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# Music Therapy as a form of Intervention for Autism Spectrum Disorder

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Abstract

For many years, music has been regarded as a therapeutic asset, dating back as early as the 1700s. Music has been used in a variety of therapeutic forums, specifically as a method of intervention. Most commonly known as music therapy (MT), it is utilized as a tool to help strengthen developmental skills, and as a primary way to improve communication and social skills. These benefits are especially valuable for individuals with Autism Spectrum Disorder. Autism Spectrum Disorder (ASD) specifically contains deficits in impaired communication, reciprocal social interaction and restricted interests, in which music has been shown to further develop through a socio-emotive lens. This can be used to help them further social knowledge, and to provide a structure for social interactions. Music offers a powerful way to improve social skills and communication, and successfully incorporates social-pragmatic skills through conversational lyrics, the act of imitating body movements or language, and purposeful musical coordination. This literary review aims to understand the effectiveness of music's role in the application of improving ASD symptoms. It will further discuss music's importance for ASD individuals from a developmental perspective, through adolescence up until emerging adulthood. Within this review, we will be looking at the perceived benefits regarding music-based intervention (music therapy) and its effects on individuals with Autism Spectrum

Disorder. We will also be exploring the different confounding variables of MT intervention, and how they can be assessed and accounted for moving onward. We hypothesize that those who incorporate music into their daily lives report a positive correlation between music and the effectiveness of improving various deficits of ASD.

# 1. Introduction

## 1.1 Prevalence of ASD

The prevalence of ASD in the United States is becoming increasingly larger among individuals of all ages, with 1 in every 36 individuals (2.8%) being diagnosed as of 2020 (CDC, 2020). This is a significant increase in diagnosis, as 1 in 44 individuals (2.3%) were diagnosed in 2018 (CDC, 2018). Throughout the past decade, the rate of diagnosis (parent or guardian reported) has increased nearly fourfold, between 1997 and 2008. One speculated reason for this is due to increased awareness of those who exhibit milder forms of ASD symptoms, which previously would've gone undiagnosed. (NIMH, 2016). Additionally, the noticing of symptoms and diagnosing of ASD is often more difficult in adults than children. This is due to some ASD symptoms overlapping with symptoms of other mental health disorders, including anxiety disorder and ADHD (NIMH, 2023). ASD is also three times more likely to present itself in AMAB (assigned male at birth) individuals (4.3%) than among AFAB (assigned female at birth) individuals (1.1%). The criteria for diagnosing ASD has begun to evolve through a spectrum, as opposed to one either having severe symptoms or none at all. (Juliahood, 2022). The direct cause of ASD is still up for discussion, as no particular factors have been identified. Since ASD can affect individuals in every demographic, there has yet to be any identifiable patterns of diagnostic correlation. However there are numerous factors that could play a role in ASD's development. Past research suggests that having a sibling with ASD, having certain genetic conditions (such as Down syndrome or Fragile X syndrome) and having a very low birth weight may play a role in the onset of ASD (NIMH, 2016).

# 2. Symptoms of ASD

## 2.1 Defining ASD and Commonly Experienced Symptoms

The term "autism" was first officially introduced by American practitioner Leo Kanner in 1943, to describe a unique syndrome that typically resides in children. This syndrome included obsessiveness, echolalia, and almost an entire lack of social

interaction with people (Frye, 2018). In adjacent studies, Vietnamese child psychologist Hans Asperger described a similar disorder known as Aspergers; characterized by lack of empathy, limited ability to form friendships, intense focus on a special interest, and clumsy movements. (Frye, 2018). Throughout the last century, the diagnostic criteria for ASD has evolved from what was previously known as a categorical approach, meaning either one had severe ASD symptoms or none at all. In the DSM-III Psychiatry considered ASD to be a subset of childhood schizophrenia until 1980 (Frye, 2018). The DSM-III, described ASD as its own disorder, and was further defined in the DSM-IV as having a deficit in social function along with repetitive and/or restrictive interests and/or behaviors but without early language impairment. When the DSM-IV was released in 1994 and revised in 2000, it was the first edition to categorize ASD as a dimensional disorder, meaning it exists on a spectrum with varying levels of each symptom, depending on the specific individual.

The main symptoms in ASD consist of deficits falling under two main categories: social and communication-based deficits. The main social deficits are defined as inadequate verbal behaviors, and a lack of socio-emotional reciprocity (Hall, 2009; Howlin, 1986; Stone & Lemanek, 1990). The main communication deficits of ASD involve the decreased ability to engage in back and forth conversations, and understand verbal and non verbal language. In terms of verbal language, these deficits often present themselves through cognitive difficulties-most commonly not being able to respond to one's name, having trouble engaging in back and forth conversations, and appearing to not look at or listen to when others are talking (NIMH, 2020).

The combination of these two deficits has been shown to have a greater impact during adolescence. This is because throughout this period of time, adolescents with ASD begin to express a desire for social interaction, while they may also experience more senses of isolation than other individuals, due to the lack of ability to engage in substantial conversation. This sense of isolation and difficulty integrating with social environments can be expressed all the way up until emerging adulthood, for some lasting even longer (Orsmond, G. 2014). Approximately one-half to two-thirds of autistic individuals have no close friendships- the ones they do have, often lack these vital depths of reciprocal social interaction and empathy within them. (Billstedt et al., 2007).

## 2.3 Communication in ASD

Individuals diagnosed with ASD are often described as being in "their own world", due to lacking a developed theory of mind, which is the ability to understand and take into account another individual's mental state (NIMH, 2020). Because of this innate focus on themselves, they often exhibit a lack of ability to communicate with others. This is primarily examined through the inability to engage in reciprocal verbal and nonverbal conversation (NIMH, 2020). Some specific patterns include repetitive or rigid language,

narrow interests, uneven language development, and poor nonverbal communication skills. Repetitive or rigid language includes contributing to conversations in ways that have no meaning and cannot relate to the topic itself- an example of this could be a child with ASD saying one phrase over and over again, or contributing in scripted ways that may not apply to the specific situation in front of them. Narrow interests refers to the tendency to hold conversation, only about specific topics that they express interest in. However these conversations have a tendency to be one-sided (NIMH, 2020). Uneven language development includes the progressed development of certain language skills, while others are developing at a different (often slower) pace. Poor nonverbal communication primarily focuses on the inability to use nonverbal gestures and incorporate them into their conversation. These gestures are most commonly expressed through lack of eye contact, along with other meaningful gestures that are meant to enhance their oral language skills.

These symptoms can present themselves in a variety of different ways, all depending on the levels of intellectual and social development of the individual (NIMH, 2020). One commonly experienced deficit includes developing and understanding verbal and language skills. Another deficit experienced often is difficulty understanding nonverbal cues, such as hand gestures, eye contact, and facial expressions. (NIMH, 2020) These deficits are experienced differently from person to person. Some individuals with ASD may be able to verbally communicate, but have difficulty understanding the meaning or rhythm of words. Others may strictly communicate nonverbally. Much like the evolved foundation of ASD diagnosis, it exists on a dimensional spectrum, no two individuals experiencing the same set of symptoms. With the incorporation of music-based intervention (as early as infancy), music can be used as a primary scaffolding method to enhance methods of reciprocal communication, and serve as a preventative backbone to make sure it only improves, as treatment progresses.

## 2.4 Social Interaction in ASD

The main social deficits in terms of ASD are defined as inadequate verbal behaviors (eye contact, body posture and facial expression), lack of socio-emotive reciprocity, limited interaction with peers, absence of empathy, deficiency in joint attention, and an absence in symbolic and imaginative play (Hall, 2009; Howlin, 1986; Stone & Lemanek, 1990). A 1994 study examined early social behaviors by reviewing videotapes of first birthday parties of children eventually diagnosed with ASD. The observational findings suggested that children eventually diagnosed with ASD demonstrated significantly fewer pointing behaviors, looking and observing around them, and responded less to their name than their typically-developing (TD) counterparts (Osterling, 1994). Likewise, Osterling et al. reported that children later diagnosed with ASD displayed fewer gestures and more repetitive movements than

their TD peers. These social deficits can be examined from both a physical and cognitive perspective, those with ASD typically experiencing deficits in both categories.

With ASD, one of the most consistent social deficits in children is the lack of understanding and demonstrating non-verbal social gestures such as pointing, showing, and giving. Developmentally, pointing starts around 8 months of age and should consist of the majority of gestures by 12 months of age (Rohlfing, 2017). Other important gestures that normally develop in early childhood include 'showing' and 'giving.' In 'showing' gestures, a child brings an object of interest to someone and extends their arms out holding the object toward a person's face, as an attempt to share their interest with others. In 'giving' gestures, a child places an object in someone's hand to share the object of interest with the person. Children with ASD are usually not able to demonstrate these protodeclarative gestures (Frye, 2018). Behavioral symptoms are also present within social deficits of ASD, specifically among interactions with others. This can include infrequently sharing interest, or enjoyment of objects and activities. Additionally, individuals with ASD are often known to talk at length about a favorite subject without noticing that others are not interested or without giving others a chance to respond (NIMH, 2020). These social deficits of ASD collectively center around the lack of reciprocity within social relationships, and the inability to initiate and respond to social interactions.

ASD individuals often experience these symptoms through a dimensional perspective. Individuals with more severe ASD often exhibit more movement-based deficits, including the expression of non-verbal gestures. Individuals with less severe ASD typically exhibit deficits in more cognitive components, including development of theory of mind and pragmatic competence (Berenguer, 2017), processing speed (Reinvall, 2017; Haigh, 2018), and metacognitive processes such as initiation and planning (Berenguer, 2018) Childhood intervention for ASD individuals is essential to improve their communication skills. The most effective route of treatment typically begins between 3-5 years of age (NIMH, 2020). This is because it specifically targets both the child's behavior and communication skills and offers regular reinforcement of positive actions (NIMH, 2020). Most children with ASD respond well to these forms of highly structured, specialized programs.

# 3. Music Therapy for ASD

## 3.1 Available treatments for ASD

While there is no identifiable cure for ASD, numerous methods of intervention have been examined as possible forms of treatment. These forms of treatment include Applied Behavioral Analysis (ABA), Pivotal Response Treatment (PRT), and Cognitive Behavioral Therapy (CBT), all forms that focus on using individualized, behavioral

instruction. These forms have been shown to target and improve some of the core symptoms that reside in ASD, specifically motivation and the initiation of communication with others (CDC, 2016). A 2010 trial showed a significant correlation between an intensive ABA therapy model (Early Start Denver Model-ESDM) and the cognitive and adaptive behavioral improvements that emerged from 48 preschool aged children, over the course of two years (Dawson, 2010). This suggests that certain developmental and applied behavioral practices could potentially work as a form of intervention, especially being applied between 12 and 18 months of age-where ASD screening is the most developmentally relevant (Dawson, 2010). Certain medicines have also been shown to be the most effective. Risperidone and aripiprazole are currently the only medications FDA approved for symptoms associated with ASD, targeting the irritability most commonly experienced within this diagnosis (Defilippis, 2016). The specific treatment we are going to be examining within this paper is music therapy (MT), and how it can be used as an effective form of intervention for individuals with ASD.

## 3.2 MT as a Mechanism for ASD Treatment

MT is defined as a systematic process of intervention where the therapist helps treat the client using musical experiences and the relationships that develop through them as dynamic forces of change (Geretsegger, M). The core functions that music possesses align greatly with the general functions of therapeutic practice. While it can be seen as a recreational activity, it can also be used to manage personal aspects of life (Schäfer, 2009). A 2009 study reports that exploration of music is most prominent throughout adolescence, as the duration of music listened to was highest at this period, and was negatively correlated with age. Adolescents primarily use music as a developmental function, often using it to help with issues that accompany this period of growth. They are able to use music as a means of self-expression and identity consolidation, as well as a form of emotion regulation and social interaction. (Schäfer, 2009).

As stated earlier, ASD symptoms also become most apparent throughout adolescence. Studies have shown that people with ASD have a natural attraction to music and may have innate enhanced musical ability and perception. This may be due to the aspect of identity expression that music holds, promoting the activity of identifying and expressing emotions in music (Behavioral Innovations, 2023). This attraction to music can be used to allow children with ASD to participate in musical experiences, in turn promoting social and communication skills (Ke, 2022). Numerous research studies have suggested that music can play a fundamental role in facilitating the development of communication. Humans have an innate ability to comprehend melodic and rhythmic aspects of music as early as infancy (Trehub, 2015). Prior to developing verbal communication, infants have shown abilities to hear and react best to a form of communication that contains incomprehensible but highly melodic speech, known most

commonly as motherese (Fernald,1991). Its highly elusive tone and exaggerated pitch produced by the mother allows for infant contribution as well-infants hearing it often reacting through infant sighs, yawns, and coos (Trehub, 2015). Specific aspects of this form of communication resemble the fundamentals also used in understanding music, such as certain rhythm and pitch dynamics (Trehub, 2015). One of the most immersive and effective forms of treatment of ASD is music therapy (MT), and its ability to target and improve deficits for ASD individuals in every demographic (Geretsegger, 2016). The use of MT can be used to further incorporate and develop these important communication skills throughout development, as these deficits become most prominent around early adolescence. MT includes specific intervention techniques that focus on prelinguistic communication skills and early vocalization skills, which are areas targeted in ASD communication deficits (Geretsegger, 2014). The application of MT allows for the ability to reform and strengthen these abilities, specifically lacking in ASD individuals. A 2014 meta-analysis regarding the effects of MT on ASD symptoms suggests that MT helped to enhance both verbal and non-verbal communication skills within ASD children, and successfully promoted stronger parent-child interactions as a secondary outcome (Geretsegger et al., 2014).

Music has also shown to be an integrative tool in improving social deficits of ASD and forming social relationships between autistic individuals. The act of listening to music plays a vital role in allowing for the enhancement of emotional empathy, prosociality and bonding. (Sharda, M. 2018). This has been specifically highlighted through live performances of music, as they promote social bonding (Hudon, 2003). One way that these aspects of music have successfully been channeled into forms of intervention is through music therapy (MT). Central MT techniques involve a combination of vocalization (free and structured), and listening to (both pre-recorded and live) music. MT is utilized as a method of introspection; the act of listening to music invites an interactive process that will often involve selecting music that holds meaning and significance for the individual (e.g. relating to an issue that the person is occupied with) and can possibly allow for reflection on personal issues related to topics brought up by the music. For those with verbal abilities, verbal reflection on the musical processes is often an important part of MT (Wingram, 2002). Music's fundamental components can also play a vital role in developing fundamental social pragmatic skills, and can help further social development and communication with others. (Hall, 2009; Howlin, 1986; Stone & Lemanek, 1990), (Sharda, M. 2018). A 2014 meta analysis further examined the effect of MT interventions on children with ASD, stating that the 10 studies (165 participants) that examined the short- and medium-term effect of MT interventions (one week to seven months) concluded that MT was superior to 'placebo' therapy or standard care involving ASD treatment. The findings of this review suggest that MT may help children with ASD tackle and improve core characteristics of the disorder, including social interaction, verbal communication, initiating behavior, and

social-emotional reciprocity. (Geretsegger, 2014) In summary, MT has been demonstrated across multiple studies to play a significant role in the intervention of ASD development, and in improving symptoms related to social-communication.

# 4. Discussion

## 4.1 Why is MT intervention important?

Continuing to further and elaborate on this area of research is extremely important, as it provides a new perspective on effective forms of treatment for those with ASD. If we are able to pinpoint these specific ways that music can help alleviate the severity of ASD symptoms, then we can utilize these practices and further them as successful methods of intervention. However, in terms of MT and its effectiveness on ASD, there are still more variables that need to be examined. There are limitations in this area of research including, the individual differences within the sample itself. There is a broad spectrum involving individuals who have autism, including the severity of symptoms, level of cognitive functioning, and development of socioemotional-communicative skills (Fang, E. 2009). These all result in each individual with autism displaying their own unique characteristics, therefore the sample of my study can by no means fully represent this diverse population (Fang, E. 2009).

Additionally, there is still research investigating whether or not different genres of music serve different functions, a 2009 meta-analysis suggesting that the basic functions of music are directly related to preference, meaning that the more intensely music can be used to serve certain functions, the more intense the preference (Schäfer, 2009). Rentfrow and Gosling (2003) suggested that preferences can be grouped into four dimensions, that reflect the general characteristics music holds: (1) reflective and complex (e.g., classical); (2) intense and rebellious (e.g., rock); (3) upbeat and conventional (e.g., pop); (4) energetic and rhythmic (e.g., rap). Each of these dimensions correlated with the functional category being sought out by participants, many of which parallel the intended outcomes that MT provides (e.g, enables better understanding of thoughts and feelings, promotes closeness with others, and connects with identity). Additionally, it is important to explore the incorporation of live music, and how it can play a role in the alleviation of ASD symptoms as well. Previous research efforts have demonstrated that engaging with music in a live, interactive environment can social bonding and synchronization of movement with others (Huron, 2003). People with ASD who often suffer from these deficits, may also find these outcomes useful.

The exploration of music's properties and how they align with ASD individuals' needs is a profound area of research that can be further explored and analyzed through a clinical lens. The production of literary reviews regarding this topic is important

because the more information we find out about how music can specifically correlate with improving the severity of ASD symptoms, the more ways in which we can incorporate these findings into real-life therapeutic practices. It is important to build off of and strengthen evidence of music-based treatment, and the impact it has on the lessening of deficits. With the continuation of this research, it will in turn, provide a new perspective of ASD treatment going forward.

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