demonstrated this in their case study, showing specific changes the use of music makes in terms of social responsiveness. Their intervention consisted of three toys, singing, and a guitar. The therapist would sing and play guitar while using verbal prompts and imitation to engage a client in the activity. Interventions consisted of 15-minute sessions, four times a week, for 29 total sessions. The client’s social baseline was recorded for the first eight weeks, during which time no specific interventions were implemented. Following, there was an alternating phase of music and non-music over 12 sessions, with seven additional sessions implemented with music as the sole means of intervention. For research validity and reliability, after the seven music intervention sessions, two follow-up sessions with no music were offered. Outcomes showed that when the non-music intervention occurred there was no eye contact in contrast to the seven music intervention sessions which resulted in eye contact six out of seven sessions with a range of three to five occurrences each session. The strength of this data were seen when there was no eye contact with the therapist for sessions when no music was offered. The researcher concluded that eye contact was not based on the therapist/client bond despite multiple sessions together but rather due to interaction through imitation.

Stephens’ (2008) study used music to investigate children with autism’s willingness to spontaneously interact by

imitating the researcher. The researcher used musical play routines, allowing the children to either participate or not participate on their own, through dancing, playing or verbalizing. The results were mixed in that three of the children demonstrated increased action and word imitation spontaneously while one showed limited spontaneous engagement.

Finally, Vernon, Koegel, Dauterman, and Stolen (2012) taught parents how to use music to increase social engagement and behaviors between them and their child with autism. The results demonstrated that using music as a structured activity led to increased eye contact, improved verbal imitation, improved affect, increased parent and child behaviors and engagement.

Increase in Verbal Communication

Approximately 30% to 50% of individuals with autism do not develop practical verbal speech skills (CDC, 2014b; National Autism Association, 2014; Sandiford et al., 2013). Of the remaining individuals with autism, most develop some verbal speech. However, these individuals may use speech in different ways such as repeating words or phrases, repeating what others say or have difficulty putting words into sentences (CDC, 2014b).

Music has the ability to increase verbal communication. One music-based technique used is the Melodic-Based Communication Therapy (MBCT), which has proven to increase verbal communication during the critical five-year span of language development (Sandiford et al., 2013). Unlike improvisation or spontaneous use of music, MBCT uses a preprogrammed melody to elicit specific words while adding rhythm, usually clapping. MBCT is a practical method that does not rely on instruments and the

sessions are portable from one setting to another; further, the approach was developed by a speech language pathologist to facilitate language development (Autism Speaks, 2014b; Sandiford et al., 2013).

A pilot study on MBCT (Sandiford et al., 2013) examined 12 children aged 5 to 7, measuring outcomes using the Autism Diagnostic Observation Schedule (ADOS). The ADOS is a standardized assessment using behavioral observation to assess and diagnosis ASD, specifically focused on communication, social interaction, and play (Lord, Risi, Lambrecht, Cook, Leventhal, DiLavore et al., 2000). Specific measured outcomes consist of the number of verbal attempts, number of correct words, and number of words reported by the parents. Sandiford et al. (2013) examined 25 words that were known to be words that children typically learn first and paired each word with a melody. The goal of the study was for the children to learn all 25 target words during 45-minute sessions in a five-week period. Results concluded that compared with the control group, MBCT children made stronger gains in verbal communication in a shorter amount of time (Sandiford et al., 2013).

In addition to MBCT, language teaching music can be utilized at home and in the community leading to successful social interactions in everyday life. Language teaching music acknowledges the connection between music and learning, and in particular learning language (Koning, 2011). Language teaching music can take the form of favorite songs, a variety of instruments, or leading a creative music group. Music can be introduced in natural settings including the classroom and home, creating a motivational tool for children with autism to participate in language acquisition.

Increase in Understanding or Recognition of Emotions

During typical child development, emotional and social skills develop through experience, observation, and imitation (Molnar-Szakacs et al., 2009; National Center for Infants, Toddlers, and Families, 2012). This is not the case for children with autism who often experience social isolation or lack of meaningful personal relationships due to an inability to understand others' emotions and difficulty expressing their own (Autism Speaks, 2014b; CDC, 2014a; Molnar-Szakacs et al., 2009).

As suggested by the opening quotes, music is a powerful tool, eliciting emotions from listeners through tempo, intensity, rhythm, and pitch. Five emotions widely expressed in music are happiness, sadness, anger, love and fear (or its opposite peace) (Juslin, 2013; Quintin, Bhatara, Poissant, Fombonne & Levitin, 2011). These emotions have an impact on individuals with autism. Research has demonstrated an increased motivation and interest in music allowing therapists to use music as an avenue to emotional understanding and experience (Molnar-Szakacs et al., 2009; Sacks, 2006).

Quintin et al. (2011) focused their study on children with autism and the children's ability to understand emotions expressed in music. They used music defined as happy, sad, scary and peaceful. The findings of this study indicated that some emotions were easier for adolescents with ASD to understand than others; particularly happy, sad and scary, whereas peaceful was the most difficult to understand. Furthermore, an adolescent's verbal ability affected their ability to express perceptions of emotions accurately. Quintin et al. (2011) wrote, "Studies of emotion recognition, so far, are more consistent in the musical domain than

the visual domain... Music seems to be a channel through which emotions can be communicated to individuals with ASD" (p. 1251).

Of interest is the use of music-based social stories. However, little research has been conducted on this. The only identified study was by music therapist Katagiri (2009) talking about the effectiveness of this intervention. Music-based social stories are written social situations with dramatic social cues which are then sung with emotion specific music cues. These songs contribute to individuals with autism and their understanding of social skills and emotions by creating a motivational avenue for learning. Emotion provoking music pulls upon the elements of music that create a story with melody, frequency spectrum, and rhythm (Katagiri, 2009). This intervention is mentioned as it has shown to impact emotional understanding as social stories are often used within the field of therapeutic recreation.

Decrease in Anxiety

Anxiety is a common issue for individuals with autism (CDC, 2014b). To reduce feelings of anxiety, it is important for individuals with autism to have structured routines (CDC, 2014a; Hagedorn, 2004). Routine is a form of predictability in an unpredictable world, offering individuals with autism stability in their environment to express themselves and feel comfortable. Examples might include ordered morning tasks, structured classroom activities, and consistency in who picks the child up from school. Additionally, to reduce anxiety, it is important to decrease stress during non-routine activities, such as by using a schedule or timer.

Kern, Wolery, and Aldridge (2006) found that music improved participation for two 3-year-old boys with autism in an inclusive classroom setting. In a morn-

ing greeting song the lyrics shared the five- step greeting routine. The teacher implemented the song once a child entered the classroom and sang the song in time with the child's actions. The children's behaviors preintervention included ignoring the teacher, screaming, or lying on the floor outside the doorway. Postintervention showed each child independently transitioned with music, decreasing socially inappropriate behaviors and increasing social inclusion with typical children.

Music is also offered as a method for implementing stability into the life of a child with autism. Music follows a common framework. Each song uses pulse, tempo, and rhythm in such a manner that allows listeners to predict what should come next. This provides an opportunity for self-soothing through the provision of security and consistency when children become over or under stimulated, have a sudden change in routine (needing a transition), or are frustrated (Hagedorn, 2004; Wigram & Gold, 2006).

Conclusion

The purpose of this literature review was to see if evidence based outcomes occurred when using music as a therapeutic intervention with children on the autism spectrum. It was found that there is an improvement in social skills, specifically socially acceptable behaviors, social responsive behaviors, verbal communication, recognition of emotion, and a decrease in anxiety. This literature review was conducted using 17 databases and 15 studies that were chosen based upon the search keywords of autism, children, interventions, music, and recreational therapy. Results showed a trend in recent research that used primarily single subject and small group studies focusing

on social skill development and improvements in social functioning.

Based on these studies, it is concluded that individuals with autism benefit from the therapeutic use of music in social functioning by decreasing social isolation and increasing interpersonal relationships. Using music as a therapeutic intervention is a versatile approach and may be used to teach parents and teachers techniques helpful in everyday situations.

Summary and Implications for Practice

As a result of this literature review, the researchers were able to address their research questions.

The first question was "What are the evidence-based outcomes of music when used as an intervention with children on the autism spectrum?" Evidence-based outcomes were evident throughout each of the articles. Studies reported outcomes that consisted of increases in verbal communication, attention span, socially acceptable behaviors, social skills, emotional understanding, language development, and peer interactions (Dieringer & Porretta, 2013; Finnigan & Starr, 2010; Francis, 2011; Kern, Wolery & Aldridge, 2007; Quintin et al, 2011; Raglio et al., 2011; Wigram & Gold, 2006). While the presence of music increased behaviors in some situations, it also decreased anxiety, stress, and stimulation in other scenarios (Gee, Thompson & St. John, 2014; O'Connor & Dieringer, 2014). Furthermore, in studies where a group of individuals were engaged in playing and creating musical melodies, the outcomes consisted of increased eye contact, engagement, and social responses (Carnahan, Musti-Rao & Bailey, 2009; Francis, 2011; Molnar-Szakacs & Heaton, 2012; Stephens, 2008). Interventions that consisted solely of rhythmic clapping had outcomes of increased verbal communication, social

interaction, and engagement (Sandiford et al., 2013). When music is used as a listening tool in classrooms and at home, the outcomes included decreased stress and increased productivity (Wigram & Gold, 2006). The evidence-based results provide support for music being used as an intervention that contributes to an increase in the quality of an individual's life and social functioning.

The next question focused on the genre or type of music that was most effective. The studies indicated a variety of music types were beneficial and effective, with no specific style more dominant than another. However, in these studies, classical music and nature sounds had the most positive effects when compared to classic rock music (Francis, 2011; Molnar-Szakacs & Heaton, 2012; O'Connor & Dieringer, 2014; Quintin et al., 2011).

In addressing the third question of what severity of autism does music have an impact upon, it is concluded that music is effective and can be used with all levels of severity on the ASD. When music is used with individuals who are lower functioning displaying minimal verbal skills, the outcomes consisted of increased verbal communication and an improvement in daily functioning (Sandiford et al., 2013). Individuals classified as being high functioning on the autism spectrum benefitted from the intervention of music in areas of increased social response behaviors and a decrease in anxiety (Raglio & Traficante, 2011; Wigram & Gold, 2006). Based on these studies, it appears that music is effective and beneficial for a majority of individuals who have autism, regardless of the severity.

When determining the ideal session frequency and duration to bring about evidence based outcomes, research question four; it is concluded that the intervention of music works best when it is

used in increments of 30 to 60 minutes at a time for four to five times a week (see Table 1). Clearly, research indicates that music should be used as a therapeutic intervention on a regular basis to consistently target desired behavior changes.

The researchers concluded that environments where there is structure are the ideal settings for the intervention of music. This addresses question five about the most successful setting and environment for the use of music with individuals who have autism. Home and school environments were the main settings used throughout the studies. Environments that are predictable were favored by the study subjects (Wigram & Gold, 2006).

Music has a significant potential to impact individuals with autism when it is used as a therapeutic intervention by recreational therapists. Recreational therapists should consider the following when implementing music as a therapeutic intervention:

- RTs should measure outcomes and examine benefits using appropriate tools that reflect the desired goals and outcomes.
- Classical music and nature sounds should be used more than others to elicit desired responses.
- Clients' interests and responses to various types of music should be assessed, as individuals may respond to other types of music.
- Music as a therapeutic intervention can be used effectively with individuals with varying levels of functioning along the spectrum disorder.
- Sessions should be 30 to 60 minutes in length, four to five times per week.
- The use of predictable and known environments (such as home or school) provides the best setting in which to conduct the intervention.

Recommendations for Further Research

Based on the identified outcomes of this literature review, the following recommendations for further research to document effectiveness of the therapeutic use of music as a therapeutic recreation intervention are shared. There is an evident need for more therapeutic recreation specialists to conduct research in this area. Additionally, research that is extended to databases beyond those not included in the Grand Valley State University system or interlibrary loan program is necessary. Further investigation and because there were few citations (refer to Table 2) that documented theoretical foundations for the use of music as a therapeutic intervention for individuals with autism, there is a need to identify theoretical and conceptual underpinnings to support the use of this intervention when conducted by recreational therapists.

More research would provide treatment protocols and a standard for the practice of the therapeutic use of music as an intervention. There were no standardized protocols for duration of session, frequency of the sessions, group size, or techniques to use when conduct-

ing music as a therapeutic intervention with individuals who have autism. With this valuable information, practitioners may be intentional during their client interventions.

Additional experimental research is needed to support the effectiveness of this intervention, specifically for use in the field of therapeutic recreation. Experiments with large sample sizes comparing the effectiveness between experimental and control groups are needed to support evidence-based practice.

Another recommendation is to determine if there is a relationship between severity of the autism, age of participants and the therapeutic outcomes of using music as a therapeutic intervention with children along the autism spectrum. The variance in subjects and larger sample sizes would result in experimental findings that could be applied to the pediatric population along the autism spectrum. According to current information, music is an effective intervention when used with children along the autism spectrum but more research is needed to support evidence-based practice of the therapeutic use of music in therapeutic recreation.

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