HOW DOES ALEXITHYMIA AFFECT CHILDREN ON THE AUTISM SPECTRUM?

By

Kamille Anastasia Roese

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APPROVED

Dr. Jan Blacher
Graduate School of Education

Dr. Richard Cardullo, Howard H Hays Jr. Chair
University Honors

Abstract

Alexithymia is defined as the inability to determine or describe one's emotions. According to a study by Hill, Berthoz, and Frith (2004), this trait is extremely common in adults on the autism spectrum. However, few studies have been conducted examining how alexithymia affects children on the autism spectrum, whose ability to feel and regulate emotions are still developing. To determine if and how children with autism experience alexithymia, 33 children with ASD from the ages of 7 to 12 years took an online survey. Hypotheses included that 1) participants would have a hard time determining what emotion each song was trying to provoke; and 2) that older participants will have an easier time identifying the emotions provoked by the songs than the younger participants. Findings indicated that all 33 children were able to identify the emotions elicited by the songs. However, numerous responses demonstrated elements of alexithymia. Furthermore, these findings showed that the oldest participants were more likely to elaborate on their emotions than the younger participants.

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Introduction

Autism spectrum disorder, also known as ASD, is an umbrella term for a group of developmental disorders characterized by difficulties with social interaction and restrictive or repetitive behaviors (DSM 5, APA, 2013). Common symptoms associated with ASD include deficits in social skills, restrictive and repetitive interests and/or behaviors, and impairments in the development of speech. Although it is traditionally considered to be a childhood disorder, ASD is in reality a lifelong condition. While some individuals with ASD can live independently with little to no help, others live with their parents, caretakers, or in group homes because they require lifelong support. The rationale for these differences in lifestyles is that the number and intensity of ASD symptoms and comorbidities vary widely between individuals. Frequent comorbidities with ASD include but are not limited to anxiety, depression, intellectual developmental disabilities, and epilepsy (Levy et al., 2010). The following paragraph will go into greater detail about another fairly common comorbidity, the personality trait alexithymia.

Alexithymia is defined as the inability to identify or describe the emotions felt by oneself and/or other individuals (Hill, Berthoz, & Frith, 2004). Although alexithymia occurs in about 10% of the general population, between 50-80% of individuals with ASD have been estimated to have this behavioral or social trait. Even though individuals with alexithymia can feel emotions, they are often perceived to be aloof or apathetic to others because they have a hard time properly expressing them. Because individuals with alexithymia have a hard time working with their own feelings, communicating their feelings, or understanding the feelings of others, they tend to experience difficulties with establishing and maintaining interpersonal relationships, which could make it even more difficult for individuals with ASD to acquire and maintain friendships (Poquérusse, Pastore, Dellantonio, & Esposito, 2018). Because a clinically measured test for

alexithymia does not yet exist, this personality trait is usually self-reported through subjective measures. Although alexithymia is technically not a disorder, treatments such as cognitive behavioral therapy and group therapy can be used to help treat it (Spek, Nyklíček, Cuijpers, & Pop, 2008). The following literature review will not only demonstrate the potential correlation between ASD and alexithymia but also showcase how music can be beneficial to individuals with one or both of these conditions.

In order to determine if autism spectrum disorder and alexithymia could be correlated, Hill, Berthoz, and Frith conducted a study in which they asked 27 adults with ASD, 49 relatives of individuals with ASD, and 35 adults without ASD to complete two questionnaires: the 20-item Toronto Alexithymia Scale (TAS-20) and the Beck Depression Inventory (BDI). While the TAS-20 was used to determine how well individuals could identify or describe their feelings, the BDI was used to assess the number and intensity of depression symptoms. Once the study was completed, it was determined that the individuals with ASD scored significantly higher on both questionnaires than relatives of individuals with ASD or individuals without ASD, supporting their hypothesis that individuals with ASD may be more likely to have depression as well as difficulties in processing their emotions. This suggests that in addition to potentially being correlated with autism, alexithymia could also be correlated with depression, another comorbidity of autism. Additionally, it demonstrates how the various comorbidities of ASD interact with alexithymia as well as with each other.

Once it was found that there is indeed a correlation between ASD and alexithymia, several studies were designed to determine how these different comorbidities interacted. One such study by Bird and Cook (2013) suggested that emotional impairments that are usually associated with autism may instead be caused by alexithymia. This "alexithymia hypothesis,"

suggests that some symptoms traditionally associated with ASD such as poor recognition of facial expressions and difficulties in interpreting emotions are also correlated with a higher percentage of individuals with severe alexithymia. This hypothesis was tested by comparing the results of a previous study (Cook et al., 2013) in which individuals with alexithymia, some of whom also had ASD, were asked to recognize facial expressions such as surprise, fear, and anger. After accounting for alexithymia, it was found that there was no significant difference in emotional facial expression recognition between the participants with ASD and their typically developing counterparts. This suggests that although alexithymia commonly co-occurs with autism, emotional processing in individuals with ASD can vary widely depending on the presence and/or severity of alexithymia. Additionally, this implies that autism interventions may need to be specially tailored to individuals based on the presence or absence of alexithymia in order to be effective.

Music is generally seen as a gateway to understanding and expressing one's emotions. However, it is traditionally believed that individuals on the autism spectrum are not very receptive to music. Sota et al.'s (2018) study assessed this belief by recruiting 53 children from Kochi Prefecture of Japan between the ages of 6 and 15 to take a shortened version of the Montreal Battery of Evaluation of Amusia (MBEA-s), a group of tests designed to evaluate each participant's musical ability, along with two cognitive tests, the Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV) and the Brief Assessment of Cognition in Schizophrenia (BACS), and two tests that measured ASD symptoms, the Strengths and Difficulties Questionnaire (SDQ) and the Autism Spectrum Screening Questionnaire (ASSQ). While 26 of the participants had ASD, the other 27 were typically developing (TD). Results indicated that the participants with ASD scored significantly lower on the MBEA-s than their TD peers. Since the

MBEA-s results were not correlated with the severity of ASD symptoms or the cognitive test results in either group, it was instead theorized that the lower music ability scores in individuals with ASD may be due to symptoms such as hyperactivity, inattention, and lower working memory. It should be noted, however, that the highest-scoring individual had ASD, suggesting that the musical ability of individuals with ASD could vary widely depending on the number and severity of symptoms.

In order to expand on the idea that one's working memory could affect their music ability, Schwartzberg and Silverman (2018) conducted a study in which participants were asked to listen to seven monosyllabic words and recall them at a later point. Of the 59 participants, 29 had ASD and were between the ages of 9 and 21 while the remaining 30 were TD and were between the ages of 18 and 22. During the experiment the monosyllabic words were delivered live or were recorded and contained either melodic or rhythmic musical elements. Upon completion of the study, it was found that both NT participants and participants with ASD scored higher when the words were presented live than when they were prerecorded. In addition, the NT group scored, on average, significantly higher on recall than their counterparts with ASD. This implies that while it is overall easier for individuals to learn when information is introduced with music in a live presentation, instructors may need to take special care to teach in a way that will benefit their students with ASD. It is worth bearing in mind though that this study was limited by the use of convenience sampling, as the age range in each group was drastically different. Regardless, this study provides insight into how music correlates with learning patterns, as well as how these learning patterns correlated with ASD.

Although the results of the previous two studies suggest that individuals with ASD may on average score lower on tests of musical ability than their typically developing peers, several

other studies have suggested that individuals with ASD are not only receptive to music but can greatly benefit from its usage. One such way to assist individuals with ASD using music is through music therapy. Music therapy can be defined as the clinical usage of music-based interventions to help clients reach their goals within a therapeutic setting. Music therapists provide treatments through a variety of methods such as song writing, music improvisation, music performance, and lyric discussion. Through these interventions, patients can experience a variety of benefits such as reducing one's heart rate and blood pressure, improving one's respiration, and alleviating one's stress. Numerous studies have demonstrated that music therapy can assist individuals with a variety of ASD symptoms. For example, Salomon-Gimmon and Elefant (2019) conducted a study in which they sought to determine if music therapy could help children with ASD develop vocal communication. They undertook this task by having four participants with ASD between the ages of 4 and 5 years receive music therapy sessions every week for five months. Upon completion of the study, they found that the quantity of vocal communication increased for most of the participants. Additionally, they found that the participants became more communicative with their music therapists over time. It should be noted, however, that the differences in quantity and quality of vocal communication only changed slightly throughout the study. In addition, the observed changes were not always linear as the participants' levels of vocal communication tended to fluctuate depending on their mood. Despite these factors, the results were still significant, as they demonstrated that music therapy could potentially help individuals with ASD develop their vocal communication skills.

In a separate study, Dieringer, Zoder-Martell, Porretta, Bricker, and Kabazie (2017) evaluated whether music therapy could increase gross motor task completion (GMTC) in elementary-school age children on the autism spectrum. In order to determine the effectiveness

of music therapy in this context, five students between the ages of 6 and 11 were asked to listen and follow along to three songs with verbal instructions while being video-recorded. While in some cases, the graduate student who ran the sessions would merely tell the participants to follow the instructions the songs provided, in other cases she would sing along and model the movements instructed by the songs. The researchers hypothesized that the students would be more likely to participate if the instructed behaviors were modelled by the graduate student. Once the music therapy sessions had concluded, it was found that the grand majority of participants performed slightly higher levels of GMTC when modelling occurred. Although this study does have some limitations such as a small sample size and a lack of assessment of language skills, it was nonetheless notable that their hypothesis was supported, as this research suggests that music therapy could be employed to create more autism-friendly physical education classes.

In Thompson, Shanahan, and Gordon's (2019) study, they examined whether music-based play would encourage children on the autism spectrum to become socially engaged with their playmates, who were in this case their mothers. They did this by recruiting nine children with ASD between the ages of 3 and 6 along with their mothers to participate in a total of five 45-minute-long play sessions led by a music therapist. While some mother-child dyads started off by playing with blocks and moved on to music-based play with small instruments, other dyads started with music-based play instead. Each play activity period had both structured and unstructured activities. After the end of each session, the mothers participated in a structured interview in which they answered questions about their experiences with playing in a clinical setting. In addition, they were encouraged to continue those play activities at home and were provided with tips on initiating and maintaining them. Upon analyzing the interviews, it was

found that although some mothers felt connected to their children regardless of the play activity they were engaged in, the grand majority felt more socially connected to their children during music-based play. According to the mothers, their children were also more likely to initiate music-based play and were generally more socially engaged with their mothers while engaging in this play activity. This suggests that music-based play, as well as music as a whole could potentially encourage children on the autism spectrum to foster social connections with their peers.

While music therapy has usually been used to treat ASD symptoms, it can also be used to diagnose ASD. For example, a music-based diagnostic tool known as the Music-based Autism Diagnostics (MUSAD) was developed by Bergmann et al. (2015) with the intention of testing for ASD in adults with intellectual developmental disabilities (IDD). The MUSAD was based on diagnostic criteria from both the DSM-V and the ICD-10 and consists of ten musical interactions, each of which were designed to test for traits affected by ASD such as joint attention, turn-taking, and socio-emotional togetherness. These traits were later sorted into five categories (social interaction, communication, stereotyped and repetitive behaviors, sensory-motor issues, and affective dysregulation). Seventy-six adults with IDD were recruited from a psychiatric department in Berlin to test the validity of the MUSAD. While most of the participants were only tested once, 4 randomly selected participants were retested after at least 3 months in order to check for test-retest reliability. In addition to the MUSAD, several previously approved diagnostic tools such as the Social Communication Questionnaire-current (SCQ-current), the Autism Diagnostic Observation Schedule (ADOS), and the Pervasive Developmental Disorder in Mental Retardation Scale (PDD-MRS) were used to test for ASD as well as for convergent validity. Meanwhile, the Modified Overt Aggression Scale (MOAS) and

the Aberrant Behavior Checklist (ABC) were used to test for discriminant validity. Upon completion of the diagnostic tools, 50 participants were diagnosed with ASD by a multidisciplinary team consisting of therapists, a psychiatrist, a special-needs caregiver, and a clinical psychologist. Afterwards, it was found that the total MUSAD score was positively correlated with the scores from the PDD-MRS and the ADOS. Additionally, it was found that the MUSAD had an acceptably high test-retest coefficient. However, there was a slight positive correlation between the MUSAD and the ABC. Despite this finding, the results overall suggest that music-based diagnostic tests could potentially be used to diagnose ASD, particularly in individuals with limited communication skills.

Although a variety of studies have been conducted on the relationship between ASD and music, the relationship between alexithymia and music still has much to be discovered. To rectify this, a handful of studies designed to examine this relationship with the goal of alleviating alexithymia have been proposed. By drawing upon a plethora of sources, Allen and Heaton (2009) proposed that music could potentially be used to treat alexithymia by inducing emotional states in a safe environment. They theorized that this could be accomplished by teaching individuals to associate the feelings they felt while listening to music with the emotions they experience in everyday life. By associating their feelings with passages of music, individuals with alexithymia could theoretically gain better insight into their mental states, which could not only help them better regulate their emotional states, but also help them better connect with others.

Since many individuals with ASD who already have difficulties with social situations also have alexithymia, the use of music therapy in this context could help them overcome what may be a daunting task. In order to expand on these ideas, Greenfield, Rentflow, and Baron-

Cohen (2014) proposed that certain types of music could help individuals with ASD as well as the general population increase their empathy. Although this study does not directly address alexithymia, it is still relevant due to the suggestion that deficits in empathy traditionally associated with ASD may actually be correlated with alexithymia (Guttman & Laporte, 2002). To support this claim, they examined previous research through the Empathizing-Systemizing (E-S) theory, which places empathizing and systemizing on opposite ends of a scale to determine an individual's style of cognition. They theorized that because individuals with ASD tend to have high systemizing levels, they may prefer music with patterns and complex instrumentation such as jazz. In addition, it was theorized that individuals with ASD are more likely to connect to music (and potentially to others) when they listen to music with lyrics that they could resonate with or perform as part of a band. This suggests that individuals with ASD may be more likely to empathize with others and form lasting bonds when they feel like they are involved with the music they listen to. This may also apply to individuals with alexithymia with or without ASD, as deficits in empathy may be more closely linked to alexithymia than ASD (Bird & Cook, 2013).

While an extensive amount of research has been done on adults with alexithymia, little to no research has been conducted on children with alexithymia. In an effort to better understand how alexithymia affects how children (particularly children with ASD) perceive and describe their emotions, this study utilized a researcher-created survey in which elementary-age children on the autism spectrum listened to music and answered questions about the emotions provoked by each song. Since alexithymia is a common comorbidity of ASD, it was hypothesized that the participants will have a hard time determining how and why the songs make them feel a certain way. In addition, it was hypothesized that the oldest (11–12-year-old) participants will have an

easier time identifying and describing their feelings than the younger (7-10-year-old) participants.

Method

Participants

Thirty-three children on the autism spectrum between the ages of 7 and 12 years were recruited to participate in the study. Children ranged in age from 7 years old to 12 years old; 24% (8) of the participants were 7-8 years old, 51% (17) were 9-10 years old, and 24% (8) were 11-12 years old. Approximately 55% (18) of the participants were male while the remaining 45% (15) were female. Additionally, about 79% (26) of the participants were White, 15% (5) were Black, 3% (1) was an American Indian or Alaska Native, and 3% (1) was a Native Hawaiian or Other Pacific Islander. Although a separate question that asked if the participants were Hispanic, Latino, or of Spanish origin was provided, none of them indicated that they were.

Participants were recruited through word of mouth as well as through advertisements posted online by the Los Angeles, Inland Empire, and San Diego chapters of the Autism Society. In order to obtain consent, the parents/guardians of potential participants were asked to read through and electronically sign a consent form while the participants signed an assent form. Both forms were hosted on JotForm, an online form creator. Once both forms were completed, a link to the survey was sent to the parent/guardian's email through an email account specifically made for this study. All study procedures and materials were approved by the UCR IRB-SB as HS-20-047.

Procedures

In order to determine how the participants identified and described their emotions, they - along with their parents/guardians - were asked to complete a survey on Alchemer, an online survey software. At the start of the survey, parents/guardians answered a few questions about the demographics of their child such as their age, gender, and ethnicity. For the sake of simplicity, participant ages were divided into three groups: 7-8 years, 9-10 years, and 11-12 years. After answering these questions, parents/guardians were asked to turn down the volume before allowing their child to participate in the next portion of the survey.

Once each participant started the second portion of the survey, they were asked to listen to three songs, each of which were between 1 minute and 2-and-a-half minutes in length. The chosen songs were "Pineapple" by JayJen, "Solo Cello Passion" by Doug Maxwell and Media Right Productions, and "Bread" by Lukrembo. All three of these songs are copyright-free songs found on YouTube and were screened beforehand to ensure that they were appropriate for the target audience. Each song was accompanied by two questions asking how the participants felt after listening to it. The first question was a multiple-choice question asking, "How does this song make you feel?" The choices included Happy, Sad, Afraid, Angry, Calm, I don't know, or Other, the last of which was a write-in. The second question, "Why does this song make you feel this way?" was a free-response question in which participants were asked to elaborate on their answers from the previous question. Upon completing this portion of the survey, participants were asked to have their parents/guardians enter the email they wanted to use to receive compensation, which was provided in the form of a $5 digital Amazon gift card. Once all of the participants completed the survey, the survey was deleted from Alchemer's servers and the results were stored offline.

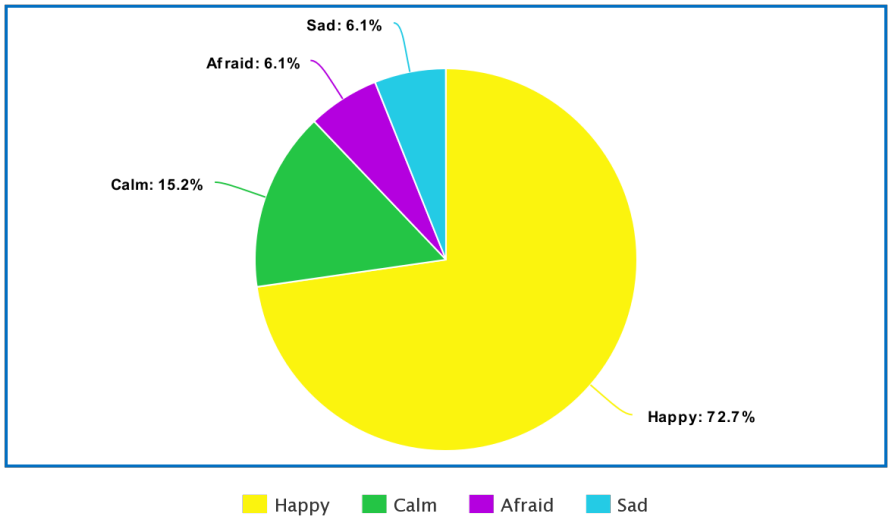
Measures

In order to measure how well each participant could identify their emotions, they were asked to answer one multiple-choice question and one free-response question for each of the three songs. While the multiple-choice questions tested whether or not the participants could identify what emotion they felt, the free-response questions were designed to determine how well each participant could elaborate on the emotions they felt. After the survey was completed, the responses were analyzed and scored based on the participant's ability to determine what they were feeling while listening to the song as well as on how they explained the emotion they had felt at that point in time. The scores were as followed: 0 (selected "I don't know", no elaboration made), 1 (selected an emotion, no elaboration made), 2 (selected an emotion, descriptive elaboration irrelevant to one's emotions), and 3 (selected an emotion, descriptive elaboration on one's emotions).

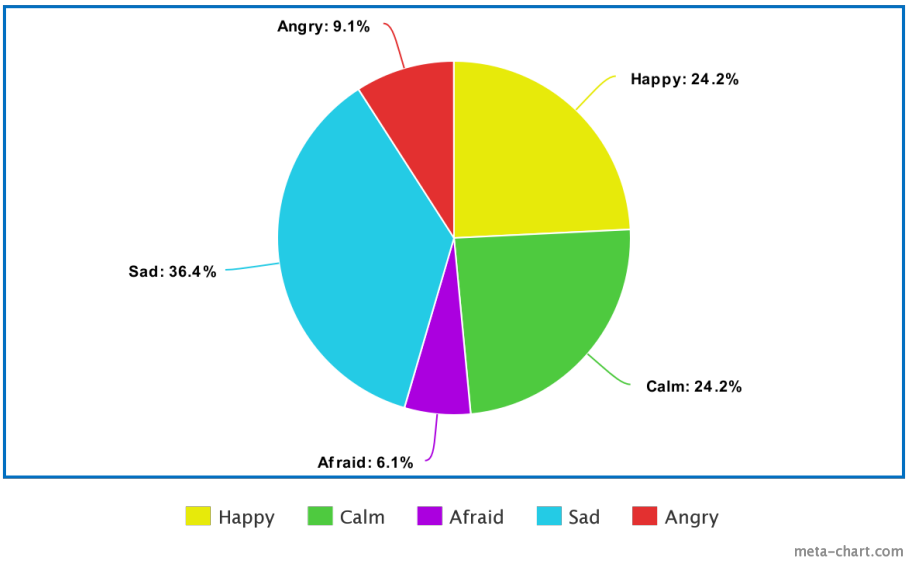
Results

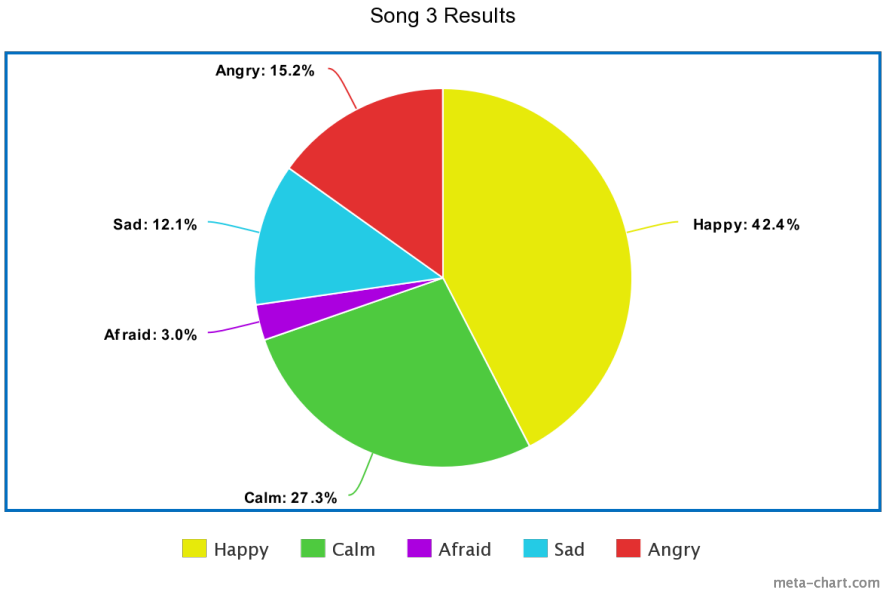
Do children with ASD demonstrate alexithymia? After listening to the first song, "Pineapple", approximately 73% (24) of the participants said that they were happy, 15% (5) said that they felt calm, 6% (2) said that they felt afraid, and 6% (2) said that they felt sad. After listening to the second song, "Solo Cello Passion", 36% (12) of the participants indicated that they felt sad, 24% (8) indicated that they felt calm, 24% (8) said that they felt happy, 9% (3) indicated that they felt angry, and 6% (2) said that they felt afraid. After listening to the final song, "Bread", 42% (14) of the participants said that they were happy, 27% (9) said that they felt calm, 15% (5) indicated that they felt angry, 12% (4) said that they felt sad, and 3% (1) indicated that they felt afraid. None of the participants indicated that they were unsure of how they felt or that they felt an emotion other than the provided options at any point.

Song 1 Results

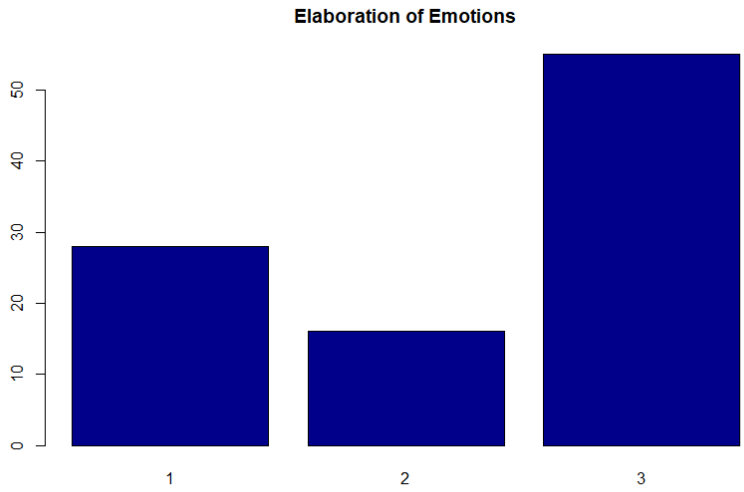


Song 2 Results





How well could children describe their emotions? Out of the 99 total responses given, 28% (28) were scored a 1 since they provided little to no elaboration on their emotional state, 16% (16) were scored a 2 because they elaborated on other details such as the music but did not describe their emotional state, and approximately 56% (55) were rated a 3 because they elaborated on their emotions at an age-appropriate level. Because none of the participants selected "I don't know" in the multiple-choice questions, none of the responses were scored zeroes.



Were they any discernible age differences? The 7-8-year-old participants received the highest percentage of 1's (41.7%), followed by the 9-10-year-old group (31.4%) and the 11-12-year-old group (8.3%). The 11-12-year-old group received the highest percentage of 2's (20.8%), followed by the 9-10-year-old group (19.6%) and the 7-8-year-old group (4.2%). Additionally, the 11-12-year-old group received the highest percentage of 3's (70.8%), followed by the 7-8-year-old group (54.2%) and the 9-10 year-old-group (49%).

Discussion

Upon further investigation, it was found that all of the participants were able to identify what emotion they felt while listening to each song. While the majority of participants reported that they felt happy while listening to "Pineapple," the results for "Solo Cello Passion" and "Bread" were more mixed. The answers to the free-response questions were ultimately more telling, as many of the participants had difficulties in elaborating on the emotions they felt while listening to the songs. For example, one participant said that they felt happy because the song "made [them] feel a little happy." Other responses that reflected this observation included answers such as, "I'm very angry because of this song," "Express happy emotions," and "This song made me happier." As none of the participants indicated at any point that they felt an emotion other than what was listed on the survey, it could be inferred that some of the participants did not actually feel the emotions they indicated and instead selected the emotions they thought would fit best or that the participants did not have the words to describe how they were actually feeling. Subsequently, it may be assumed that some self-report bias was present.

On an interesting note, it should be mentioned that many of the participants described aspects of the music itself instead of elaborating on what emotions they felt following each song. For example, one participant said that they felt angry because "the music [was] too tight."

Additionally, several participants described the rhythm, pitch, tone, melody, instrumentation, and notes found within the songs. These responses could suggest that the participants described details found within in music because they were unsure of how to elaborate on their own feelings. In addition, it could display the hyper-attention to detail found among individuals on the autism spectrum (Baron-Cohen et al., 2009). It was also found that the 11-12-year-old participants had the highest proportion of responses in which they explained their emotions, which supports the hypothesis that this age group would be better than the other age groups at elaborating on their emotions. This may have occurred because the emotional development of children tends to progress as they age. However, more research needs to be done to determine if the same can be said for individuals on the autism spectrum, as some studies have suggested that some aspects of emotional development such as emotion recognition remain relatively unchanged between different age groups (Rump, Giovannelli, Minshew, & Strauss, 2009).

This study had a few limitations, the first of which is the small sample size (N = 33). The small number of participants in this study may have been at least partially due to the ongoing COVID-19 pandemic, which made recruiting children for in-person assessments difficult if not impossible. In addition, the study did not have a control group of typically developing children. The age groups were also unevenly distributed, as a little over half of the participants were between the ages of 9 and 10. It should also be noted that the study's findings may not be generalizable due to its small sample size.

Although this exploratory study does have some limitations, future studies could expand the sample by recruiting a larger number of participants with ASD, as well as by recruiting a control group of typically developing youth, roughly matched by age. By expanding the sampling pool to typically developing youth, the data from both groups could be compared in

order to search for differences in emotional recognition and elaboration. It would be especially noteworthy if school-age children with ASD and alexithymia were compared to children with only alexithymia, as a potential study could be done to determine if and how alexithymia manifests differently in each group. Additionally, it may be beneficial to run future studies in person rather than by questionnaire, in an effort to better measure the participants' emotional responses and to allow further interview questions. Once the effects of alexithymia on children with autism spectrum disorder are better understood, it is hoped that parents, teachers, and therapists may become better equipped to provide emotional support, perhaps by teaching them more about vocabulary to express emotions and how to recognize emotions in themselves. As many of the previously mentioned studies have suggested, music may be the key to unlocking the potential of individuals with ASD and/or alexithymia.

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