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**CONSTRUCTIVE INFLUENCE OF MUSIC AND ACOUSTICS FOR STUDENTS WITH
AUTISM SPECTRUM DISORDER (ASD)**

**A MASTER'S THESIS SUBMITTED
TO THE FACULTY OF BETHEL UNIVERSITY**

BY

WILLIAM JAY ZIESMER

**IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF THE DEGREE OF
MASTERS OF ARTS IN SPECIAL EDUCATION**

SEPTEMBER 2023

CONSTRUCTIVE INFLUENCE OF MUSIC AND ACOUSTICS FOR STUDENTS

WITH AUTISM SPECTRUM DISORDER (ASD)

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APPROVED

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SEPTEMBER 2023

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I couldn't have gotten through the experiences of graduate school without the help and support of my family, friends, and dogs. They have shown me the support and care that I have gotten from them into my practice as an educator. Showing myself how to be the person I can be. For that, I will be forever humbled.

My professors, thesis advisor, and fellow teachers have taught me a great amount of knowledge and understanding through these experiences of not just becoming a teacher but also through the winding pathways of life.

ABSTRACT

Music is one of the oldest building blocks in human civilization and throughout most of human history. It's played a crucial role in the education system of many students throughout the United States and across the world. Music can provide students with a lens into many aspects of learning, such as theme, culture, and self-control. Music education and proper sound implementation can be valuable resources that can be used for students with abilities both inside and outside the classroom. However, students who have mild to strong disabilities such as Autism Spectrum Disorder (ASD) have shown that music and excessive sound can have both positive and negative influences on student development. This literature review will review many aspects of positively influenced music and autistic-based learning and Autism Spectrum Disorder through the exploration of scholarly journals. The application thesis adventures through multiple musical-based learning models/interventions to support the positively based interactions with students with Autism Spectrum Disorder.

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CHAPTER I: INTRODUCTION

Thesis Writer's Story

The writer of this thesis was an intermediate setting four paraprofessional for five years and has had a multitude of positions working with students with various physical/mental health needs. The writer is now a special education teacher for a public school center-based elementary Autism Spectrum Disorder (ASD) program and co-teaches adaptive music classes with the writer's current school band teacher. These hands-on experiences and responsibilities enlightened the writer on the importance of supporting mental health needs in the school setting and the community. This could be seen particularly during the transition from intermediate districts to public districts. Mental health needs and services have seen rapid successive growth over the past decade in most states in the country, including the state of Minnesota. The MREA or Minnesota Rural Education Association (2019) stated that the number of students who receive special education services has increased from 115,000 in 2003 to 147,00 in 2019. The evaluation also showed that the number of students receiving special education services is readily increasing amongst most counties in the state of Minnesota. The only exceptions are core cities such as Minneapolis and St. Paul.

When observing school administration officials and special services advisors such as Individual Education Plan (IEP) teams, Occupational Therapy/Physical Therapy (OT/PT) specialists, and behavioral specialists, one of the first questions when planning for special needs service provision is where to start the process. What curriculum should be used, how much of the service will the student need, and how will the service become a positive outcome on the student's academic or behavioral progress? The time spent on finding solutions to these

questions can put a strain on the IEP team, the family of the student, and the student themselves. Fortunately, the rise of mental health awareness has increased dramatically in the last 20 years. Showing not only a quantity of different practices and teaching methods tested to improve academic success but also showing the quality of resources and of those practices to help improve student well-being. The effort strives to decrease both the number of negative student behaviors while also decreasing the length of time of those behaviors if they occur in the classroom.

At the elementary school level, this writer noticed the high need for constructive influential teaching methods that would be accessible to all of their ASD students in their K-5 center-based classrooms. All of the students in each presentable classroom have different levels of academic performance and behavioral regulation, showing difficulty in trying to find a model that would be receptive to most, if not all, students. When this researcher started to introduce constructive music and musical-based learning in his classroom, he saw promising results and responses from the students, teachers, and parents/guardians. It is very apparent that the majority of the students view music and musical-based learning as an interactive learning experience that gives the support they need both inside and outside the classroom.

Schools are adopting musically-based learning materials in their curriculum to help support the growing need for increasing student participation, academic performance, and behavioral management in the school system. Many schools have made it a priority to include music, choir, and other classes of the arts into the schedules of students with special needs as an avenue to explore different experiences with their peers outside of the classroom setting. It is easy to forget about students with special needs being entertained by music and acoustics. It is easy to fall into the stereotypes of students with special needs, such as ASD, as being loud,

repetitive, and not a fan of bright lights or loud noises. Not only would this curriculum become a valuable asset in special education classrooms but across all classrooms in the state of Minnesota. Music has many forms of interaction with students with special needs, such as emotional expression, communication, and interpretive language, that no other form of media can provide. The writer of this thesis is very passionate about supporting students with special needs and making sure that they get the best learning experience they deserve.

How does musical-based teaching potentially change the outcome in the classroom?

The research rationale behind the topic musical integration model or musical-based teaching revolves around the idea that music and proper acoustic regulation can serve as a reputable tool and service in improving the academic and behavioral experiences of students with special needs. It is part of educators' responsibility to ensure they not only teach the necessary skills needed to ensure the continued growth of the student but also find the best teaching model that benefits the most positive result for the students and model their learning around those positive interactions. The research will demonstrate, further into the thesis, the importance of music and music-based learning on learning interactions. The research will also use a variety of music-based tools and models to strengthen the validity these practices can bring to the field of special education. One such tool that will be demonstrated later in the thesis is the Music-based Scale for Autism Diagnostics (MUSAD). The MUSAD is an observational screening tool for assessing ASD in adults with intellectual disability (ID) and limited verbal abilities (Tergeist et al., 2022). Tergeist et al. (2022) explained that the screening tool will prompt and diagnose relevant behavior in twelve musical instrumental situations.

Academic research over the recent years has focused on this topic more extensively from many different angles, and this thesis will demonstrate the effects of music-based learning with an emphasis on serving the academic and behavioral needs of students with special needs both inside and outside the school setting.

Academic performance

Academic performance is important throughout children's educational careers. Special education students need to be able to receive the best forms of teaching in order to retain the vital information needed in their educational experiences. It is also extremely necessary for teachers to find the best formulas that resonate with their students in the classroom. But what can deter special needs students from understanding the content being presented to them? Many know that motivation, personal interest, presentation, and more can affect all aspects of how a student operates in the classroom. These aspects can also be applied to practice in the home as well as in the community. The proper responses to these aspects, while also effectively implementing the appropriate modeling/scaffolding techniques, could potentially affect the student's academic performance in positive ways.

Music-based learning is not just limited to classes of the arts, such as band or choir. But this model of teaching can be implemented in all areas of educational learning. Areas of difficulty apparent with most students with ASD are the subjects of reading and writing. Researchers have asserted that "children with ASD presented with limited ability to form gestalts, a necessary skill required for reading and social comprehension" (Schwartzberg & Silverman, 2016, p. 55). In Schwartzberg's study, their goal was to investigate the effects of singing versus reading a short story on the short- and long-term reading comprehension of

children with Autism Spectrum Disorder (ASD). It was mentioned in the results that “The use of a live music-based short story may have resulted in increased cognitive arousal and attention span aiding in immediate and long-term increased comprehension of the experimental group” (Schwartzberg & Silverman, 2016, p. 58). Therefore, cross-modeling music-based learning models have immediately affected the academic performance of students with ASD.

Behavioral Management

When interacting with students with Autism Spectrum Disorder, there are commonalities that are shared among most ASD students. Some of these common tendencies are experiencing difficulties with processing and regulating auditory sensations and being hypersensitive to particular sounds or smells (Carmen et al., 2022). The irregularities in these senses can cause either selective attention or provoked overstimulation of these senses, depending on the individual. In correlation with these effects, moderate to severe behavioral responses tend to be seen from ASD students as a format of adapting, interacting, or retaliating to the stimuli. In order to help regulate and prevent significant behavioral responses, many ASD specialists have created various intervention models/tools to help with behavioral regulation. Physically interactable tools, such as fidgets and toys, are used while also creating interventional methods, such as the Behavioral Intervention Plan (BIP), to help teachers and staff prepare and respond to current and future unwanted behavioral responses.

While children with ASD may reject or ignore sensitive sound stimuli around their environment, music appears to be one of the few forms of auditory engagement that is accepted with positive responses. Carmen et al. (2022) found that “people with ASD can exhibit emotions when listening to ‘happy’ or ‘sad’ music, despite their deficit in understanding emotions in

non-musical social communication” (p. 121). In Carmen’s study, the purpose of the study was to investigate whether listening to specific sounds and music would reduce disruptive behaviors. The results stated that “Consonant music appeared to decrease disturbed behaviors compared with the other types of music and proved more effective than silence” (Carmen et al., 2022, p. 132). This demonstrates that using music can be a formattable tool to help regulate and manage behavioral management with students with ASD.

Thesis Question:

- 1) How do music and music-based teaching positively impact constructive student learning for students with disabilities?**
- 2) And how can music-based teaching positively impact behavioral regulation for students with disabilities?**

CHAPTER II: LITERATURE REVIEW

Research process

This researcher used many different resources to acquire the right research (such as peer-reviewed journals and articles) for this thesis. Bethel's online library search engine was one of the main sources used. Many of the resources found at the library led to different research engines such as PsycINFO and EBSCOhost. Keywords that were used in the search engines to find the required source materials were: music, music-based learning, music therapy, music integration, academic performance, academic progress, behavioral regulation, behavioral learning, social skills, and autism spectrum disorder.

Academic Performance

It is important to understand how music-based learning and acoustics can impact individuals with ASD. The purpose of this research project is to understand all of the aspects and impacts that music-based learning can have on the academic performance and behavioral management of students with ASD. Music-based learning is a wide topic with multiple different avenues of implementation. So it is important to analyze these avenues and the positive impacts they have on special needs students both inside the classroom and outside the classroom.

How do music and music-based teaching positively impact constructive student learning for students with disabilities?

Schwartzberg & Silverman (2016) researched the effects of a music-based short story on short- and long-term reading comprehension of individuals with Autism Spectrum Disorder. Reading skills, such as many other forms of learning, are conducted through a three-tier process

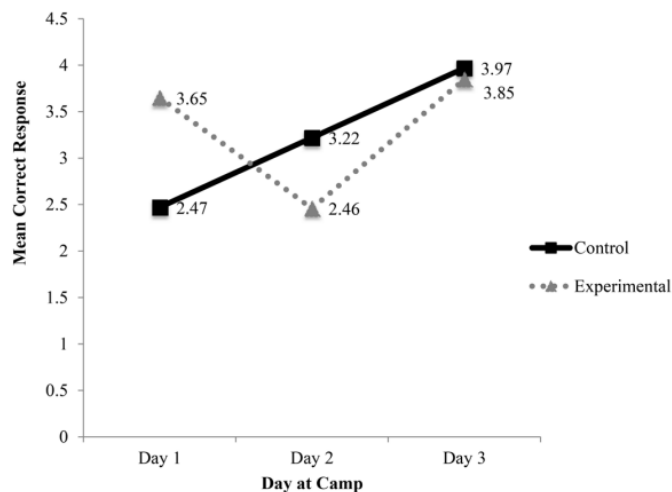
of learning. These three tiers go into the order of tier one being “knowledge” of the material, followed by tier two sage of “comprehension” of the material given to the student, concluded by tier three being the “application” of the student's understanding of the information. These tier-levelled processes are a function of all forms of learning.

Being able to remember and comprehend both what one reads as well as hears are two separate cognitive skills; both are vital skills required not only for academic progress but also for the acquisition of social skills (Schwartzberg & Silverman, 2016, p. 54). Understanding this idea can apply heavily to students with ASD. In this case, ASD students have demonstrated deficits in language acquisition and reading comprehension. Researchers determined that auditory stimulation in the form of a song resulted in increased frontal gyrus activation and increased frontal-posterior functionality connectivity relative to speech stimulation. This led Schwartzberg & Silverman (2016) to theorize that music might be an engaging blending technique to help promote brain activation, resulting in increased communicative abilities in children with ASD.

The methods used in the Schwartzberg & Silverman (2016) randomized study consisted of 108 camping students that attended three separate weeklong summer camps. During each weekly camp session, 36 participants were picked and then evenly separated into six groups. All of the participants had a primary diagnosis of autism spectrum disorder (ASD). The instruments assigned for this study consisted of a Comprehension Check (CC), a short story, and a musical instrument. The CC assigned to each student consisted of a series of five close-ended (yes or no) questions relating to a short story to measure comprehension. The questions written in the CC incorporated the same vocabulary integrated into the assigned short story.

The short story selected for the study was “The Magic Tree” by Pablo Pedro Sacristan Sanz. The story was found using an internet search parameter using keywords such as “short stories for children ages 9-14.” Although the top age range of participants in the current study was 21, the researchers felt that “using the average age would not only address the chronological age but also the developmental age of all participants in this group-based study” (Schwartzberg & Silverman, 2016, p. 56). Finally, the music played along with the short story was an original composition created by the researchers. The musical piece was in the key of C Major to serve as the song employed for the experimental group. The researcher accompanied herself/himself on a steel-string acoustic guitar.

Results of the study showed that while there were “...no significant between-group differences, results were significant for day and there was a significant interaction concerning day by group” (Swartzberg & Silverman, 2016, p. 57). While both groups demonstrated improved comprehension of the reading material, the experimental groups showed a slightly higher mean average of correct responses on the CCs over the course of the three days. The success of both groups could be through the enhanced deliverance of the material through auditory and visual cues. The researchers found increased comprehension of the experimental group on day 1. This could be resultant of a higher attention span and arousal during the delivery of the music-based short story. Swartzberg & Silverman (2016) concluded that information processing is enhanced by music-induced arousal and that there is a strategic role for music in both educational and therapeutic settings.



The integration of music into a learning system can show benefits when implemented alone. However, one of the great things about music and music-based learning is that it can be combined with other forms of teaching tools within the environment. With the advancements in classroom technology, music and electronics can create a new form of hands-off and hands-on interactional learning not available before the turn of the 21st century.

Barnes et al. (2021) studied the effects of music and technology by conducting an exploratory comparison study between typically developing students and students with autism within a musical dance game with child-robot interaction. The study will focus on three major therapeutic services for learning. These services are music, robotics, play, and dance therapy. Each of these therapies and interactions encompasses a variety of techniques that are mixed and combined, including receptive, recreative, compositional, improvisational, and musical activity (Barnes et al., 2021, p. 251). While children with autism have difficulties with managing socio-communication and responsive behaviors, many autistic children possess a musical

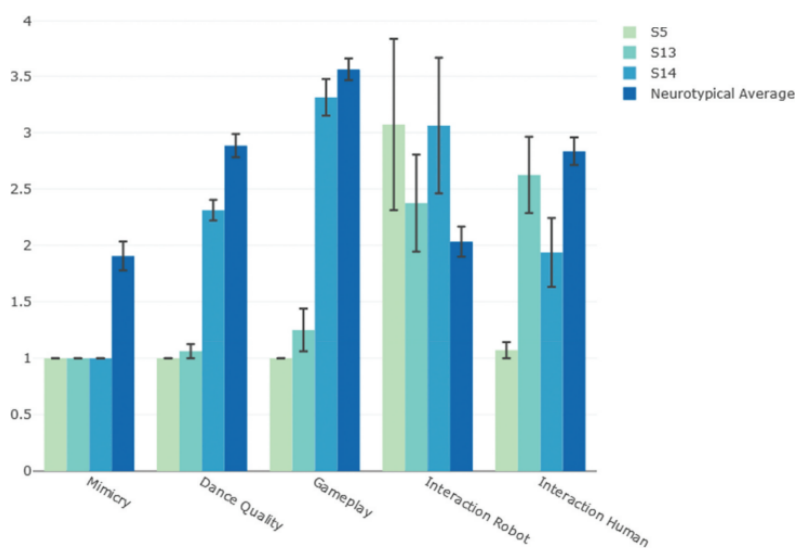
potential that can be developed with significant results. The researchers conducted the study with three primary questions: First, is there a difference between typical development (TD) children and autistic children while playing a physical musical game? Second, is there a difference between how children interact with a humanoid robot and an adult human partner during the game? Finally, how do different music choices influence the interaction of children and robots or children and an adult human during the game?" (Barnes et al., 2021, p. 253).

Barnes et al. 's (2021) methodology played a game titled "Dance Freeze," which is a children's game in which the children dance while the music is playing and freeze in place when the music pauses randomly. The freeze game was selected as a base test as it incorporated all four therapeutic services of music, play, robotics, and dance within the activity. The researchers decided that proper music choices were critical to the study. A music validation was then conducted by having participants evaluate a set of potential songs. All songs were required to be positive and pleasant, as critiqued by the researchers and participants. As the evaluation was finished, 12 songs were selected to be used in the study. Six of the twelve were traditional children's songs. The other six songs were classical instrumental songs. The robot used in the study was a 58 cm tall humanoid robot named NAO. NAO danced and interacted with the students when the selected music was being played.

The study participants consisted of 12 typical developing (TD) children and three children with autism spectrum disorder (ASD). The researchers titled the three ASD participants as Subjects 5, 13, and 14. Subject 5 was a nine-year-old white male who was diagnosed with ASD at age 2.5 and was nonverbal with poor social skills. Subject 13 was a four-year-old white male and was considered vocal but not intelligible by his parental questionnaire. Finally, Subject

14 was the eldest ASD subject at 12 years old. He was capable of having fluent conversations with others and also had a secondary diagnosis of cerebral palsy.

The results of the study showed that children with ASD tended to interact with the robot more than the adult human. Subjects 5, 13, and 14 also tended to show a higher score than TD children in the interaction score with the robot with the accompaniment of music. Barnes et al. (2021) also determined that upbeat music corresponded with more energetic dancing than calm music, but the music genre did not seem to have a large effect. The researchers found that the mix of music and robotic interactions showed signs of positive influence. The lack of significant results for music genre and style was indeed disappointing. They theorized that the lack of difference in the music selection may have contributed to the given results. Future research is needed on how different types of music can be used more efficiently in future experiments.



Barnes et al. (2021) demonstrated the effectiveness of combining music-based learning and technology through the use of robotics to help improve academic engagement and performance. Kossyvaki & Curran (2020) hoped to find similar results in their following study. The purpose of their study was to study the role of technology-mediated music-making in enhancing both student engagement and social communication in children with autism and other intellectual disabilities. While it is important to understand how this process will positively influence structured academics, such as grades, curriculum, and work quality, the focus on social communication, social skills, and student participation are just as valuable to a student's academic well-being. Particularly for students with ASD or other intellectual disabilities, these skills might be at the forefront of the student's IEP progress versus tangible work such as work boxes or worksheets.

Music making, encompassing musical performance and responding to music, can provide a fundamentally important channel of communication for pupils with ID, fostering their engagement even where spoken language is not possible (Kossyvaki & Curren, 2020). It provides one of the few universal experiences that is shared among all cultures, faiths, and practices across the world. Because of music's universal and innate nature, music provides an essential human experience that people of all ages and disabilities can grasp and understand in some form or capacity. It is through this mindset that Kossyvaki and Curran (2020) state that individuals with autism have shown interest in listening to and producing music due to the possibility that music offers a sense of structure and predictability. The same effects can be found in similar studies found by the authors indicating the effects of integrated technology such as computers, tablets, smartphones, video games, and more. These forms of technology appear to have a positive influence on students with autism because of the "structure, visual supports,

control over the environment and the opportunities for repetition it offers” (Kossyvaki & Curran, 2020, p.119).

With the combination of both these factors, this study has substantial value towards using music-based learning to improve academic performance for students with autism. Kossyvaki & Curran (2020) state three interest points that support their claim. Underlining firstly that “it contributes to existing knowledge through focusing on a largely under-researched population, namely that of individuals with autism and severe intellectual disabilities (SID). Secondly, this is one of the few studies involving teaching staff in the research process from the outset, giving them an active role in developing and implementing an intervention to be embedded in the school curriculum. Thirdly, the study intends to address a gap in the music education literature where there is a near-absence of any discussion of the social and relational aspects of the music-making of young children with autism and SID, especially in the form of advice for teachers in school” (Kossyvaki & Curran, 2020, p. 120).

The methodology of the study aimed to research the impact of a music-making intervention on the engagement levels and the social communication skills of children with autism and ID at school. The participants of the study consisted of five children with autism or ID and five classroom members. The staff members’ group consisted of one newly qualified teacher (NQT) and four teaching assistants. The intervention used during the study is called Cosmo units. Cosmo is an interactive hardware consisting of six switches that provide auditory and visual cues. The switches come in an array of full customization choices that can be made, such as the number of buttons, light colors, music choices, and activity choices. The music samples themselves can be customized to specific musical styles and may be mono- or

polyphonic, meaning that single tones, notes, instruments, or any combination of these can be incorporated into an activity.

Kossyvaki and Curran (2020) created a set of five different cities to be tested during the study. Each activity chosen for the study was selected because of its focus on student engagement and social communication. The first activity consisted of improvisation: each Cosmo unit was assigned one note; the child played along with a backing track as she/he wished to, touching each unit to make sounds. Secondly, exploration: the units, programmed to be touch-sensitive, enabled the music's volume or sound effects to be altered according to the amount of pressure applied by each child. Thirdly, follow the light: one unit was lit, inviting the child to make a sound; after she/he did this, another unit lit up, providing another invitation for the child to play. Fourth, orchestration: each unit was programmed to play a single instrument (e.g., guitar or drums), and the child was encouraged to build up layers of sound. Finally, turn-taking: the units were divided equally between the child and the researcher. When the researcher's units lit up, she made sounds with them. After a short time, these lights went out while the child's units lit up, signaling their turn.

The results of the Kossyvaki and Curran (2020) study indicated significant points in terms of the use of school-based technology-mediated music-making interventions to promote engagement levels and social communication skills for children with autism. They reported "some positive outcomes for all children in the sample, suggesting that the intervention can be an effective tool for all teaching staff working with such populations" (Kossyvaki & Curran, 2020, p. 131). Evidence from researchers showed high percentages of both engagement and disengagement from the five students across all eight sessions. While the findings were positive, there were however considerable within-child variations of engagement from each session to the

next. Certain aspects of engagement showed to have steadily increased across the eight sessions, such as awareness, anticipation, curiosity, and initiation. The researchers also found that other measures of engagement showed little to no progress across the sessions. These measures could be identified as investigation, discovery, and persistence.

With the assistance of music-based learning, it is clear to see that music can have academic benefits in improving the quality of learning for students with ASD. While academic scholarship is important for all students to retain the necessary knowledge needed for life outside of the classroom, in the world of special education, the teaching of social skills, community skills, and behavioral regulation is just as important to an ASD student's wellbeing. It may even be more important, depending on the needs and goals of the student. So the following question we must ask ourselves is how can music-based teaching positively impact behavioral regulation for students with disabilities?

Behavioral Management

Lense et al. (2020) conducted a study of integrated parent-child music classes and the impact it has on community participation and well-being for families of children with and without ASD. The authors named several variables that related to reduced community participation for families with children with ASD. Some of these variables stated by the authors were "Parents' (specifically mothers') own community participation in recreational activities also appears to be related to children's participation though it is unclear if this is due to joint family participation or general family attitudes toward recreational activities," as well as "Negative attitudes of other community members (e.g., stigma) toward children with disabilities and their families can be another large barrier to participation in community activities" (Lense et

al., 2020, p. 2). To improve these negative interactions, the researchers attempted to use musical play to connect family well-being and positive community integration. The authors tested this theory by using the PRESS-Play framework, which suggests that “musical play activities may provide a setting that is particularly conducive to community integration and participation since musical experiences involve predictability, reinforcement, emotion regulation, shared attention, and social play” (Lense et al., 2020, p. 3).

The methods used in the Lense et al. (2020) study involved pairing these two groups of families in which the families with TD children had no prior training/experience in working with children with special needs. One of the goals that the authors are looking for is “examining attitudes toward individuals with disabilities in school and work settings indicates that positive social contact with individuals with disabilities leads to more positive attitudes and acceptance by those without disabilities” (Lense et al., 2020, p. 2). Participants of the study were chosen via flyers for a parent-child music program posted at the university autism research center and community sites. It is important to note that for the families with children with ASD, the ASD participants had varied developmental levels of language skills, ranging from 7 to 41 months of age (Lense et al., 2020). During the study, the families participated in a 10-week parent-child music class program named “Serenade.” Serenade was led by a board-certified music therapist, who provided parent training and peer interaction in a musical play context following a manualized curriculum (Lense et al., 2020). The measures in which the results were recorded consisted of a 14-item evaluation survey at the end of the program, a 15-minute semi-structured interview with the parents, and a coding scheme to analyze children’s class enjoyment (Lense et al., 2020).

Results from the Lense et al. (2020) study identified five major themes that emerged from the interview discussions. These five themes were “(1) positive experience of class participation, (2) awareness and empathy, (3) family connections, (4) parenting strategies and skill learning, and (5) perceived changes in child behavior” (Lense et al., 2020, p. 6). From these five themes, the researchers concluded that an increased active engagement in music session activities and parents learned to employ music-based strategies in the program, in the community, and in the home. The parents of both ASD and TD students reported a sense of accomplishment in terms of their child demonstrating specific skills in the class and in the home. These skills included both musical and nonmusical skills, as reported by the parents and the observers, showing that “these caregiver impressions were supported by behavior coding indicating that children increased their active engagement in class activities over time” (Lense et al., 2020, p. 11).

While Lense et al. (2020) focused on the impact that music-based learning had on community participation and the well-being of families of children with and without ASD, Epstein et al. (2020) looked more closely at the therapeutic potentials of using music when working with verbal children on the autism spectrum. Epstein et al. (2020) conducted a qualitative study through the theory of “communicative musicality.” This theory describes the idea of supporting children to acquire self-regulation and reinforcing social communication development. For young children on the autism spectrum, promoting the regulation and organization of sensory experiences may be seen as a precondition to supporting further development in relational skills (Epstein et al., 2020). The range of music therapy practices applied to the study had been shown to support children with autism to develop verbal and non-verbal communication skills, build closer interpersonal relationships, and motivate social engagements. The researchers conducted their study with purposeful sampling with several

educational administrators who worked in programs for children with autism. The authors stated that the sample size selected was chosen based on their ability to provide the required information needed for the study.

Epstein et al. 's (2020) method of study was to analyze the constructive–qualitative method ascribed to the interpretative phenomenological analysis (IPA), along with semi-structured in-depth interviews from qualified music therapists working with children on the spectrum with moderate to high verbal skills. IPA was chosen because it allowed the researchers to create links and connections between data from individual participants and, therefore, aimed to uncover a broader understanding of their joint experience gathered into a common theme while maintaining differentiation between the individual voices (Epstein et al., 2020).

The results of the study outlined three main themes that emphasized how music therapists used music in different ways in order to attune to each child’s emotional, psychological, creative, and playful qualities. The first theme identified by the IPA analysis was described as musical infrastructure, showing a great deal of similarity in the way the participants used music to facilitate important foundational qualities to support social interaction. These positions were reflected in the descriptions offered by the participants in this study, who perceived that music often supported different forms of regulation in verbal children with autism (Epstein et al., 2020).

The second theme stated the meeting points between musical and verbal playfulness. This theme showed significant progress in adding vitality and expansion to each child’s playtime and expression during play. Results from each interviewer showed signs of music fostering the socio-dramatic or imaginative play of the child. They considered that the music helped to add meaning to the play in various ways, such as by sparking ideas for narratives and actions in the

child's play or inspiring the child to expand on their story and the progression of the play (Epstein et al., 2020).

Theme three focused on musical responses. Two main forms of musical responses were demonstrated by each child. Vocalizations that focused on the proto-musical features of the child's expressions and creative use of songs to accompany the child's play and behaviors (Epstein et al., 2020).

Epstein et al. (2020) discoveries gave great insight into the themes of how music and music-based learning can have an effect on behavioral responses in students with autism. The works of Carmen and Lopez (2022) attempted to identify the influence music has on the behavior of persons with autism spectrum disorder (ASD). Behavior within the classroom can come from a variety of different auditory perceptions from these individuals. Examples of these stimuli are distant sounds, door slamming, traffic, voices or noises from other classrooms, and other rhythmic sounds. The hyperactive responses to these sensory perceptions can link to events that may result in the development of phobias, hypervigilance, and anxiety, due to the unpredictability and lack of control of sensory input (Carmen & Lopez, 2022, p. 122). This lack of control may contribute to the students' need for self-stimulation by interacting with the described sensory perceptions. Therefore, self-stimulation to music and other sounds could prove to be a useful tool in identifying or regulating behaviors and perceiving disturbed behaviors.

The perception of music on persons with ASD can have a fortitude of effects in both positive and negative ways. While students with ASD may regret common auditory characteristics in their environment, research has shown that they will generally accept music into their list of preferred stimuli. Understanding that "people with ASD can exhibit emotions

when listening to ‘happy’ or ‘sad’ music, despite their deficit in understanding emotions in non-musical social communication” (Carmen & Lopez, 2022, p. 122). The reaction of music has spurred many different studies of research on how persons with ASD perceive music. The purpose of this study was to look into the effects of what types of music can warrant certain responses. Underlining that the goal of the study was to “demonstrate whether listening to ‘soothing’ music can affect the behavior of individuals with low functioning autism (Carmen & Lopez, 2022, p. 124).

The methods used in the study were constructed to expose the participants to different types of music and record the resultant effects on their behavior. The participants in the study consisted of 16 individuals from various different age-groups. All participants in the study had moderate or severe ASD or intellectual disabilities (IDs). Each participant went through the same 10 experimental conditions throughout the study. The key independent variable was the type of music being played during each block. The three types of music being used were consonant (happy) music, dissonant (unpleasant) music, and ambient sounds. The order in which the music was played was randomized in each session until all session conditions were met in order to measure any behavior provoked by the music heard in each block. Silence intervals were placed in between each music block. This process was repeated until all 10 sessions had been completed, and all data collection was retrieved from direct observation video-taping analysis.

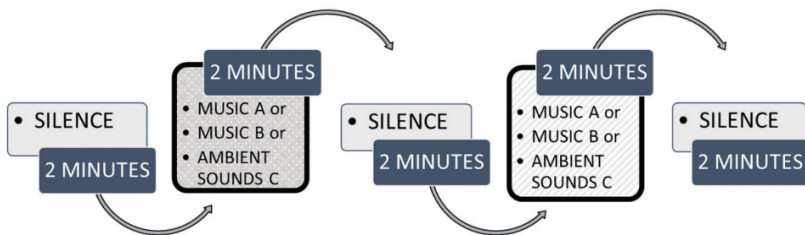


Figure 1. Sequence of the 9 experimental conditions. First ‘silence’ (2 minutes). Followed by track of music or sound (2 minutes). With 2 periods of ‘intermittent silence’ after listenings (2 minutes). (A) dissonant music (‘Threnody of the victims of Hiroshima’ by Penderecki.), (B) consonant music (‘Elegy for cello and Orchestra, op. 24’ by Faure), and (C) ambient sounds. Permutations: AA, BB, CC, AB, AC, BA, BC, CA, CB.

The results identified by the Carmen and Lopez (2022) study found that the behavioral responses from persons with ASD generated by music corresponded with the music heard in each session. This showed that consonant music set a more positive mood state and was linked to the reduction of anxiety and disruptive behavior, while dissonant music increased participants’ anxiety, aggressiveness, and nervousness (Carmen & Lopez, 2022, p. 134). Quintin et al. (2011) identified different emotions caused by exposure to different types of music. Their results were obtained in high and medium-functioning individuals with ASD. They rated the intensity of the emotions similarly, especially those that could be described as pleasant and unpleasant. The present work confirms this previous study, providing a behavioral measure of disturbed behaviors elicited by music in low-functioning individuals, obtaining significant differences between consonant music and dissonant music.

The evaluation of the disturbed behavior observed during the study was used to verify changes in the sample’s behavioral state. The researchers identified that “listening to two different types of music could reduce or increase anomalous behaviors such as self-harming, rocking, avoidance, gestures of rejection, nervousness, etc.” (Carmen & Lopez, 2020, p. 135). The two types of music that were found to work well with each other used a mix of consonant

music and ambiance sounds. These findings show, as stated previously by Carmen & Lopez (2022), how the perceived music being played can alter and influence correctional behaviors for individuals with ASD.

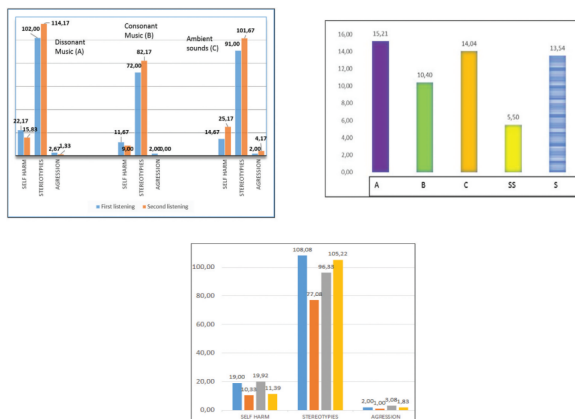


Figure 3a. (a) Graphics with means on type of behaviour.

Some of the best forms of behavioral intervention techniques adopted by most school districts across the state of Minnesota have the same thing in common. That commonality is the extensive practice of these techniques and models by trained professionals and researchers. The work of these individuals creates the framework in which they are approved by state or district officials. Music therapy and music-based learning is no exception to this rule. As this form of learning is still relatively new to the practice in private practice and in schools. Much research and trials are needed to determine the validity of these forms of teaching intervention.

Walworth (2012) studied the effects of music-based therapy intervention on social communication and emotional development for children and adolescents with Autism Spectrum Disorders (ASD). Music therapy is defined as 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” (Walworth,

2012, p. 317). The goal of accomplishing individual goals to help the client meet certain criteria of improvement is very similar to how goal building is set in Individualized Education Plans (IEPs) and Behavioral Intervention Plans (BIPs). Therapeutic musical talent can prove to be a valuable tool not just in the classroom but also in other community places. The idea that music can be used as a therapeutic intervention strategy can be found as early as ancient Greek texts. The first signs of documented use of music therapy in America were found in the aftermaths of World War I and World War II for soldiers and refugees who were dealing with physical and emotional trauma. Musicians who visited these hospitals were able to notice changes in the emotional and physical responses of the veterans (Walworth, 2012). This ability to change the patient's responses resulted in musicians being hired to address the various issues their patients faced.

Walworth (2012) explained how and why music interventions worked for persons with ASD. Music has been shown to contribute to cognitive development, emotional regulation, and social interaction by stimulating neural growth (Walworth, 2012). For children with ASD, there are no significant deficits in recognizing the emotional content that is tied to music. This could be due to the fact that children with ASD demonstrate distinctive auditory discrimination skills compared to children who are neurotypical. These findings suggest that music can be an amenable form of treatment for children's intellectual disabilities both in a medical and school-based setting.

How music therapy can meet the individual goals of the learner can vary depending on the participant of the therapy and the professional conducting the therapy or lesson. Some children may show different initial interest in how to interact with the music. This can be seen as either creating a music playlist or playing certain types of musical instruments. The professional

who is giving the lesson will be able to identify the challenges that the child may be facing after their initial assessment of a certain musical activity. As music lessons progress, the professional can use the opportunity of teaching musical skills to teach non music skills such as turn-taking, following distal points when communicating verbally (pointing away from your body with a finger), regulating when routines change within the session, and using support systems to augment communication during the lesson (Walworth, 2012, p. 320). However, not every medical practice or school district provides these types of services for students using nonmusical goal-making. In these situations, professionals will use music as a form of engagement medium in order to assess new skills within existing activities. These new skills can lend themselves to creating new opportunities for communication, emotional responses, and socialization.

To determine the effectiveness of how musician intervention can positively impact children with ASD, Walworth (2012) studied three different studies that showed successive applications of music therapy interventions. The first study was a playground case study conducted by Kern and Aldridge (2006) that investigated four boys aged 3 to 5 years old diagnosed with ASD who were exposed to an outdoor music center added to the playground. All children in the study showed an absence of peer-related interaction on the playground, but all showed a common interest in music. A covered music hut was installed on the playground with age-appropriate musical instruments to foster a desire to engage in musical play. Kern and Aldridge (2006) showed that the amount of time spent engaged in unsupported positive peer interaction increased when comparing peer-mediated play with the baseline and the music hut without intervention settings.

The second study identified by Walworth was a self-contained classroom case study conducted by Brownell (2002), who conducted a series of four case studies with male children

aged 6–9 years old who exhibited problem behaviors in the school setting in a self-contained classroom. To counteract the unpreferred behaviors, Brownell (2002) created a set of social stories written specifically about the undesired behaviors that were either sung to them or verbally read. The results indicated by Walworth & Brownell showed that the negative behaviors occurred with the lowest total frequency after the music-assisted social story conditions (Walworth, 2012, p. 326).

In the third study, Walworth (2012) investigated the successful application of music therapy interventions conducted by Kern et al. (2007). Their study conducted two case studies with 3-year-old children in the preschool setting. Both children in the study had difficulties transitioning into the classroom at the beginning of each school day. With the help of a music therapist, they insisted that the teachers incorporate a song into the morning transition time from home into the classroom for the two children. The results of Kern et al. (2007) were the same as those found by Walworth (2012), signifying the simple fact that singing is naturally a multiple-person activity and may be the reason the children in these case studies had more positive responses during the singing condition (Walworth, 2012).

Given the information that has been researched through this literature review. The use of music and music-based learning can be shown to have positive and influential effects on students with ASD. They can have lasting effects on academic performance in the classroom, as demonstrated by Schwartzberg & Silverman (2016), Barnes et al. (2021), and Kossyvaki & Curran (2020). Other studies have noted beneficial behavioral regulation as analyzed by authors Lense et al. (2020), Epstein et al. (2020), and Carmen & Lopez (2022). All of these studies consisted of the implementation of music-based learning within controllable scientific environments, with a few exceptions for practical classroom use. As the thesis writer continues

the progression into the world of education, it will be important to remember that this thesis writer will take the lessons discussed in the literature review and use the inspiration to create something of his own as a way to be used as a practical application in the classroom.

CHAPTER III: APPLICATION OF RESEARCH

Application Observations

There is ample research to show that using music-based learning can be an effective addition to an educator's arsenal. The use of this teaching style can benefit multiple pathways of a student's learning experience. The first research opportunity that can be implemented within the classroom environment is the effects of how music-based learning impacts academic performance for special needs students. The second ample form of research demonstrated in this thesis is the effect on behavioral regulation for students with special needs inside and outside of the classroom. The aim of the application of the research portion of the thesis is to apply the new understanding of music-based learning with previous applications made by the thesis writer, current practices being implemented by the thesis writer, and future implementation ideas that the thesis writer can use in future classrooms.

What has been learned from this research is that music-based learning can be effective in improving the learning for students with special needs, not just in school but also in the community. This supportive instruction influences curriculum and learning materials that can take the necessary lessons required by each school's planning team. Including musical aspects of learning helps improve student attention, collaboration, and motivation. It will also focus on creating a curriculum that meets the requirements of standards and services of the designated school district. The flexibility of music-based learning allows it to be applied to all age and class groups. However, it's up to the teaching professionals, such as the thesis writer and other teachers, to make material appropriate to the student body's age and demographic. These

variables may determine the material used in the curriculum, such as the type of music used, video/movie accompaniment, or the use of practical musical instruments and musical tools.

Application Model

For the application of research on current classroom practices, this thesis writer is and will continue using music-based learning in their own classroom practices during the annual school year. Throughout this section, the thesis will explain and demonstrate how the use of music-based education has shown a positive progression in the students' academic performance and behavioral regulation in their daily classroom routines. The writer will explain the setting in which the practice is being used, such as tier setting, age group, grade group, & primary disabilities. Secondly, the writer will describe the material used with the students in the classroom setting. Finally, the researcher will identify the positive influences that music and music-based learning have had on students in both academics and behavior.

The thesis writer, practicing this application of research, is in a K-5 elementary school in the southwest metro area of the Twin Cities of Minnesota. The school consists of both general education classrooms and special education programs and services. The practice application takes place in a program titled “Attain,” a center-based classroom specializing in students with a primary disability of autism spectrum disorders (ASD). The Attain program is classified as a tier 3 center-based program in which students receive higher intervention services such as more instructional time, smaller group sizes, and more focus on teaching specific skills based on each student's IEP goals. Student class times will begin at 7:50 AM until the end of the day at 2:15 PM.

The students participating in the writer's application of research are all a part of the caseload. Each student is part of the Attain program classroom assigned to students in the grade groups of K-1. The student age groups range between a minimum of four years old and a maximum age range of seven years old. The class size consists of seven students, four kindergarteners, and three first graders. Within the class size, there are six male students and one female student. Each student in the classroom has a diagnosis of ASD as their primary disability, with some students having a secondary disability label. Two students have recorded secondary disabilities. One student is identified as having Gross Motor Deficiency Disorder (GMDD), and another has Impairment Deafness Disorder (IDD) in one ear. Each student in the class has been assigned an IEP with a minimum of 2 goals for each student determined by the case manager. Each student has also been assigned a Behavioral Intervention Plan (BIP) due to past and present signs of disruptive physical, verbal, and emotional behavior.

Application Materials

The materials used by the thesis writer for this application of research consist of a variety of interactable tools that are both in a physical and technological medium. One example of these academic tools is the use of Google slides created by the thesis writer that revolve around each part of the student's educational day: morning meeting, math, reading, social skills, and the end-of-the-day wrap-up. Each presentation will review the curriculum assigned by the special education team of the represented school district's academic standards while the thesis writer incorporates music-based learning material in each presentation.

The second learning material used in the application of research is the use of communication devices for students who are labeled as nonverbal or have limited speech

capacity. Students of the thesis writer will use their assigned Tobi Dynavox communication speaker given by the school's Speech-Language Pathologist. The speaker will contain a copy of each presentation slide that can be interable by touch screen for the student to use as a resource if necessary. If a student is not assigned an electrical communication speaker for use, then that student will be given printed versions of each presentation that are laminated and binded to be used as a resource in substitution.

The third material used in the application of research used by the thesis writer will be a television (TV) media screen provided to the classroom by the represented school. The TV in the classroom will be touchscreen and can be interacted with by students and staff according to the rules and regulations placed by the homeroom teacher.

These materials are implemented throughout the day at the designated times, during which their assigned academics are taught. The academic sessions the students will go over each day are morning meetings, math, reading, social skills, and end-of-the-day wrap-up. The example presented for the research application will be the morning meeting section of the student's schedule.

Application Example

The morning meeting presentation will cover an array of lessons on tracking the student's day, such as weather, current emotions, reading calendars, social greetings, and more. Each slide will include an assessment in which the student will be tested on their knowledge of the lesson material while having many music and signs that help associate with the assigned lesson through blending and scaffolding. The presentation slides also include a choice of two to three song choices assigned by this thesis writer. The thesis writer will swap the songs and music links

bi-weekly unless chosen to stay due to student impact, such as overall enjoyment or being repeatedly chosen by the students. Combining the use of blending related musical signs to the assessment of each category is in the hopes of helping with student engagement and retention of knowledge related to the lesson.

Application Assessment

The application of research will also assess the students of the thesis writer in improving social interactions and classroom management. Many of the students of the thesis writer need help with behavioral regulation and team-based skills such as taking turns, waiting for others, and accepting situations that are not in their control. Music has shown that it is a universal enjoyment by all students in the classroom. So, the thesis writer implements these preferences of picking and listening to music in these social skills while in the classroom. An example of this application is that the thesis writer will choose one student to select one song out of three. But before the student leaves their seat, comes to the board, and clicks on their sign choice, the student must choose by using the electronic communication device or pointing and choosing the song on the laminate presentation printout. This practice also allows the students who didn't get to choose and even get a song that they may not may not prefer. It will be a test for them to practice the skills of self-control and personal behavioral regulation.

It is important to keep in mind during the research section of the thesis the idea of how to best support students with special needs through the power of music and music-based learning within the classroom. While taking in the idea of how to use music-based learning for students who may not favor music or musically-based auditory. In comparison to other forms of learning media. Currently, this researcher is an ASD (Autism Spectrum Disorder) paraprofessional and

substitute teacher who works at the elementary grade level. Students under my caseload have ASD-based Individualized Educational Plans (IEPs) with goals that must be measured and realistically attainable for each student. The goals assigned to each student hope to improve both academic performance and behavioral regulation within the school setting. The focus on implementing music and music-based learning is to assist in achieving the student's desired IEP goals.

CHAPTER IV: DISCUSSION AND CONCLUSION

SUMMARY OF LITERATURE

This thesis focused on the constructive influence of music, music-based learning, and acoustics for students with Autism Spectrum Disorder (ASD). The hypothesis for this tried to answer two questions. The first question asked, “How do music and music-based teaching positively impact constructive student learning for students with disabilities?”. Secondly, we must ask ourselves, “How can music-based teaching positively impact behavioral regulation for students with disabilities?”. The research process started slowly as this is a relatively newer topic of discussion in education. But, as the thesis research continued, many resources were available with music-based learning and using music as a teachable medium. The result of the research showed positive results in how this approach of teaching can be an available tool to use in special education classrooms.

Schwartzberg & Silverman (2016) demonstrated the positive effects on academic performance by researching the effects of using a music-based short story on short- and long-term reading comprehension of individuals with Autism Spectrum Disorder. Their study results showed that the experimental groups showed a slightly higher mean average of correct responses on the assessments over the course of the three days of the experiment (Swartzberg & Silverman, 2016). Certain researchers, such as Lense et al. (2020), studied the benefits of music-based learning on behavioral management by conducting a study of integrated parent-child music classes and the impact it has on community participation and well-being for families of children with and without ASD. The results showed that musical and nonmusical skills demonstrated that “these caregiver impressions were supported by behavior coding

indicating that children increased their active engagement in class activities over time (Lense et al., 2020, p. 11).

LIMITATIONS OF RESEARCH

When looking at the limitations of research, age can be a potential factor. Data can be skewed based on musical motivation and personal preference based on the age of the student listening to music. A modest amount of educational music and songs are made for the demographic of students ranging from pre-care to late elementary and early middle school. Using these music samples could show different results if giving the music to students of older ages, such as high school age groups.

Thinking about the implementation of the research into practice, a limitation of setting could be an initial factor when referring to this practice of study. While each person may have an innate sense of musical drive and enjoyment, it may not be a preferred form of teaching that every teacher may enjoy or want to use in their teaching method. Educational programs may choose to follow a curriculum that meets more traditional standards of teaching, with years of research and practice already put into effect in most school districts. This limitation could have lower effects in alternate or charter schools settings. Implementing this theory of practice could hold more resolve if practiced in public or private school settings. Because of this change in setting, researchers could be able to deliver the dependent variable changes and track student comprehension over a longer period of time.

Cultural bias, personal bias, and training lenses of the researchers and participants could also serve as a limitation to current and future resource material. Some students with ASD may be susceptible to various sounds, so using music may cause more irritation and discomfort than

suppressing it. Changes may need to be made slowly, and students with ASD may also need a longer time to engage and to make connections with other students. This reminds us that we must look into the strengths of the individual participants and gauge the appropriate intervention for using music for sound and acoustic-sensitive ASD students.

IMPLICATIONS OF FUTURE RESEARCH

There are many implications and variables regarding future research on this topic. Special education classrooms are an ever-changing environment. Interventions and the way how teachers interact with their students can change on a daily basis depending on the needs and wants of the students and staff. However, one intervention that runs parallel with interventional change is the progression, usage, and implementation of technology in the classroom for academic and recreational use. Interactable technology such as iPads, electronic talkers, and touch screen televisions can give students with ASD unlimited access to videos and music, giving students the ability to use music in the education environment anytime they choose. Just giving students the ability to access music in any capacity for academics and behavior can have more positive effects on students' well-being, motivation to work, and student engagement.

Music-based learning could also give future implications for research on the basis of using it as a resource for the community and as a providable service for schools. Music Therapy, especially, could hold limitless potential for students with disabilities, hoping to improve more than just hurdles within special education classrooms, such as academic performance and behavioral regulation. But also to provide greater opportunities for the inclusion of children with special needs into mainstream classrooms and community life.

PROFESSIONAL APPLICATION

Strong academic performance and minimal behavioral interventions are something that all special education teachers strive for with their students. When put into the perspective of the parent or caretaker of a special needs student, it would be safe to assume that they would also want their child to obtain these goals. While these goals are all admirable to strive for when discussing a student's future, these goals only serve as a secondary priority compared to the main objective the special education system should seek. That objective is the physical health, mental health, and administering the necessary services to improve the life of special needs students physically and/or mentally.

Students with special needs, such as ASD, tend to have difficulty sharing or expressing their emotional states of being, making it harder for individuals who may not know them to interpret their current feelings and assist them in the appropriate way. Music can work in supporting students with ASD because music is one of the few arts that can express almost every emotion or message in ancient and modern history. It can give an outlet for people to speak in a way that no other form of communication can provide in terms of expression of self. So, for students with special needs who may have a deficiency of speech or expressing emotion, this can give them an outlet to allow them to tell the story they want people to hear.

What the thesis writer has learned from this thesis is the understanding of how music and music-based learning can heavily impact the constructive influence of academic performance and behavioral management for students with ASD. The thesis also aimed to understand how music therapy can serve as a supplemental service that could have lasting effects, not just in the classroom but also as a service provider and in the community.

CONCLUSION

Music can affect many factors of the human experience. Music still holds as one of the most important forms of formative expression that serves as a catalyst to all cultures. It can formulate existing and new emotions for people of all backgrounds. This can be seen very much in examples for people with ASD. Studies have shown that throughout the years, music has improved the health of the students' minds and played a huge part in the success of their well-being.

Many people today use music in cooperation with their academic lives and personal lives. This impact comes in many different levels of impact. This can be seen as simply listening to music while students study to help them keep focused or even listening to music to help a person reduce stress. But it can play a more significant role than this for students who make music a big role in their identity and purpose. Those students who play in a school band or sing in a choir may make it a goal to improve these skills in a way that can be academically and financially successful, such as through scholarships or employment. No matter how big or small the integration, music can find a way to have a lasting effect in the world of education, thereby finding a way to integrate itself into the lives of our students.

What was learned most is that ASD students need the support of special education professionals now more than ever, and music can help be that support. It is an avenue for people with ASD to give themselves to experience life. Because at the end of all things, that is one thing that music can be proven to be. Music is not just a voice for the voiceless but, ultimately, the rhythmic song of life.

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