THE USE OF MUSICALLY ADAPTED SOCIAL STORIES TO BUILD SOCIAL SKILLS IN INDIVIDUALS WITH AUTISM SPECTRUM DISORDER

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Acknowledgement

As I started this process, I looked up verses on strength and perseverance, as I was being challenged in a way I had never been challenged before. I wrote down a few different verses, one of which was Philippians 4:13, “I can do all things through Christ who strengthens me.” While I did and continue to need Christ in all aspects of my life, the verses from Proverbs (3:5-6), which I also wrote down at that time, truly capture my ongoing need for Christ when pursuing my goals, desires, and dreams. “Trust in the Lord with all your heart and do not lean on your own understanding. In all ways acknowledge Him and He will make straight your paths.” More times than I can count, I forgot to rely on, seek, and praise God as I traversed this path. There were moments when I considered abandoning the work I had done. In those moments, I was not trusting God to guide me through the challenges and see His light on the other side. Thankfully, He does not rely on me and my acknowledgement of His goodness, as He continued to challenge, protect, and demonstrate His love for me throughout. He led me to this point, the moment when I could say, “It is finished!”

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Dedication

I had just finished babysitting three rambunctious, adorable little boys. After their mother came home, I remember standing in her foyer listening to her talk about her journey getting her doctorate. I also remember that as a high school student I thought to myself, “That will never be me.” However, at the same time I was inspired by her and what she had accomplished. Over 10 years later, this memory remains vividly ingrained. I would like to dedicate this dissertation to her, thanking her for teaching me that life can take us on unexpected journeys and women are capable of amazing things. I would also like to dedicate this dissertation to a special little guy with a genetic disorder that presents similarly to ASD and his mother. His mother encouraged me to do musical activities with him and though my time watching him, I gained a deeper understanding of the challenges and triumphs families with these exceptional children experience. She had confidence in me and encouraged me to pursue my studies. I would not be where I am today without these individuals setting an example and encouraging me!
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Introduction

Rationale of the Study

The number of individuals diagnosed with autism spectrum disorder, or ASD, has increased steadily since it was first included in the *Diagnostic and Statistical Manual of Mental Disorders, Third Edition*, published in 1980 (Matson & Kozlowski, 2011). As individuals with ASD are becoming diagnosed earlier, there also has been an increased emphasis on implementing interventions and treatments. Research has determined early intervention services can improve outcomes and alleviate symptoms associated with autism spectrum disorders (Scott & Baldwin, 2005). Several intervention approaches exist to serve individuals with ASD, including biological interventions, cognitive behavior therapy, and applied behavior analysis (McConnell, 2002).

Because of the social and communication deficits characteristic in ASD, many interventions are designed to enhance social behaviors. Social stories, introduced by Carol Gray in 1993, are often used to build social skills in individuals with ASD (Gray & Garrand, 1993). Research has demonstrated social stories are effective in enhancing appropriate social behaviors, such as initiation and cooperative play (Thiemann & Goldstein, 2001; Barry & Burlew, 2004). Music therapy, which became increasingly popular in the 1990’s, is another common intervention approach utilized to enhance social and communication behaviors in individuals with ASD (Peters, 2000). One study found individuals engaged in more of the targeted social
behaviors when intervention material was presented using music compared to when the same content was provided without a musical component (Finnigan & Starr, 2010).

Because of the demonstrated effects of both social stories and music therapy interventions, the integration of these techniques has the potential to be very effective for individuals with ASD. Although interventions utilizing music have exhibited positive effects on social and communication behaviors in individuals with ASD, more research is required before this approach can be considered an established, evidence-based intervention option for individuals with ASD. Therefore, continued research, exploration, and the confirmation of the value of music interventions and musically adapted social stories is necessary.

**Autism Spectrum Disorder**

One in 68 individuals in the United States is diagnosed with autism spectrum disorder, or ASD, which is a pervasive developmental disorder (CDC, 2014). A disorder that is pervasive is one that lasts throughout the lifespan, although symptoms that were once severe may become less severe later in life (APA, 2013).

Individuals with ASD experience significant deficits in social functioning and communication. Deficits in building and maintaining interpersonal relationships, engaging in and understanding nonverbal communication, such as eye contact, and engaging in appropriate social reciprocity is typical in individuals with ASD (APA, 2013). Many individuals with ASD have restricted interests that dominate play and conversations (APA, 2013). Some persons with ASD engage in repetitive motor movements, such as rocking, hand flapping, and spinning. Repetitive motor movements may serve a self-stimulatory function for the individual, but the movements do not serve any other purpose (Tantam, 2012). Individuals with ASD often have difficulty coping
with changes in routine (APA, 2013). Sensory sensitivity, such as hyper or hypo sensitivity to light and sound is also very common in individuals with ASD (Tantam, 2012).

While research has been conducted to determine whether or not there are biological indicators of ASD, no specific gene or biological abnormality has been implicated in the disorder (Tantam, 2012). Structural differences in the brain have been found when comparing individuals with and without ASD. For example, individuals with ASD were found to have increased grey matter in areas of the brain associated with social cognition, communication, and repetitive motor movements, strengthening the argument there is a biological component to ASD (Hyde, Samson, Evans, & Mottron, 2010).

Many individuals with ASD have verbal and nonverbal communication delays; therefore, expressive language deficits are typically the first indicator an individual is at risk of having ASD (Wetherby & Prizant, 2005). Along with verbal communication deficits, many individuals with ASD display deficits in nonverbal behaviors, particularly deficits in eye gaze and joint attention behaviors, from a young age. Deficits in gaze, joint attention, and imitation are reliable signs that further evaluation should be considered (Plauche Johnson & Meyers, 2007).

Many disorders are comorbid with ASD. Characteristics of Attention-Deficit/Hyperactivity Disorder (ADHD), such as difficulty maintaining attention, a lack of planning, and a need to be in constant motion are common in individuals with ASD (Mahajan et al., 2012). Social and communication deficits also may put individuals with ASD at-risk for anxiety and depression (Mayes, Calhoun, Murray, & Zahid, 2011). Learning disorders and medical conditions, such as gastrointestinal disorders are common comorbid conditions (APA, 2013).
Along with addressing disorders that are commonly comorbid with ASD, it also is important to differentiate ASD from other disorders with similar characteristics. For example, individuals with Rett’s Syndrome display communication delays similarly to individuals with ASD, however, individuals with Rett’s Syndrome display significant regression in functioning and development after a period of normal development (APA, 2013). Language disorders include a lack of or delays in verbal communication similar to individuals with ASD (Guerts & Embrechts, 2008). Individuals with language delays typically do not display the nonverbal communication deficits, such as a lack of eye contact or a lack of joint attention, present in individuals with ASD (Guerts & Embrechts, 2008).

**Intervention Approaches for Individuals with ASD**

Intervention has been shown to produce positive outcomes and reduce symptoms of ASD (Matson, 2007). Many parents are eager to enroll their children with ASD into early intervention, as is recommended. Interventions should be tailored to meet the unique needs of the individual (Scott & Baldwin, 2005).

There are a variety of intervention approaches available for individuals with ASD, including biological interventions, cognitive behavioral therapy, applied behavior analysis, child-specific interventions (McConnell, 2002) and interventions that use concepts of social learning theory (Mesibov, 1997). The purpose of intervention is typically to develop communication skills, support the development of social skills, encourage more adaptive behaviors, and reduce the severity of ASD symptomology (Scott & Baldwin, 2005).

By biological interventions, it is meant the individual with ASD takes medication to reduce symptoms associated with this disorder (Mesibov, 1997). For example, many individuals with ASD have comorbid Attention-Deficit/Hyperactivity Disorder (ADHD), resulting in
inattentive behaviors, constant motion, and difficulty planning (APA, 2013). Individuals with ASD, who have comorbid ADHD may take medications to improve attention and reduce hyperkinetic behavior (Mahanjan et al., 2012). While medications are commonly prescribed to individuals with ASD, biological interventions to treat symptomology often associated with ASD should not be the primary or only intervention utilized (Mesibov, 1997).

Applied behavior analysis is commonly utilized with individuals with ASD. This approach focuses on rewarding appropriate behaviors through positive reinforcement. Either inappropriate behaviors are not reinforced, or negative consequences are enforced to reduce undesired behaviors (Mesibov, 1997). Functional behavior assessments help to identify why an individual is engaging in a particular behavior. These assessments enable professionals to plan and implement interventions targeting the difficulties that are most salient for the individual (Anderson, Rodriguez, & Campbell, 2015).

Child-specific interventions are designed to build an individual’s knowledge of a particular skill. The intervention also may be designed to increase the frequency of a behavior or improve the quality of a social behavior exhibited by an individual (McConnell, 2002). Child-specific interventions occur in one-on-one settings and are designed to fit the child’s unique needs, paying attention to the strengths and weaknesses of the child and his or her personality (Koenig, 2012).

Another type of intervention approach that has become increasingly common is cognitive behavioral therapy, or CBT. This approach focuses on cognition and attempts to help individuals understand how their thoughts and feelings affect how an event or situation is interpreted (Mesibov, 1997). CBT is commonly used to help individuals with anxiety and has been found to be effective for individuals between the ages of seven and 14 years old. For higher functioning
individuals with ASD who have comorbid anxiety, CBT may be an appropriate option (Wood, Fujii, & Renno, 2011; Drahota, Wood, Sze, & Van Dyke, 2011).

Interventions using the concepts of social learning theory may be utilized with individuals with ASD to build social skills and to encourage social interactions (Mesibov, 1997). Social learning theory is built upon the idea behavior is influenced by social interaction (Bandura, 1977). The focus of social learning theory interventions may utilize modeling (Apple, Billingsley, Schwartz, & Carr, 2005), play groups, or a peer-mediated components to encourage social interaction and help individuals with ASD interact positively with peers (Kasari & Locke, 2011).

Along with the various intervention approaches, the components of a given intervention are important to consider. There are essential components all interventions for individuals with ASD should include. Firstly, interventions should focus on the core deficits of ASD, such as interventions focusing on social and communication deficits (Brady, Shores, McEvoy, Ellis, & Fox, 1987). Interventions should be highly structured, and behaviors targeted in the intervention should be clearly defined and easily measurable (Taylor & Jasper, 2001; Howlin, Magiati, & Chairman, 2009). Whenever possible, interventions should be conducted in a naturalistic environment (Lord & McGee, 2001).

**Social Skills Interventions for ASD**

The use of social stories is a particularly common intervention approach to build social skills in individuals with ASD (Earles, Carlson, & Bock, 1998). Carol Gray first introduced social stories in 1993 to address skill deficits in individuals with ASD (Gray & Garrand, 1993). Social stories include descriptive sentences, which define the situation and directive sentences, which provide direct responses or cues for the given situation to the individual. Along with these
two types of sentences, perspective sentences, which provide information about the physical and emotional states of the individual with ASD using the social story, are also included at times. As time has progressed, social stories have evolved. Now, social stories are to include descriptive, directive, perspective, and affirmative sentences. The purpose of affirmative sentences in the social story is to provide cultural meaning. Affirmative sentences highlight basic beliefs of a particular culture. Social stories can also include control sentences, which are used to help individuals with ASD recall necessary information, and cooperative sentences, which are sentences for other individuals to use as a means to help the individual using the social story (Reynhout & Carter, 2006).

A case study by Kuttler, Myles, and Carlson (1999) used social stories to target inappropriate verbalization behaviors in a 12-year old male with ASD. Two different social stories were presented to the participant two times a day, during a time that was considered particularly difficult for the individual. The mean frequency of his inappropriate vocalizations was between 11 and 16 instances prior to the introduction of the social stories. During the intervention, the frequency of the target behavior reduced drastically, occurring zero to two times during the sessions. The removal of the intervention led to drastically high increases in the target behavior. Again, once the intervention was reinstated, the vocalizations reduced in frequency, similar to the first intervention phase. Results of the research indicate individuals with ASD may be dependent on the social stories to engage in appropriate behaviors (Kuttler et al., 1999).

Another study used social stories to build communication skills in individuals with ASD. Ten typically developing individuals and five individuals with ASD between the ages of six and 12 were included in the study. Participants were exposed to the social stories and provided with opportunities to evaluate social behavior via video after the intervention session. The five
individuals with ASD all demonstrated increases in initiation and attention securing behaviors. As has been the case in other research, these results were not maintained once the intervention was removed (Thiemann & Goldstein, 2001).

Social stories also have been used to encourage prosocial behaviors in preschool aged individuals diagnosed with ASD. A study by Wright and McCathren (2012) utilized social stories to build social behaviors during free play in four males between the ages of two and three. For three out of four participants, social stories included pictures of classroom peers. Prior to free play, participants were read the social story by the classroom teacher. A multiple baseline design was utilized, and the percentage of non-overlapping data was calculated to determine intervention effectiveness. Engagement in positive social interactions was the behavior targeted in the intervention. Examples of the target behavior included requesting peer attention, using gestures or verbalizations to initiate joint attention, answering a peer, and responding behaviorally to a peer’s initiation. Results varied by participant; the intervention was not effective for one individual, mildly effective for two participants, and moderately effective for one individual. Along with the overall mild increases in prosocial behavior, maladaptive behaviors decreased modestly for all four participants after the initiation of the social stories (Wright & McCathren, 2012).

Scattone, Tingstrom, and Wilczynski (2006) developed social stories to increase appropriate social behaviors in three individuals with ASD; two participants were eight years old, the third was 13. Targeted behaviors included appropriate social interactions, such as handing something to a peer, making a comment or engaging in conversation, and engaging in an activity with a peer. Participants were read social stories prior to unstructured play periods. Results of the intervention differed by participant. Changes in social interactions were not
observed in the first participant after receiving the intervention. For the second participant, the percentage of non-overlapping data between the baseline and intervention phase was 89%, suggesting the intervention was effective for this individual. The intervention was shown to have moderate effects for the third participant, with the percentage of non-overlapping data at 69%. As the effects of the intervention varied by participant, the use of social stories may not be appropriate for all individuals with ASD (Scattone et al., 2006).

Three individuals with ASD were included in a study designed to evaluate the effect of social stories on social engagement. The target participants were matched with typically developed peers in the classroom. A variety of social behaviors, including appropriate and inappropriate social engagement, attention seeking, initiating comments, initiating requests, and making contingent responses were recorded. Overall, increases in socially appropriate behavior were observed. The majority of social behaviors included contingent responding and imitating comments, indicating additional support may be required in order for an individual with ASD to initiate comments and requests and engage in intentional social attention-seeking behaviors (Delano & Snell, 2006).

Similarly to Delano and Snell (2006), Hanley-Hochdorfer, Bray, Kehle, and Elinoff (2010) investigated the effectiveness of social stories in increasing verbal initiation behavior in individuals with ASD. Four participants were included in the study, three of whom were male. Participants were six, nine, 11, and 12 and all were diagnosed with autism or Asperger’s Disorder. Participants were observed during 15 minutes of lunch and verbal initiations and contingent responses with peers were recorded. Intervention included exposure to the social story four times a week within 15 minutes of lunch. After the social story had been read, participants were asked four comprehension questions. Observations occurred three times a week during
lunch. The percentage of non-overlapping data ranged from one percent to 38% for both verbal initiations and contingent responses. In order for the effectiveness of an intervention to be considered fair, the percentage of non-overlapping data should be at least 70%; therefore, the social stories intervention was not found to be effective (Hanley-Hochdorfer et al., 2010).

While both Hanley-Hochdorfer et al. (2010) and Scattone et al. (2006) used the percentage of non-overlapping data to determine the success of a social stories intervention, results were in contrast with one another. Similarly, while both Hanley-Hochdorfer et al. (2010) and Delano and Snell (2006) targeted similar behaviors, the success of the interventions were vastly different. Because of the differences in results, it is valuable to consider the limitations of the study conducted by Hanley-Hochdorfer et al. (2010). The lack of effectiveness could be related to an inappropriate antecedent condition. The social stories presented did not include pictures of the lunchroom, which may have limited the generalizability of the social stories to the lunchroom (Hanley-Hochdorfer et al. (2010).

Social stories also have been used to encourage individuals with ASD to make choices independently and engage in appropriate play. The purpose of the social stories was to teach play skills to the two individuals, ages seven and eight, included in the study. Targeted behaviors included the duration of appropriate play and the number of responses required before the participant selected a center. Prior to the introduction of the social stories, neither participant engaged in play after being physically directed to one of the play centers in the classroom. During the second phase, the intervention focused on helping the target participants select a center and engage in appropriate play through teacher-led interactions. During this phase, the number of verbal prompts required before the participants engaged in play decreased. The third phase focused on the children’s interactions with peers. In this phase, one of the participants was
able to engage in appropriate play without prompting. After the second participant had been introduced to the social stories, prompting was still required to facilitate engagement in appropriate play. However, the number of prompts required to elicit the desired behavior decreased after the participant heard the social stories (Barry & Burlew, 2004).

Increases in appropriate play and increases in the ability to independently make choices were observed throughout the intervention. Results persisted even after teacher-led instruction and prompting were removed, demonstrating the possible long-term effects of social stories interventions (Barry & Burlew, 2004).

Social stories were combined with video self-modeling to teach individuals with ASD appropriate social behaviors, including greeting others, inviting peers to play and contingent responding. A three-year-old male’s targeted behaviors were observed, using a multiple-baseline single subject research design. Three social stories were written, each story targeting one of the social skills. Three different videos, each presenting the social stories through dialogue between two hand puppets were utilized to model each skill. Fifty minute intervention sessions occurring twice weekly were conducted, and each session included reproductions of scenes from the video that provided opportunities to engage in the target behaviors (20 minutes) and free-play (30 minutes). The participant watched the videos of the social stories three different times throughout the day in his home (Lитras, More, & Anderson, 2010).

As a result of exposure to the social stories intervention, the participant’s engagement in greeting behavior and accepting invitations to play rose. Contingent responding also increased. Increases in behavior remained above baseline at follow-up. Results indicate social stories presented through videos may be effective in increasing social behavior in individuals with ASD (Lитras et al., 2010).
Music is a pervasive part of the human experience, as it is present in a number of venues visited, such as stores and special events, and is an ever-present component of the media (McPherson, Davidson, & Faulkner, 2012). Music has been found to reduce stress, promote bonding, and bring comfort (Edwards, 2011). It has also been shown to increase creativity, concentration, social skills, and self-discipline in children (Hallam, 2010).

As children grow, they progress through various stages of musical development. The Vernacular stage occurs when children are between the ages of four and six and is characterized by unstructured, spontaneous music expression. Starting around age five, children begin to engage in more intentional music expression, characterized by patterns and rhythmic expression. The Speculative Mode begins at age ten, and it is in this stage children begin to ignore the conventions of music. Long phrases and a lack of rhythmic accuracy characterize the Speculative Mode. Around 13 years of age, children enter the Idiomatic Stage of music development, characterized by a return to the conventions of music. At this stage, children often attempt to mimic popular music. Lastly, starting at 15 years of age, children enter the Symbolic and Systemic modes. Unique to these stages and beyond, individuals intentionally reflect on musical experiences and engage in intentional music development (Marsh, 2008). Early exposure to musical experiences also impacts musical development in children. Exposure to live and recorded music, instruments, and various musical experiences may increase a children’s interest in taking lessons and engaging in teacher-directed musical activities (McPherson et al., 2012).

Music and ASD

Many individuals with ASD find music motivating and interesting, making the use of music in therapy and intervention valuable to consider (Srinivasan & Bhat, 2013). Individuals
Musically Adapted Social Stories

with ASD may excel at and have a special interest in music (Graham, 2001). Similarly to typically developing peers, individuals with ASD have been found to have similar physiological responses to music. For example, changes in heart rate and cortisol levels were found to be similar between individuals with and without ASD when exposed to different musical selections (Zangwill, 2013).

The presence of increased levels of a dopamine receptor called DRD4 was found to be correlated with musical interest in a study conducted by Emmanuele, Boso, Cassola, Broglia, Bonoldi, Mancini, Martini, and Politi (2009). Typically developing individuals with music backgrounds and individuals with ASD were found to have higher levels of DRD4 when compared to neurotypicals without musical backgrounds. Results may partially explain why individuals with ASD often have a special interest in music (Emmanuele et al., 2009).

Individuals with ASD were found to have superior pitch processing skills in a study by Heaton, Hermelin, and Pring (1998). Individuals with ASD were compared to typically developing individuals. Musical tones were matched with a picture of an animal. Participants were asked to listen to the tone and select a picture matching the tone. Participants were asked to do the same task with speech sounds instead of musical tones as well. Both groups of participants were able to match speech sounds with the pictures equally well. However, individuals with ASD were better able to match the musical tones with the picture, suggesting a connection between musical processing skills and ASD (Heaton et al., 1998).

Skill superiority may be partially explained through the mirror neuron system, or MNS. The MNS is involved in emotional expression and communication and enables individuals to respond to his or her actions as well as the actions of others (Wan, Demaine, Zipse, Norton, & Schlaug, 2010). Communication and social deficits, including difficulty recognizing the
emotions of others and engaging in appropriate social reciprocity, are characteristic of individuals with ASD (APA, 2013). As the mirror neuron system is involved in social and emotional communication, it has been proposed dysfunction of the MNS may explain social and communication deficits in persons with ASD. As music making has been linked with activation of the MNS, using music may heighten an individual’s ability to understand emotions and engage in imitation (Wan et al., 2010).

As many individuals with ASD have communication deficits and difficulty with emotional reciprocity (APA, 2013), the potential of music to facilitate the development of these skills was suggested by Allen and Heaton (2010). Although Allen and Heaton (2010) did not conduct any research, they hypothesized teaching facial expressions to individuals with ASD would help connect cognition with affective, emotional states. Allen and Heaton (2010) used previous research to support their hypothesis, noting individuals with ASD were able to match excerpts from classical pieces with different visual depictions of emotions (Allen & Heaton, 2010).

Although much of the research on music and ASD has focused on music’s ability to facilitate skill development, a study by Allen, Hill, and Heaton (2009) focused on better understanding how individuals with ASD perceived musical experiences. Results indicated 75% of participants used music to alter mood and for pleasure. Many aspects of music were found to be motivating for participants. For example, the message of the music, musical structure, technical aspects, the familiarity of the piece, and the energizing and relaxing aspects of the music were all found to be important characteristics for the participants. Although participants experienced emotional arousal while listening to and performing music, these individuals still had difficulty expressing the emotional experience (Allen et al., 2009).
Music Therapy and ASD

For the past 65 years, music therapy has been used to help individuals with a variety of mental health and physical difficulties. Music therapy was first utilized in psychiatric settings, but is now more likely to be implemented in therapeutic settings (Reschke-Hernandez, 2011). The use of music therapy has been found to help individuals with anxiety and depression (Maratos, Gold, Wang, & Crawford, 2008), those experiencing grief (Hilliard, 2001), individuals with post-traumatic stress symptoms (Bensimon, Amir, & Wolf, 2008), and individuals with substance abuse problems (Michel, 1985). Physical pain and muscle rigidity also has been soothed through the use of music therapy (Peters, 2000). Music therapy is commonly used to help individuals with physical and cognitive disabilities build functional skills, communicate, and exhibit fewer problem behaviors (Peters, 2000). The use of music therapy for individuals with ASD became increasingly common in the 1990s (Reschke-Hernandez, 2011).

A goal-directed therapy, music therapy uses music as a facilitator to help others achieve their goals. Individuals who engage in music therapy do not need particular musical skills, and the purpose of therapy is not to become a better musician (Peters, 2000). Increasingly, research is becoming focused on evidence-based research, which is difficult at times because of the internal changes experienced as a result of therapy that are challenging to measure (Abrams, 2010). Music therapy is not yet an established, evidence-based therapeutic approach for individuals with ASD. Rather, it is an area of emerging research with some research support (Wong, Odom, Hume, Cox, Fettig, Kucharczyk, Brock, Plavnick, Eleury, & Schultz, 2013).

Although music therapy is an area still requiring research, several studies have shown music therapy to be effective with individuals with ASD. It is commonly used to help individuals with ASD build social skills and understand emotions (Reschke-Hernandez, 2011).
Edgerton (1994) utilized improvisational music therapy to build communication skills in 11 individuals with ASD. An increase in communicative responses was found for all individuals in the study (Edgerton, 1994). Kim, Wigram, and Gold (2009) also used improvisational music therapy for ten individuals with ASD to build social skills. Participants were exposed to music and non-music therapy sessions aimed to build social skills. All participants experienced more joy behaviors, such as smiling, laughing, and emotional synchronicity, in the music condition compared to the non-music condition. Participants were found to be more compliant in the music condition, and increases in imitation and emotional synchronicity were present. Results indicated music can help individuals with ASD engage in more adaptive social behaviors (Kim et al., 2009).

As echolalia is commonly exhibited by individuals with ASD, Lim and Draper (2011) conducted a study to determine whether or not a combination of applied behavior analysis and music therapy could reduce echolalia and increase appropriate verbal production in these individuals. Participants were exposed to both a music and non-music learning situation. Results indicated participants performed higher on verbal production tasks in the music therapy condition compared to the therapy sessions without a music component, reiterating music’s ability to facilitate adaptive behavior (Lim & Draper, 2011).

Musically Adapted Social Stories

Interventions with a music component have been frequently utilized with individuals with ASD to build social and communication skills (Edwards, 2011). Brownell (2002) used musically adapted social skills to reduce maladaptive behaviors in four individuals with ASD. Participants experienced music in both sung and spoken conditions. Participants were evaluated through three
different phases, including baseline, exposure to traditional social stories (spoken), and exposure to musically adapted social stories (Brownell, 2002).

For an individual exhibiting echolalia, the use of traditional social stories dramatically reduced the behavior. Behavior decreased even more once the musically adapted social stories were introduced, although no significant differences were found between the music and spoken conditions. The second participant was introduced to the musical social stories prior to the traditional social stories to reduce noncompliant behavior. Although no significant differences existed between the sung and spoken conditions, a sharp decrease in behavior was present once the musically adapted social stories were presented. The target behavior for the third participant was reducing the use of a loud voice while in the classroom. He received the spoken social stories first. Reductions in the use of a loud voice were found in both conditions; however, a significant difference was found between the sung and spoken conditions. Fewer instances of a loud voice were observed in the sung condition. The target behavior for the last participant also was the use of a loud voice. He received the musically adapted social stories first. Reductions in the use of a loud voice were observed in both conditions, although there was no significant difference between conditions (Brownell, 2002).

Pasiali (2004) utilized musically adapted social stories to promote social skills in three individuals with autism in their homes. The first participant frequently made inappropriate vocalizations at the dinner table. When presented with a musically adapted social story prior to dinnertime, a reduction in inappropriate vocalizations was observed. For another participant, repeatedly watching particular movie scenes were reduced significantly through the introduction of a musically adapted social story. A reduction in rummaging behavior was observed in the final participant in Pasiali’s study; however, reductions were not significant (Pasiali, 2004).
Similarly to Brownell (2002), Finnigan and Starr (2010) compared music and non-music conditions to determine how socially avoidant and socially responsive behaviors differed in the two conditions. Eye contact, turn taking, and imitation were behaviors targeted in the case study, utilizing a three-year-old female with ASD. There was no overlap between the number of times the participant engaged in imitation during the baseline phase compared to the music condition. Although imitation behaviors increased in the non-music condition, the percentage of imitative behaviors was not as high as found in the music condition. Turn taking behaviors also increased in both conditions; however, a higher number of turn-taking behaviors were observed in the music condition compared to the non-music condition. When examining socially avoidant behaviors, instances of such behaviors were only observed in the non-music condition (Finnigan & Starr, 2010).

A peer-mediated intervention was used by Kern and Aldridge (2006) to support social interaction and outdoor play in individuals with ASD. Participants were observed on the playground, and then, musical adaptations were made to the playground. Phases of teacher-directed and peer-directed play in the music hut occurred throughout the course of the intervention. Small increases in social interaction occurred after the introduction of the musically adapted playground. Teacher-directed play in the musical hut led to large increases in the number of social interactions the target participants engaged in with peers. When peer-mediated instruction was introduced, peer interactions did decrease slightly but remained higher than baseline. Although teacher-directed play resulted in the greatest increase in social interactions, individuals with ASD are required to engage in less structured activities, such as lunch and recess which require higher levels of independence (Kern & Aldridge, 2006).
Chapter Summary

Although not all individuals learn to play an instrument or have interest in increasing musical skill, music is a pervasive component of the human experience (McPherson et al., 2012). It is important to note that many individuals with ASD find music motivating and interesting; therefore, using music to build deficit skills in this population may be an appropriate and effective motivational tool (Srinivasan & Bhat, 2013). Music therapy and interventions with a musical component may encourage participation and cooperation in individuals with an interest in music. Heightened musical interests in persons with autism may be related to neurological differences, such as the increased levels of dopamine receptors and superior pitch processing skills (Emmanuele et al., 2009; Heaton et al., 1998). When planning and implementing interventions, the interests of individuals should be considered (Scott & Baldwin, 2005). Therefore, it is logical to conclude individuals with ASD who enjoy music or have a special interest in music would be appropriate candidates for music therapy, music intervention, or both. Additionally, research has demonstrated individuals with ASD have physiological experiences similar to neurotypical individuals. Shared physiological experiences could facilitate bonding and communication between an individual with ASD and his or her therapist, family, and peers in ways therapy without a music component could not (Zangwill, 2013).

Previous research on music therapy and music interventions have revealed the positive effects music can have on individuals with ASD. Increases in social behaviors and communication skills and reductions in maladaptive behaviors, such as echolalia, have resulted from exposure to music therapy interventions (Edwards, 2001; Lim & Draper, 2011). Much of the research involving music therapy and persons with ASD was conducted in the 1990s and early 2000s and is not what is considered evidence-based (Peters, 2000; Abrams, 2010).
Additional research is required to establish music therapy intervention as an evidence-based treatment approach. Because many individuals with ASD are interested in and have heightened music ability, continuing to examine the effects of music intervention and pursue research in this area should be a priority.

**Purpose of the Present Study**

Considering the rise in ASD diagnosis is likely due, in part, to broader diagnostic criteria and earlier detection of the disorder, appropriate treatment to alleviate symptomology and provide support to persons with ASD and family members is the next component of best practice (Matson & Kozlowski, 2011). Twenty-seven intervention approaches, including antecedent-based intervention, exercise, peer mediated intervention, social skills training, and pivotal response training have been identified as evidence-based intervention approaches for individuals with ASD (Wong et al., 2013). Although music therapy has been an established field since the 1950s (Peters, 2000), music therapy interventions have not yet been classified as evidence-based due to limited research groups (Wong et al., 2013). Combining the knowledge that individuals with ASD often have increased musical interest and/or skill (Allen et al., 2009; Graham, 2001) with the idea interventions should be tailored to suit the individual interests of children presents a need to further research the potentially powerful impact of music for this population (Koenig, 2012; Scott & Baldwin, 2005).

The purpose of the present study is to determine whether or not musically adapted social stories administered in a small group setting will effectively increase targeted social skills in individuals with ASD. Specifically, will participants who receive small group intervention including musically adapted social stories have greater gains in targeted social skills compared to other individuals with ASD who do not receive the specific intervention?
Musically Adapted Social Stories

Significance of Study

According to Wong et al. (2013), music therapy and music interventions are emerging interventions for use with individuals with ASD. While interventions using music have demonstrated positive results for individuals with ASD, there is not yet enough research to classify these interventions as evidence-based practice. Many of the studies including music therapy and music interventions lack a comparison group. In order for music therapy and music interventions to be evidence-based practice, these individuals need to be compared to typically developing peers or individuals with other developmental disabilities (Wong et al., 2013). As many individuals with ASD respond positively to musical experiences and may have increased musical processing skills, this is an important area to research (Graham, 2001).

Previous research on music interventions typically involves musically adapted social stories that are designed specifically for one individual. The use of the same social story for a small group of individuals with ASD has not been researched extensively. Studying the application of musically adapted social stories in small group settings is a way to effectively increase the utility of music interventions and expand upon current research.

Typically, parent rating forms are not included in studies utilizing musically adapted social stories. Including quantitative information from the parents, such as a rating scale or a survey, would provide additional information about the impact of musically adapted social stories.

Limitations

As with many studies using music interventions to help individuals with ASD, the present study includes a small sample size. Because of the small sample size, the generalizability of the results may be limited. However, it is anticipated that by incorporating a control group,
including parent rating scales, and utilizing a single-subject research design will make a significant contribution to the literature.
Chapter II

Review of the Literature

This chapter provided a literature review relevant to the current study. It includes information on autism spectrum disorders, prevalence rates, diagnostic criteria and comorbidity, and biological components of the disorder. The chapter discusses common interventions utilized when working with individuals with ASD. Additionally, the chapter discusses the benefits of music, the biological components of music, and the use of music therapy and music intervention with individuals with ASD. This study specifically focused on the use of music interventions in a group setting to improve social skills in individuals diagnosed with autism spectrum disorder.

Autism Spectrum Disorder

According to the Center for Disease Control and prevention (CDC, 2014), 1 in 68 individuals is diagnosed with an autism spectrum disorder, or ASD in 2010. Ten years prior, the rate of ASD diagnosis was 1 in 150. The prevalence rate is 1% in North America, Europe, and Asia and 2.6% in South Korea. Individuals with autism spectrum disorder come from a variety of ethnic backgrounds and socioeconomic groups. Rates of the disorder vary between males and females, with the incidence being one in 42 for boys and one in 189 for girls (CDC, 2014).

Autism spectrum disorders, or ASDs, are pervasive developmental disorders, meaning an individual’s functioning is impacted throughout the lifespan (American Psychological Association, 2013). Autism was originally called Kanner’s Syndrome, as identified by Leo Kanner in 1943, after he observed a child who displayed stereotyped behavior and deficits in social reciprocity, characteristics that are now essential components of an ASD diagnosis. A year
later in 1944, Hans Asperger identified four boys with precocious speech development, social
deficits, and stereotypic behavior; these observed behaviors became characteristic traits
identified in Asperger Syndrome (Lai, Lombardo, & Baron-Cohen, 2014). Currently, there is no
diagnostic separation between Autism and Asperger Syndrome. Rather, both disorders are

Deficits in social functioning and communication include deficits in nonverbal behaviors,
difficulty developing and maintaining interpersonal relationships, and deficits in emotional
reciprocity. Children with ASD display affection but typically on their terms. Parents often
describe their children with ASD as independent, as a way to label aloof behavior (Rapin, 1997).
Nonverbal communication deficits may be characterized by a lack of eye contact, a flat affect, or
limited social smiling. Individuals with ASD would be expected to have difficulty starting and
maintaining conversations, sharing in the interests of others, and interacting socially with others
(APA, 2013).

Along with social and communication deficits, individuals with ASD have restricted
interests, repetitive motor movements, or both. Deficits in this area are characterized in
individuals with ASD by at least two of the following traits: Restricted interests, repetitive motor
movements, strict adherence to a routine, and hyper or hyposensitivity (APA, 2013). Individuals
with ASD who have restricted interests would likely dominate play and conversations with
others by engaging in activities and talking only about their restricted interests (APA, 2013).
Repetitive motor movements typically serve a self-stimulatory function for persons with ASD.
Individuals with ASD may engage in repetitive motor movements, as these behaviors provide
comfort and increase feelings of security (Tantam, 2012). Examples of repetitive motor
movements include hand flapping, rocking, spinning, and echolalia (Nazneen, Boujarwah,
Sadler, Mogus, Abowd, & Arriga, 2010). Many individuals with ASD adhere strictly to routines and have difficulty adjusting to alterations in their routine (APA, 2013). When changes in routine occur, individuals with autism spectrum disorders may respond negatively. For example, children may throw temper tantrums or become emotionally reactive to an atypical degree (Sipes, Matson, Harovitz, & Shoemaker, 2011). Hyper or hyposensitivity may be exhibited in many ways. Individuals may have an aversion to texture. For example, the tags in clothing or certain fabrics cause extreme discomfort in some individuals with ASD. Diet sensitivity, such as food aversions, also may be present. Individuals with ASD may have difficulty with loud noises or bright lights (Tantam, 2012).

In order for individuals to receive a diagnosis of ASD, symptoms must be present early in the developmental period (APA, 2013). Typically, expressive language deficits are the earliest indicator someone is at-risk of having ASD. Many individuals with ASD have limited expressive language (Wetherby & Prizant, 2005); at least a third of individuals with ASD are nonverbal (Bryson, 1996). While intellectual disabilities are often present in individuals with ASD, social and communication deficits impact the individual’s functioning to the greatest degree. Children with ASD have more significant impairment in imitation than children with other developmental disorders (Rogers, Hepburn, Stackhouse, & Wehner, 2003). Studies have revealed non-verbal deficits in individuals with ASD aid in discriminating between ASD and other disorders (Mundy, Sigman, Ungerer, & Sherman, 1986). Persons with ASD must be significantly impaired by the symptoms of ASD in order to receive a diagnosis (APA, 2013).

Biological Components of ASD

Heredity has been found to play a role in ASD, and about 15% of autism cases have found a genetic mutation associated with the disorder. However, no specific genetic mutation or
genetic abnormality of any kind has been specifically implicated in ASD. Because there is no
definite cause of ASD, it is included in the DSM-V (APA, 2013). Much research has been
conducted with the intention of determining biological causes of ASD. Consider Rett’s disorder,
which was listed in the DSM-IV as a pervasive developmental disorder with no known cause.
The disorder caused developmental regression after a period of normal development that
impacted individuals throughout their lifespan (APA, 2000). Recently, a biological cause of
Rett’s Disorder was identified, leading to the removal of the disorder from the DSM-V (Smeets,
Pelc, & Dan, 2012).

Many believe that like Rett’s Disorder, biological abnormalities lead to ASD. Research
has demonstrated that while biological abnormalities exist in individuals with ASD, no specific
abnormalities have been found across studies. Specifically, subtypes are likely involved and
different genetic abnormalities result in presentations of ASD that vary in symptoms and severity
(Tantam, 2012).

Continuing to consider subtypes, it is important to discuss other genetic disorders that
share similarities to ASD. For example, children with William’s Syndrome present with
symptomology similar to children with ASD. Many individuals with William’s Syndrome have
language and communication difficulties similar to difficulties exhibited by children with ASD,
such as pragmatic language difficulties (Philofsky, Fidler, & Hepburn, 2007). Visual processing
difficulties also are present in individuals with ASD and William’s Syndrome. For example,
individuals with ASD and William’s Syndrome often focus on parts of objects, rather than the
whole object. When playing with a toy car, individuals with both disorders are likely to focus on
spinning the wheel of the car, rather than playing with a car similarly to typically developing
peers (Grice, Spratling, Karmiloff-Smith, Halit, Csibra, de Haan, & Johnson, 2001). Lastly,
exhibiting repetitive motor movements, such as hand flapping or rocking are often characteristic of individuals with ASD and William’s Syndrome (Urgeles, Alonso, & Ramos-Moreno, 2013). However, unlike ASD, there is a known genetic component involved in William’s Syndrome, a 7q11 chromosomal deletion (Berg et al., 2007).

Although no specific gene is implicated in ASD, there are structural differences between individuals with ASD and typically developing peers. Reductions in grey matter in the left medial temporal lobe and increased grey matter in the right temporoparietal junction have been found in individuals with ASD (Kuemerle et al., 2007). These areas of the brain are associated with social cognition and communication. Increases in grey matter lead to social and communication deficits as well as repetitive behaviors, all characteristic in individuals with ASD (Hyde, et al., 2010).

In typically developing individuals, the amygdala is activated during social interactions. In individuals with ASD, frontotemporal regions of the brain were activated, but the amygdala was not. The difference in brain activation between neurotypical individuals and those with ASD may help to explain social and communication deficits present in individuals with ASD (Baron-Cohen et al., 1999).

ASD Identification, Presentation, and Comparison to Typical Development

Symptoms and the severity of symptoms related to ASD may change over time, making early diagnosis more complicated and inconsistent. A study by Guthrie, Swineford, Nottke, and Wetherby (2013) included 82 individuals between 15 and 24 months of age, identified as at-risk through screening on the Communication and Symbolic Behavior Scales Developmental Profile (Wetherby & Prizant, 2002), the Infant Toddler Checklist (Wetherby, Woods, Allen, Cleary, Dickinson, & Lord, 2004) and the Systematic Observation of Red Flags of ASD (Wetherby, et
The vast majority of participants were Caucasian males. Participants who were labeled as at-risk during the screening process were referred for further evaluation. Participants, between the ages of 15 and 24 months and then again at least 12 months later were assessed, to determine the long-term stability of their diagnosis. All participants who received a confirmed diagnosis of ASD continued to have a confirmed diagnosis of ASD at follow-up. Individuals with ASD demonstrated a worsening of repetitive and restricted behaviors; these behaviors were stable in non-ASD participants. Ruling-out ASD also was 100% stable from the initial evaluation to follow-up. Of the 14 individuals who could not be placed confidently into either category, ASD was ruled out for 10 of the 14 participants at the follow-up evaluation. Results supported the importance of screening and early evaluation for individuals who are determined to be at-risk for ASD. Individuals who are diagnosed with ASD between 15 and 24 months continue to demonstrate symptoms that support a diagnosis of ASD (Guthrie et al., 2013).

Early identification and intervention has been found to be extremely important for individuals with ASD. When children are young, frequent doctor visits and wellness checks are typical to ensure children are developing appropriately (Tantam, 2012).

Routine surveillance by pediatricians is the best method to determine children who should be referred for further evaluation (Gabovitch & Wiseman, 2005). Parents, because they are around children most often, are typically the first to identify and address concerns with the pediatrician about their child’s development. The child’s parents typically recognize deficits, particularly communication and social deficits, when the child is around 18 months. Doctors can help identify behaviors and identify abnormal development through a screening process to help identify individuals who may be at-risk for ASD (Tantam, 2012).
Children who do not reach certain developmental milestones appropriately would be labeled as at-risk (Gabovitch & Wiseman, 2005). Deficits in both joint attention and imitation are reliable signs indicating further evaluation should be completed. Other early signs of ASD include lack of pretend play, flat affect, and lack of appropriate gaze (Plauche Johnson & Myers, 2007).

In order to understand the differences in emotional development present in persons with ASD, it is first necessary to examine typical social development. Emotional development and expression begin early in development. Within the first six months of life, infants begin to engage in primary emotions such as anger, joy, fear, and sadness. Facial expressions are present in infancy and provide insight into emotions (Santrock, 2014).

Smiling is a social behavior present early in development. Within the first month after birth, infants engage in reflexive smiles. Reflexive smiles do not occur as a result of external environmental influences. By as early as four to six weeks of age, smiles become intentional and are called social smiles (Santrock, 2014). Social smiles are smiles that serve as a response to external stimuli. Increases in social smiling are seen throughout the first year of life. Infants begin to initiate smiling and respond to others through smiling. Past a year old, smiling continues to be an important way for toddlers and children to express positive feelings and demonstrate enjoyment (Messinger, 2008).

Before an individual can make eye contact, visual acuity must develop. At birth, vision is estimated to be 20/240, meaning infants see objects that are 20 feet away as clear as adults with normal vision see objects 240 feet away (Aslin & Lathrop, 2008). Although vision is blurry, infants demonstrate a preference for faces very soon after birth. Typically, developing infants show a preference for patterns over solid colors and a preference for faces over patterns. Infants
can match voices to faces and can identify their mother at less than a day old (Santrock, 2014). Joint attention occurs when two or more individuals share a focus on the same object or event. This process requires the ability to track another’s behavior, which may be characterized by making eye contact and following the eye gaze of another individual. Joint attention also involves reciprocal interactions and one person directing the behavior of another. Prior to engaging in joint attention, the development of basic eye contact must be present (Santrock, 2014). By 15 months, children engage adults in joint attention through pointing and using words and sounds to gain attention from others (Gabovitch & Wiseman, 2005).

Imitation, also known as observational learning or modeling, is another important skill infants develop that aids in social interaction (Santrock, 2014). Starting around four months of age, infants begin to repeat actions that bring pleasurable results, which is called a secondary circular reaction. Although infants are engaging in imitation at this time, actions are limited in scope because infants are only able to produce certain actions. For example, parents talking to their children and smiling may result in the infant babbling and smiling in response. Although children at six months of age cannot speak as adults do, imitation of social behaviors is present at this time (Santrock, 2014).

When comparing typical development with the development of individuals with autism spectrum disorders, a discussion of the theory of mind is often present. Theory of mind refers to an individual’s awareness of their mental processes, including their own thoughts and feelings, along with the thoughts and feelings of others. In typically developing individuals, an increased understanding of the emotions of others occurs during early childhood. Additionally, young children are able to begin to recognize the need to manage their own emotions. By age eight, children are typically able to describe their thoughts. Unlike their typically developing peers,
individuals with autism spectrum disorders have difficulty understanding their own mental processes and the mental processes of others. Social deficits present in individuals with autism are also considered to be a result of theory of mind deficits (Santrock, 2014).

Comorbidity and Differential Diagnosis

ASD is comorbid with several other disorders. Many individuals with ASD exhibit characteristics of ADHD, such as inattention, poor planning, and constantly being in motion (APA, 2013). Although rates vary from 41%-78% depending on the sample, consensus is that a large proportion of individuals with ASD also have comorbid ADHD (Mahajan et al., 2012). Often times, children with ADHD and ASD are prescribed medications, such as stimulants, to reduce inattention and hyperkinetic behaviors (Advokat & Scheithauer, 2013; Mahajan et al., 2012).

Other disorders also are comorbid with ASD. Many individuals with ASD experience anxiety, depression, or both, which is often related to difficulty communicating and interacting socially with others. An individual with ASD, who has difficulty with changes in their routines may experience physiological responses similar to individuals with anxiety (Mayes et al., 2011). Individuals with ASD also may have comorbid learning disorders, which often includes difficulty with reading and/or mathematics (APA, 2013). Medical conditions, such as epilepsy and gastrointestinal disorders are often present in individuals with ASD (APA, 2013).

Individuals with ASD may exhibit tantrum behaviors, such as resisting adults and engaging in noncompliance. The Baby and Infant Screen for Children with aUtlsm Traits was administered to 774 caretakers of infants and toddlers. Individuals in the study included children with medical conditions likely to lead to developmental delays, such as autism, language delays, Spina Bifida, and exposure to teratogens in utero. ANCOVA and regression analyses were used
to determine how the display of tantrums and conduct problems differed in severity throughout the sample. Individuals with autism engaged in greater symptoms of tantrum and conduct problems compared to individuals with PDD-NOS. Individuals with PDD-NOS displayed more symptoms of tantrum behavior than atypical controls (e.g., those with Down Syndrome, Spina Bifida; Sipes et al., 2010).

Before diagnosing an individual with ASD, it is important to rule out other disorders with similar presentations. Individuals with ASD and those with social phobia may exhibit significant deficits in social interactions, impacting their ability to make and keep friends. Similarly to individuals with ASD, individuals with social phobia may engage in limited eye contact and difficulty reading facial expressions and facial emotions (Tyson & Cruess, 2012).

It can be more difficult to differentiate intellectual disability from ASD. Those with intellectual disabilities may display communication deficits similarly to individuals with ASD. In order to differentiate between the disorders, it is important to focus on how social and communicative skills compare to nonverbal skills. If social and communication deficits are significantly lower than nonverbal skills, a diagnosis of ASD is likely appropriate. However, if verbal and nonverbal communication skills are both relatively similar, a diagnosis of intellectual disability is likely more appropriate (APA, 2013).

Because of the social and communication deficits characteristic in individuals with ASD, it also is important to differentiate between language disorders and ASD. One study including 65 preschoolers between the ages of four and seven identified symptom severity in individuals with speech and language impairments and compared symptom presentation to individuals with ASD. Results demonstrated individuals with ASD had more language difficulties than individuals with
speech language impairments. Impulsivity was identified as having the greatest impact on pragmatic language and language structure (Guerts & Embrechts, 2008).

**Intervention Approaches for Individuals with ASD**

Intervention has been shown to produce positive outcomes for individuals with ASD. Involvement in intervention can help reduce symptoms associated with ASD as well (Matson, 2007). The idea of early intervention is a relatively new initiative spurred by federal legislation. As early intervention is highly encouraged, many parents are eager to obtain intervention services for their children with ASD. It is important to understand and select intervention services appropriate to that individual (Scott & Baldwin, 2005).

There are a wide variety of interventions available for individuals with ASD, including biological interventions, cognitive behavioral therapy, applied behavior analysis, and social learning interventions (Mesibov, 1997). Many therapies focus on developing communication skills, aiding in emotional expression, enhancing social development, modifying behavior, and reducing the severity of symptoms associated with ASD (Scott & Baldwin, 2005). Having support for families with a child with ASD is extremely important, as families with children with ASD often experience high levels of stress and financial burden. Many intervention programs are designed not only to benefit the child, but also to benefit the parent. Family support programs typically include information about what a diagnosis of ASD means, education and training opportunities, assistance with determining what interventions and services are most appropriate, financial support, social-emotional support, and respite care (Dunlap & Fox, 1996).

Many individuals with ASD receive biological interventions, meaning medications are taken to reduce symptoms associated with ASD. Symptoms treated with medications may be associated with comorbid disorders and not ASD. A variety of different medications are often
prescribed to individuals with ASD. As epilepsy is often comorbid with ASD, anticonvulsant medications are often prescribed. Anti-depressants and beta-blockers are commonly prescribed to individuals in this population. Individuals with ASD also commonly take stimulant medications and vitamins. Although biological interventions are very common, medicine should not be the primary or only intervention (Mesibov, 1997).

Applied behavior analysis and behavior intervention are extremely common to use with individuals with ASD. Reward and punishment are very important concepts in behaviorism. The overarching idea of behaviorism is to reward positive behavior and either not reinforce negative behaviors or provide negative consequences to extinguish undesired behavior. Through a process of rewarding positive behavior and not reinforcing undesirable behaviors, behavioral shaping occurs (Mesibov, 1997). Focusing on reinforcing positive behaviors is an essential element of behaviorism today. Functional behavior assessments enable interventionists to determine the function problem behaviors serve and develop positive interventions that support desired behavioral outcomes (Anderson, Rodriguez, & Campbell, 2015).

Cognitive behavioral approaches also have become increasingly common. The addition of cognition emphasizes the thoughts and feelings people experience and attempts to understand how information is interpreted and integrated (Mesibov, 1997). Cognitive behavioral interventions have been used to help individuals with ASD who have comorbid anxiety disorders. This type of intervention is most commonly used with individuals who are between seven and 14 years of age and have been shown to effectively decrease symptoms of anxiety in individuals with high-functioning ASD (Wood et al., 2011; Drahota et al., 2011). An analysis of nine articles involving CBT for individuals with ASD found this type of therapeutic intervention promotes positive outcomes for individuals with ASD. Typically, when using CBT with
individuals with ASD, modifications are made to program materials and strategies to incorporate more components of applied behavior analysis. For example, additional prompting and reinforcement may be added to the intervention to encourage participation and progress (Lang, Regester, Lauderdale, Ashbaugh, & Haring, 2010).

Social learning interventions focus on peer interactions and peers serving as models to teach individuals with ASD essential skills regarding social interactions (Mesibov, 1997). Social learning theory is built on the premise people’s beliefs about the outcome of a situation heavily impact behavior. In other words, a social component is at play, impacting people’s actions (Bandura, 1977).

Interventions modeling appropriate behavior are implemented in an attempt to improve self-regulation skills and reduce anxiety, which include components of social learning theory. For individuals with autism spectrum disorders, the use of video modeling interventions is popular to increase social behaviors. Apple, Billingsley, and Schwartz (2005) incorporated several aspects of social learning theory in an intervention aimed to help individuals with ASD increase compliment giving behaviors. Participants were taught how to give compliments via video modeling and their ability to manage their behavior in a social context was recorded. Increases in social behavior occurred as a result of the intervention. It also was found that the use of self-management skills increased the ability of the participants to complete tasks independently (Apple et al., 2005).

Play groups and peer-mediated interventions use the principles of social learning theory as well. In peer-mediated intervention, typically developing peers are often trained to provide feedback and positively reinforce peers with autism spectrum disorders. Peer mediated interventions are well researched and have been shown to improve social skills in individuals
with ASD (Kasari & Locke, 2011). Children with ASD attending play dates also have shown increased social behavior, such as turn-taking and reciprocal conversation (Frankel, Gorospe, Chang, & Sugar, 2011).

**Essential Elements of Intervention**

Most interventions for individuals with ASD utilize aspects of learning theory, and these interventions have been most widely researched. Although interventions utilizing elements of behaviorism are widely used with persons with ASD, other less-intensive interventions focusing on the social and communication deficits identified in individuals with ASD also have been found to positively impact individuals with ASD (Howlin et al., 2009).

Intervention should focus on the core deficits seen in individuals with ASD. Social behavior, particularly imitation and joint attention skills are characteristic deficits in individuals with ASD. Individuals should be directly taught how to engage in imitation and initiation behaviors with others (Brady et al., 1987). As interventions should be highly structured (Taylor & Jasper, 2001), a clear and descriptive manual is necessary to ensure fidelity of the intervention. Behaviors should be measurable and clearly defined as well. A highly structured intervention with well-defined target behaviors and goals will ensure the intervention can be replicated with fidelity (Howlin et al., 2009). Also, the role of adults should be reduced as individuals progress through the intervention (Taylor & Jasper, 2001).

Along with the instructional components identified to be important for this population, other essential intervention components also were identified. Social programming, teaching play skills, and teaching communication skills are essential. These skills should be taught in a naturalistic environment whenever possible (Lord & McGee, 2001).
When considering generalization effects, it cannot be assumed generalization will naturally take place once people have received treatment. Interventions should be designed to demonstrate generalization occurred. Also, maintenance can be determined through observation and data collection after the completion of the intervention to determine if the effects of the intervention persisted. The generalizability and intervention effects are often learned throughout the intervention process. For example, an intervention phase may be followed by a baseline phase to determine whether or not the effects remained once the intervention was removed. Lastly, observation of target behaviors in a different setting or a different time of day than the intervention also can provide insight as to whether or not the intervention’s effects were generalizable (Schreibman, 2000).

Research Directions

To further research and develop evidence-based interventions, there are certain guidelines recommended to follow. A treatment group compared to a control group of some kind would be considered best practice. The control group may include individuals who receive no treatment or individuals who receive a reduced level of treatment. Individuals involved in studies should have a clear ASD diagnosis. Ensuring confounding variables are reduced or eliminated is also essential to support results that are related to the intervention and not other extraneous factors (Scheibman, 2000).

Social Skills Intervention

As social and communication deficits are most significant in individuals with ASD, particular attention to the essential components of social skills interventions is extremely important for this population. Social skills interventions tend to fall in one of five categories: (1) ecological variations, (2) collateral skills interventions, (3) child-specific interventions, (4) peer
behavior, and (5) comprehensive interventions. While these five distinct types of interventions exist, there is much crossover between the various types of intervention (McConnell, 2002).

Ecological Variations

Ecological variations occur when the environment is manipulated to encourage social interaction and social development. For example, an activity or toy the child enjoys may be placed in the environment to encourage participation and interaction (McConnell, 2002). When conducting ecological interventions, environmental aspects and the personality and traits of individuals partaking in the intervention are taken into consideration. One intervention used an ecological approach to help individuals with ASD obtain employment. An ecological approach in this situation meant the personality characteristics of the individuals with ASD were taken into consideration, as well as the skills, strengths, and weaknesses of the individuals when attempting to find them employment. Along with the personality characteristics of the participants, the study examined how the personalities of other employees and the work environment would impact individuals (Morgan & Schultz, 2012). Ecological approaches also have been incorporated with other types of intervention, such as cognitive-behavioral therapy (Bauminger, 2007).

Collateral Skills Interventions

Collateral skills interventions involve individuals with ASD engaging in specific play activities to build social competence. For example, sociodramatic skills training is used with this population. Through involvement in desired activities, individuals with ASD are positively reinforced, encouraging continued engagement with peers. Positive results have been identified in these types of interventions; however, additional intervention should occur in addition to collateral skills training. (McConnell, 2002).
Along the same lines, social skill groups have been utilized to help individuals with ASD build skills. Social skills groups are designed to teach a small group of participants a particular social skill and then provide opportunities for practice. Such groups have been shown to improve social skills and promote positive social interactions in individuals (Kamps, Leonard, Vernon, Dugan, & Delquadri, 1992).

**Child-Specific Interventions**

Child-specific interventions attempt to increase an individual’s knowledge of a skill, increase the occurrence of the skill, and/or improve the quality of overall social behavior in individuals with ASD. Child-specific interventions involve direct one-on-one instruction. This type of intervention has been found to increase social behavior and the maintenance of social behavior in individuals with ASD (McConnell, 2002).

To increase the success of any given intervention, considering the personality and skill strengths and weaknesses of individuals with ASD is essential. In order to customize an intervention to fit the unique needs of the child, the behavior must be clearly defined. It is then important to understand how best the child learns to better determine how to change behaviors. An intervention should be selected that is feasible and practical to implement in multiple settings that fit within the child’s learning style. Prior to implementing the intervention, those carrying out the intervention should consider possible challenges that may arise. This process puts the specific needs of the child first and takes into consideration the learning differences between individuals (Koenig, 2012).

**Peer-Mediated Interventions**

Peer-mediated interventions, which are based off of social learning theory and behaviorism, also have shown positive outcomes for individuals with ASD, including
improvements in social behaviors (Howlin, et al., 2009; McConnell, 2002). In peer-mediated learning situations, students with varying levels of skill and achievement are placed together in groups (Utley, Mortweet, & Greenwood, 1997). Many peer-mediated interventions conducted with individuals with ASD are intended to build social skills in these individuals. Using peer-mediated intervention, typically developing students are taught how to interact positively with peers with autism spectrum disorders, utilizing the concepts of social learning theory. Intervention is carried out in a systematic fashion, reflecting the principles of behaviorism (Sperry, Neitzel, & Engelhardt-Wells, 2010).

Laushey and Heflin (2000) trained typically developing kindergarteners to understand a buddy system in the classroom. Two male participants with ASD were the target students in the intervention. Target behaviors included asking for an object and responding accordingly, getting the attention of a peer in an appropriate manner, waiting for a turn, and looking at or in the direction of another person who was speaking to them. A trained observer collected data for 10 minutes once every 10 days, using an event recording logging strategy (Laushey & Heflin, 2000).

All of the students in the classroom, including the two target students were taught how to play, talk to, and stay with peers during free play. When the buddy system approach was in place, both target participants engaged in the target behaviors more frequently. When the buddy system was removed in the second baseline condition, a marked decrease in the target behaviors occurred. When the intervention was reinstated, the frequency of target behaviors increased again. For one of the participants, follow-up data were obtained within six weeks after the completion of the intervention; the learned social skills were found to generalize to the participant’s new classroom environment in first grade. Results of the intervention demonstrate
that training peers can increase socially appropriate behaviors in children with autism spectrum disorders (Laushey & Heflin, 2000).

Peer-mediated intervention was used in a study by Kamps, Royer, Dugan, Kravits, Gonzalez-Lopez, Garcia, Carnazzo, Morrison, and Garrison (2002). The study sought to determine whether or not training typically developing peers helped build social skills and cooperation in individuals with ASD. Five individuals with ASD and 51 peers in the general education classroom were included in the study. To build cooperative learning skills in the target participants, general education peers were taught to tutor partners on vocabulary words and facts from the social skills curriculum. They also were asked to complete the activity as a team. For the social skills groups, initiating responding, cooperation, and engaging with peers was emphasized through activities; participants were rewarded for engaging in socially appropriate behaviors. Results demonstrated increases in the length of time target participants engaged in social interactions with peers in both the cooperative learning situation and the social skills group situation. Peers of the target participants also became increasingly interactive with the students with ASD, demonstrating the mutually beneficial effect of the intervention (Kamps et al., 2002).

Comprehensive Interventions

Comprehensive interventions include a combination of two or more of the previously described interventions. There is evidence comprehensive interventions can improve social behavior in individuals with ASD; however, future research should be conducted, as these interventions are typically very complex (McConnell, 2002).

Social Stories Interventions

Social stories were created and first introduced by Carol Gray in 1993 (Gray & Garrand, 1993). The purpose of social stories is to address an objective for a particular person. Social
stories should be individualized to aid in the acquisition of information about a particular skill. Social stories can be presented verbally or visually, and visual presentation may include text, pictures, or both (Earles, Carlson, & Bock, 1998).

Every social story should include four types of sentences: Descriptive, perspective, directive, and affirmative sentences. Descriptive sentences define the situation by explaining the who, what, and why. Perspective sentences state the physical state, emotional state, or both of the individual. Perspective sentences also often include descriptions of the emotions and thoughts of others. Directive sentences directly state appropriate responses or cues for a situation. Lastly, affirmative sentences bring cultural meaning to the skills taught in each social story (Reynhout & Carter, 2006).

Previous research has demonstrated that using pictures is helpful for individuals with ASD to learn new information. Therefore, using a case study design, social stories with words and pictures were used to reduce tantrum behavior and behaviors that typically preceded a tantrum with a 12-year-old male with ASD with limited expressive communication. The targeted behaviors included inappropriate vocalizations, such as screaming and cussing, and dropping to the floor (an action that preceded a tantrum) (Kuttler et al., 1999). The study participant was exposed to two different social stories constructed to be consistent with Gray’s guidelines during morning work and lunchtime, as those were the times of the day most difficult for him. Each sentence of the story was accompanied by an icon from the Picture Communication System Book on a tag board. Classroom paraprofessionals and the classroom teacher collected the data, which included a frequency count tallying the target behaviors. The study used an ABAB design. During the intervention phase, the participant heard the social stories and was exposed to the accompanying pictures prior to the two activity times targeted. Inter-rater reliability was 93%.
During the first baseline phase, the mean frequency of the target behaviors was 15.6 during morning work and 11.6 during lunchtime. In phase 2, the behaviors decreased to zero during morning work and two during lunchtime. When the intervention was removed, the mean frequency of the target behavior increased to 15.33 during morning work and 18 during lunchtime. When the intervention was reinstated, the mean of the target behavior was zero during morning work and 1 during lunchtime. Results demonstrate exposure to social stories decreased inappropriate vocalization and laying on the floor in one individual (Kuttler et al., 1999).

A study by Thiemann and Goldstein (2001) utilized social stories in conjunction with written textual cues and video feedback to build social communication skills in children with ASD. Ten typically developing individuals and five individuals with social impairment were included in the study. Participants with social communication deficits ranged in age from six to 12 years old. Intervention took place in the school library for 30 minutes two times a week. Sessions included 10 minutes of social story instruction, 10 minutes of a social activity, and 10 minutes of self-evaluation via video feedback. Sessions were video recorded and coded to identify the frequency of appropriate and inappropriate social communication behaviors. Securing attention, initiating comments, initiating requests, and contingent responses were the socially appropriate behaviors recorded in the intervention. Topic changes, unintelligible responses, and a lack of response also were recorded as inappropriate social communication behavior (Thiemann & Goldstein, 2001).

A multiple baseline intervention design was utilized. Baseline data were collected during social activities. Two typically developing peers met with the researcher and were taught four skills about talking to friends and were asked to brainstorm why the skills would be important. The five individuals with deficits were taught social skills through direct instruction using social
Musically Adapted Social Stories

stories, pictures, and text cues. All activities focused on the target behaviors. Inter-observer reliability data was collected using general education teachers, who did not know the purpose of the study and provided subjective ratings. Inter-observer agreement was consistently over 80% and ranged between 87% and 100% agreement (Thiemann & Goldstein, 2001).

The first participant increased his attention-securing behaviors and results remained above baseline throughout the intervention. He also increased the number of comments made in the absence of prompts and increased in the frequency of initiating requests. The second participant’s securing attention behavior and initiating requests increased throughout the course of the intervention. The third participant demonstrated increases in initiations and securing attention behavior; initiations decreased when new social skills were introduced. The last participant displayed increases in initiations and securing attention; initiation behaviors were not maintained. Overall, the interventions showed increases in initiation and attention securing behaviors for all participants, but those behavioral gains were not generalized beyond the intervention context (Thiemann & Goldstein, 2001).

A multiple-probe, across-participants design was utilized to evaluate the effects of social stories on social engagement in three individuals with ASD and six nondisabled peers (three boys and three girls) (Delano & Snell, 2006). Each individual with ASD was matched with a same-aged peer for the intervention and a second peer for generalization probes. The participants all attended the same elementary school in a rural district. All three individuals with ASD were receiving services under the special education disability category of ASD. All participants used functional verbal communication, had at least pre-reading skills, were able to follow directions, and were given opportunities to interact with same-aged peers in general education. Of the three
male individuals with ASD, two were Caucasian, and one was African American (Delano & Snell, 2006).

Behaviors, including appropriate social engagement, inappropriate social engagement, and the absence of peer engagement were coded during the intervention. The following target social skills also were tallied: Seeking attention, initiating comments, initiating requests and making contingent responses. Prior to baseline collection, three informal assessments of the target students occurred. Participants were observed with others involved in the study in their classrooms. A comprehension assessment revealed the social stories needed to be presented in a picture-symbol format for two of the students and the text and read aloud format for the third target student. The goal of the social stories was to increase peer interaction. Brainstorming sessions were conducted with the target student and their peers (Delano & Snell, 2006). Social stories were written for the target students based on Gray’s design for social stories. The six typically developing students were observed, and data were collected to measure the duration of appropriate and inappropriate social engagement and the duration of the absence of social engagement to compare to the target students. The purpose of the study was to determine whether or not the duration of social interaction increased after intervention (Delano & Snell, 2006).

Baseline and intervention phases contained three components: Story reading, a comprehension check, and a play session. Data also were collected prior to the intervention; participants were asked to wait in a corner with a puzzle, colored pencils, and paper. After 15 training sessions, fading began. It was determined that if social behavior remained 40% greater than baseline, then the social story reading would cease (Delano & Snell, 2006).
During the intervention, social engagement ranged from 137 seconds to 452 seconds for the first target student; no overlap between baseline and intervention existed. There were slight drops in the duration of social behavior during the fading phases; however, social behaviors were still greater than baseline. During the play sessions, social engagement behavior ranged from 43 seconds at baseline to 321 seconds by the fifth probe. Overall, social engagement increased as a result of the social stories intervention. The second participant’s social engagement ranged from 30 seconds to 557 seconds. One intervention point overlapped with baseline data. While fading, the second participant’s pattern of social engagement varied. Although there were points of overlap between intervention and fading with baseline data, overall, this participant demonstrated increases in social engagement. Engagement during play sessions also increased and at one point, his social engagement exceeded the average of his peers. The third participant’s duration of appropriate social engagement ranged between 155 seconds and 492 seconds during the intervention phases; no overlap existed between baseline and intervention. After an increase in social engagement during the first six sessions of intervention, the third participant began requiring ongoing reinforcement to increase peer engagement. When the intervention was completely withdrawn, variable levels of social engagement were observed. Little improvement during play sessions were observed, demonstrating the generalizability of the intervention was not as salient for this participant (Delano & Snell, 2006).

Along with duration, the frequency of socially appropriate behaviors was recorded. For the first participant, an increase in socially appropriate behaviors was demonstrated, although performance was variable. The second participant also began to show increases in appropriate behavior during the intervention phase; however, his performance was variable. The third
participant displayed very few target behaviors during baseline, and appropriate behaviors increased during both the intervention and play sessions (Delano & Snell, 2006).

Overall, increases in social behaviors resulted from the intervention. It is important to note that increases in the target behavior were, usually, contingent responding and imitating comments. Maintenance was not clear in the results, due to variation in performance (Delano & Snell, 2006).

Barry and Burlew also used Gray’s concept of social stories to teach play skills in two individuals with autism (2004). The first participant was a seven-year-old female, and the second was an eight-year-old male. Both participants engaged in echolalia, but had little to no expressive language. The intervention was put into place to provide support for the two participants to engage in free-play time successfully. The intervention took place in the Exceptional Special Education (ESE) classroom. Free-play (the targeted time of the intervention) occurred three times a week for 30 minutes. Students in the class were able to choose from a selection of nine centers, including a Lego center, an area with toy animals, and an area with books. Each student was to show which area he/she wanted to play in by placing a picture of themselves by a photograph of the center desired (Barry & Burlew, 2004).

An ABCD multiple baseline design was used. The first phase, (A), was the baseline phase, which involved teacher led instruction. In phase (B), the focus was on choice-making and appropriate play; this also was teacher led. Phase (C) focused on child interactions with peers. Lastly, in phase (D), the social stories were still available, but teacher assistance was no longer available. A five-point rating scale was used to determine the level of prompting required. The child received a rating of zero when no prompting was required to make a center choice. A rating of one indicated the participant made a center choice after only one verbal prompt. A rating of
two indicated the student made a choice after the student was verbally prompted, and the teacher pointed to the picture. A rating of three was given when the participant did not make a choice, but did follow physical prompts from the teacher. A rating of four was given when the participant did not respond to any of the verbal or physical prompts provided. Appropriate play was defined as play typical of the child’s same-aged peers. The definition of appropriate play was measured differently at each center. The duration of appropriate play was recorded; the duration ended if the child left his/her center, engaged in self-stimulatory behavior, and/or if the participant was no longer attending to (looking at and/or touching) the materials (Barry & Burlew, 2004).

During the first phase, the female participant would go to her center after a physical prompt but did not engage in play. The male participant would not go to his center and engaged in several self-stimulatory behaviors at baseline. After the social stories for choice-making were introduced in Phase B, the female participant was able to make a choice after only one verbal prompt and her play duration increased. The male participant also began to require fewer prompts in Phase B, and he increased the duration of play. The female participant was able to make her choices independent of any prompts in Phase C and play became more interactive. The male participant required fewer prompts to make his choice and continued to increase his time engaged in appropriate play. In the final phase, the female participant continued to be able to make her center choice without any prompts and continued to increase her time in appropriate play and the male participant required only one prompt to make a choice and engaged in appropriate play for longer durations (Barry & Burlew, 2004).

Overall, this study demonstrates the positive effects social stories can have on increasing choice-making behavior and increasing time spent in appropriate play. Not only was the female
participant able to make choices without prompting after being involved in the intervention, but she also increased her social interactions with peers. Even after prompting and teacher-led instruction were removed, the effects of the intervention remained. The Barry and Burlew (2004) study demonstrates the possible long-term effects of social stories interventions.

A social stories intervention aimed at increasing the occurrence of appropriate social behavior in individuals with ASD using Gray’s earlier design standards was conducted by Scattone et al., (2006). Three individuals with ASD were included in the study; two of the participants were eight years old, the other was thirteen. All three participants had difficulty engaging in appropriate social interactions with their peers. Intervention occurred during unstructured times of the day, including lunch, unstructured time in the classroom, or recess. Social stories were typed out and placed on black construction paper (Scattone et al., 2006).

Using a multiple baseline design, the researchers collected data on the participants’ social interaction skills. The target behavior was appropriate social interaction, including handing something to a peer, making a comment or engaging in conversation with a peer, or engaging in an activity with a peer. Data were collected for 10 minutes, three days a week, for 11 weeks during unstructured times. The teachers read social stories to the participants prior to the unstructured play periods. After the story was read, the teacher would ask a predetermined set of questions to ensure the student comprehended the information (Scattone et al., 2006).

Results differed depending on the participant. The first participant’s engagement in social interactions did not change as a result of the intervention. Immediately after the social story was introduced, an increase in social behavior occurred; however, this was not maintained. The percentage of non-overlapping data was only 10%, indicating treatment was not reliable for this individual. The second participant demonstrated the greatest gains in appropriate social
interactions. At baseline, the participant was engaging in social interactions during only seven percent of the intervals; during the intervention, appropriate social interactions ranged from 17 to 57%. The percentage of non-overlapping data was 89%, suggesting the intervention was effective for this individual. The third participant’s social interactions increased a small degree after exposure to the social stories. Prior to intervention, appropriate social interactions ranged from zero to 22%; after the initiation of the social stories, appropriate social interactions ranged from 10-37%. The percentage of non-overlapping data was 69%, which indicates the intervention effectiveness was fair. The introduction of social stories was found to have varying rates of effectiveness depending on the individual, indicating such an intervention may not be appropriate for all individuals (Scattone et al., 2006).

Summary of Interventions

When designing interventions, the deficits of ASD, namely social deficits, should be the focus. Target behaviors should be taught via direct instruction (Brady et al., 1987). Additionally, interventions should be highly structured, and behaviors should be clearly defined (Howlin et al., 2009).

Peer-mediated interventions have been found to result in increases in social behaviors in individuals with ASD (Sperry et al., 2010). One study found that pairing typically developing students with individuals with ASD resulted in increases in targeted social behaviors in a kindergarten classroom (Laushey & Heflin, 2000). The use of peer-mediated intervention also resulted in improved social behavior, including increased time spent in social interactions and cooperative play, in a study conducted by Kamps et al. (2002).

One of the more commonly utilized social skills interventions for individuals with ASD involves the use of social stories, developed by Carol Gray (Gray & Garrand, 1993). Kuttler et
al. (1999) found that using social stories reduced tantrum behavior in individuals with ASD with limited expressive communication. Using social stories in conjunction with video feedback of social performance has also demonstrated positive effects on the social skills of individuals with ASD (Thiemann & Goldstein, 2001). The use of social stories was found to increase the length of time individuals with ASD engaged in social play in multiple studies (Delano & Snell, 2006; Barry & Burlew, 2004; Scattone et al., 2006).

**Music and Its Benefits**

This section includes information about the benefits of music, music development, and how the musical brains of individuals with ASD contrast neurologically compared to typically developing individuals. Additionally, an explanation of music therapy and the use of this type of therapy with individuals on the autism spectrum is included. To conclude, a review of music interventions utilized with individuals with ASD is contained within this section.

Music has been used cross-culturally throughout history to promote overall health and well-being. Music is a pervasive part of the human experience. Whether or not people have musical skills, they are still exposed to a variety of musical genres and experiences through media, special events, and music playing in stores and restaurants (McPherson et al., 2012).

Listening to music and being involved in musical experiences elicits physical and emotional responses in individuals. Music has been shown to promote physical and psychological wellness in a variety of ways for individuals of all abilities and backgrounds. Music has been found to promote comfort and bonding (Edwards, 2011), and promote learning (Hallam, 2010). Musical skills have been demonstrated to impact creativity, fine motor development, concentration, social skills, emotional sensitivity, self-discipline, and self-confidence in children (Hallam, 2010). Collaboration, communication, and interpersonal
connectivity also have been shown to increase through musical interactions and experiences (Peters, 2000).

*Music Development in Children*

Children progress through various stages of musical development. Between the ages of four and six, children engage in intentional music expression in what is known as the Vernacular stage. Musical expression is likely to be spontaneous, uncoordinated, and unstructured. Between the ages of five and nine, children attempt to sing melodies, engage in pattern repetition, and begin to focus on more intentional rhythmic expression. At age 10, the Speculative Mode begins. In this stage of music development, children intentionally ignore the normal conventions of music, resulting in a lack of rhythmic accuracy and long, ebullient musical phrases. The Idiomatic stage begins at age 13. In this stage, adolescents begin to conform to normal musical conventions. These individuals often attempt to mimic the rhythmic and melodic patterns common in popular music. The last stages of musical development are the Symbolic and Systemic modes, which begin around 15 years of age. Reflection and intentional music development occur within these phases (Marsh, 2008).

Early musical influences impact development. Musically rich environments are those in which children are exposed to live and recorded music, instruments, and musical experiences. Children may be given opportunities to take musical lessons, which would lead to engagement in teacher-directed tasks, such as playing scales. Practice, involvement in music activities, and exposure to musically rich environments help individuals excel in the area of music (McPherson, Davidson, & Faulkner, 2012).

Music is often thought of as a language and a relationship between music and language development exists. Language looks at naming things, assigning qualities to objects, and
understanding relationships and actions. Musical language involves dynamics, pitch, note duration, and timbre; musical language differs by culture. Both music and language are highly complex forms of communication (Ockelford, 2013). Whereas language uses words that form basic units, music uses notes to create basic units as well. For example, letters comprise words, and three or more notes combine to create chords. While there are differences between language and music, both are forms of communication that are expressed through sound (Srinivasan & Bhat, 2013).

**Music, ASD, and the Brain**

It is important to understand the unique connection between ASD and music. Music has been found to be motivating and interesting to many individuals with ASD (Srinivasan & Bhat, 2013). Many in this population excel at music and many people with ASD have music as one of their restricted interests. He or she may be overly interested in one aspect of music, such as a particular genre or instrument (Graham, 2001). It also has been found that superior music processing often is present in individuals with ASD (Wan et al., 2010). The connection between ASD and music may be at least partially explained through the mirror neuron system (MNS). The MNS is implicated in emotional expression and communication. It is believed music may activate the MNS and help individuals understand emotion, engage in imitation, and become involved in intentional learning (Wan et al., 2010).

One study examined typically developing individuals with and without musical backgrounds and individuals with ASD to determine if differences in DRD4 levels existed. It was not stated whether or not the participants with ASD had previous music experience. DRD4 is a dopamine receptor associated with novelty-seeking behavior. The individuals with a music background and those with ASD, who had varying levels of musical experience demonstrated
increased DRD4 compared to neurotypical individuals who did not have musical expertise. It is believed music may help individuals seek rewards and pleasure. The finding, which indicates musicians and individuals with ASD have higher levels of DRD4 than neurotypical individuals without a musical background, may partially explain why individuals on the spectrum often have a special interest in music (Emmanuele et al., 2009).

Physiological responses, such as increased or decreased heart rate, body temperature, and cortisol levels have been used to indicate similarities and differences between music experiences in those with and without ASD. It was found individuals with ASD had similar physiological responses to music as neurotypical individuals. Although the interpretation of music may differ from person to person, the physiological responses are quite similar (Zangwill, 2013).

Individuals with ASD were found to have superior pitch processing skills compared to typically developing peers in a study by Heaton, Hermelin, and Pring (1998). The study attempted to identify components of musical knowledge that could be indicative of savant musical ability in individuals with ASD. Participants included individuals with ASD who were mental-aged matched with a typically developing child. Therefore, the control participants were younger than the participants with ASD. Participants were first presented with a picture; the picture was matched with a specific note (or musical tone). The participants were later asked to listen to the tone and then select the appropriate animal picture matching the tone. Four different animal pictures also were paired with speech sounds (i.e. one animal was associated with the speech sound “la”) (Heaton, Hermelin, & Pring, 1998).

Results indicated participants with ASD and those without were able to match speech sounds equally well. However, individuals with ASD were better able to identify the appropriate animal when presented with the note compared to individuals without ASD. Results indicated
individuals with ASD may have superior pitch processing abilities compared to typically developing children (Heaton, Hermelin, & Pring, 1998).

A study by Allen and Heaton (2010) aimed to determine the potential of music in alexithymia for individuals with ASD. Alexithymia means without words or emotions, and it occurs in 85% of individuals with ASD (Hill, Berthoz, & Frith, 2004). To connect affective, emotional states and cognition, the authors hypothesize that teaching facial expressions are key. For example, infants repeated exposure to the facial expressions of their mothers and infants’ internal feelings help children to label emotions. This article did not conduct a study but used previous research to hypothesize that using music would be an effective way to help individuals with ASD label and understand emotions. Previous research and pilot studies conducted by the authors were referenced, stating individuals with ASD were found to be able to reliably match excerpts from classical pieces to visual depictions of emotions. As is often the case, this type of study may not be “scientific enough” to be considered an appropriate, evidence-based, music therapy technique (Allen & Heaton, 2010).

Twelve men and women with ASD (some with a diagnosis of Asperger’s, some with autism), between the ages of 21-65, were included in a study, which aimed to answer how adult individuals with high-functioning ASD experienced music. Convenience sampling was used; all participants had participated in previous research at the college. Participants completed a semi-structured questionnaire. Questions surrounded autobiographical musical experiences and current reactions to music (Allen et al., 2009).

Questionnaire results revealed 75% of participants used music to alter their mood. Music was either used for arousal or relaxation. Motivational subnodes included aesthetic, achievement, therapeutic, movement, enjoyment, performance, and mood congruent. Fifty-eight percent of
participants used music to alter mood; music for aesthetic pleasure was the second highest endorsed by participants (Allen et al., 2009).

Next, researchers examined the characteristics (the what) of music for these individuals. The characteristics of music found to be motivating to participants included the message, timbre, appropriate association, emotional expressiveness, melody and harmony, structure and pattern, technical competence, familiarity, and the energizing and relaxing components of music (Allen et al., 2009).

This study demonstrated aspects of music that are motivational and important to individuals with high-functioning ASD. One limitation of the study was the lack of a comparison control group. Five participants explicitly denied their use of music to induce valency changes. Results support previous research that individuals with ASD experience emotional arousal when listening to or performing music, however, they have more difficulty expressing their emotional experiences and analyzing their own emotional states and reactions (Allen et al., 2009).

Music Therapy

While therapy is deemed as important for children with ASD, a consensus about which therapy is best has not been reached. Several therapies have been shown to be successful in children with ASD, but some therapies are effective for some children and not for others. Music therapy is a commonly used type of therapy for individuals with ASD (Peters, 2000).

Music therapy is an intentional, goal-directed therapeutic approach with a purpose to promote physical and mental wellness. Music therapy usually includes singing, rhythm-based activities, improvisation, composition, and instrument playing. Music therapists are board certified and receive extensive training in developing programs appropriate to meet individual needs. Rapport development and positive interactions between the therapist and the client are
essential in the success of music therapy. Music therapy is not designed to provide immediate results; instead, the process is gradual and focuses on making small changes that lead to achieving long-term goals. Unlike a music educator in the schools, a music therapist is not concerned with his/her client’s ability to gain musical skills and expertise. In other words, the intention of music therapy is not to enhance music skills or produce highly skilled musicians. Rather, the purpose of therapy is to facilitate goal achievement through a musical medium (Peters, 2000).

The discipline of music therapy was established in 1950, where it was introduced in adult psychiatric settings. A renewed interested in music’s role in development and mood resurfaced in the 1970s and professional organizations for music therapy emerged in the 1980s. Music therapy began to focus on children with autism in the 1990s (Reschke-Hernandez, 2011).

Music therapy can be used to help individuals with a wide variety of difficulties and concerns (Peters, 2000). Commonly, music therapy is considered to help individuals with anxiety and depression (Maratos et al., 2008). Music therapy may be used to help individuals who are experiencing grief over the death of a close friend or family member (Hilliard, 2001). Post-traumatic stress concerns also can be eased with music therapy. For example, individuals who have fought in Iraq or Afghanistan may receive music therapy to ease PTSD symptoms (Bensimon, Amir, & Wolf, 2008). Music therapy has been utilized to reduce pain, muscle rigidity, and insomnia (Peters, 2000), as well as to help individuals with substance abuse problems (Michel, 1985).

More commonly, music therapy is often used to help individuals with physical or mental disabilities. This type of therapy is commonly used with individuals who have intellectual disabilities or physical disabilities to help build functional skills; music therapy can be done to
improve intellectual and physical wellness in children and adults (Michel, 1985). Music therapy is commonly used to build communication and social skills and reduce behavioral concerns in individuals with ASD (Peters, 2000).

In the past, subjective accounts have been used to demonstrate the effectiveness of music therapy. Oftentimes, the benefits of music therapy are experienced internally. For example, individuals with severe anxiety may report symptom reduction, but no quantitative evidence exists to suggest the program was effective. Reliance of qualitative evidence has been a weakness in the field of music therapy (Abrams, 2010). In today’s society, evidence based practice is an essential concern. Schools often use a three-tiered response to intervention that relies on data to determine whether or not a student is progressing appropriately on a particular skill. Single-case research design is often used in the schools to determine intervention effectiveness and relies heavily on data to do so. In order for music therapy to become an accepted intervention approach in a school setting, developing evidence-based practice is essential. Music therapy could be used in the schools to assist individuals experiencing a wide variety of academic, behavioral problems, or both. It could be beneficial for individuals with and without ASD as well. Knowing music therapy can be beneficial for individuals with ASD, developing evidence-based practice to support the use of this form of therapy in the school setting would be beneficial (Cook & Cook, 2013). In the fields of medicine and psychology, in general, a greater emphasis has been placed on evidence-based practice (Abrams, 2010).

Music therapy can be measured through observable outcomes. One study examined the impact of a vibroacoustic chair, which is a chair that emits vibrations at specified beats per minute, on externalizing and self-injurious behaviors in individuals with ASD. In this study,
vibroacoustic chairs were found to reduce externalizing behaviors in individuals with ASD (Lundqvist, Andersson, & Viding, 2008).

Music Therapy and ASD

When used with individuals with ASD, music therapy often focuses on building social skills, such as joint-attention and imitation skills. While the presentation of music in and of itself cannot enable individuals with ASD to understand emotion in ways similar to their typically developing peers, therapy could serve as a facilitator to understanding emotions and regulating one’s own emotions (Reschke-Hernandez, 2011).

A study by Edgerton (1994) examined the effectiveness of improvisational music therapy on communicative behaviors in individuals with ASD. Eleven individuals between the ages of six and nine with ASD were included in the study. Communication deficits were present in all participants; five were nonverbal. A snare drum, a piano, a cymbal, and drumsticks were musical materials included in the study. A communication checklist was completed prior to the start of therapy. Therapy sessions were recorded, and 10-minute samples were coded. A reversal design was used, indicating the intervention was introduced and then withdrawn for a session, then reintroduced. Participants attended 30-minute therapy sessions once a week for eight to nine weeks. The therapist created a musical environment for the participant and provided opportunities for the child to engage in musical activities and communication (Edgerton, 1994).

Throughout the intervention, participants increased communicative responses. When the intervention was withdrawn, a dramatic drop in communicative behaviors was observed. However, once the intervention was reinstated, communicative behaviors increased again (Edgerton, 1994).
Kim et al. (2009) conducted a study aimed to determine the effect of improvisational music therapy in building social skills in individuals with ASD. Ten participants between the ages of three and five and a diagnosis of ASD were recruited from a hospital in Korea and included in the study. Half of the participants were nonverbal. For each participant, a rating scale for autism-spectrum related behaviors, a developmental profile, and questions related to social functioning were completed to assess the presence and severity of autism symptoms in each participant (Kim et al., 2009).

Using a repeated measures and within subject comparison design, participants were exposed to 12, 30-minute improvisational music therapy sessions and 12, 30- minute play sessions. In the music condition, participants were exposed to a variety of instruments, including an upright piano, cymbals, drums, colored handbells, horns, and egg shakers. In the play condition, participants were exposed to a variety of toys, including puzzles, tops, Legos, toy fruit, balls, a dollhouse, and toy vehicles. Participants were randomly assigned to receive either the play or music condition first; a week of no therapy divided the two types of therapy. At the beginning of each session, the therapist greeted the child and allowed the child to engage in undirected play. During the 15 minute, undirected portion of the therapy session, the therapist would engage with the child and elaborate upon their initiations. Next, participants were directed in activities with the therapist for 15 minutes. During this portion of the therapy session, the therapist taught participants modeling and turn-taking. Each session ended with a goodbye ritual. To keep the conditions differentiated, therapists were discouraged from singing or engaging in musical activities of any sort in the play condition; in the music condition, keeping the focus on music-directed play was important (Kim et al., 2009).
The frequency and duration of joy, defined as the participant laughing, and emotional synchronicity, defined as a time when the child and the therapist shared the same emotional affect while engaged in an activity together, was obtained on four minute samples taken from four pre-selected sessions. Also, the frequency of initiation behavior, compliant responses, and a lack of response were recorded during the four pre-selected therapy sessions. Repeated measures ANOVA was utilized to determine whether or not change was significant. Inter-rater reliability information also was obtained; reliability rates were between 0.86 and 0.98 (Kim et al., 2009).

Results indicated participants displayed significantly more joy behaviors in the music condition compared to the play condition. Significantly more instances of joy were observed during the undirected portion of the music therapy compared to the directed portion. When looking at emotional synchronicity and initiation of engagement, significantly more instances of such behaviors were found in the music condition compared to the play condition. Compliant responses were significantly greater in the music condition, and a lack of response was found with significantly greater frequency in the play condition. Results demonstrate the ability of music to increase initiation, emotional synchronicity, and joy in individuals with ASD (Kim et al., 2009).

A study by Lim and Draper (2011) aimed to determine the effects of music therapy in combination with applied behavior analysis to reduce echolalia. Twenty-two preschoolers between the ages of three and five with ASD were included in the study. Seventeen participants were males; five were females. Participants experienced music therapy sessions and speech training sessions (sessions that involved no musical component). Target words and phrases were selected, and the goal was to have participants answer questions, name pictures, repeat phrases, and complete sentences. Verbal instructions were sung, and the target words and phrases were
sung to the participants by a board certified music therapist; the music therapist also led the speech sessions. Pre and posttest data were collected; the verbal production evaluation scale (Lim, 2010) was utilized to measure verbal behavior. The order in which the trainings were received was randomly assigned, and participants learned different words in each condition. Participants received therapy three days a week for two weeks, for a total of six sessions (Lim & Draper, 2011).

Paired t-statistics and an analysis of covariance were utilized to analyze results. Echolalia was the most common behavior exhibited by the participants, likely because the participants tended to engage in high levels of echolalia prior to beginning the study. While the results demonstrated no statistically significant differences between the two training sessions, participants did perform higher on the verbal production evaluation scale on words learned during the music therapy sessions compared to the speech training sessions. Receiving training was determined to be better than not receiving any therapy at all (Lim & Draper, 2011).

Overall, improvisational music therapy has been used effectively to build skills in individuals with ASD. This type of music therapy was found to increase communicative responses (Edgerton, 1994) and increase the frequency and duration of joy, emotional synchronicity, and shared emotional affect in persons with ASD (Kim et al., 2009). As social and communication deficits are characteristic of ASD (APA, 2013), further investigation into the value and applicability of music therapy with individuals on the spectrum is essential. For an individual with a special interest in music, music therapy may be more effective than other approaches with that particular individual (Srinivasan & Bhat, 2013).
Music Interventions for Individuals with ASD

Music therapy and music intervention in general have been used to facilitate communication and social skills in individuals with ASD. Parent-child music therapy has been used to increase parent-to-child dialogue and increase attachment (Edwards, 2011). Parent-child interaction therapy involving music can help parents learn ways in which to connect with their children and develop a bond. For parents with children with ASD, parent-child interaction music therapy may be particularly relevant to increase social and emotional attachment and communication (Edwards, 2011).

Using Carol Gray’s model for social stories, Brownell (2002) created musically adapted social stories to reduce problem behaviors in four individuals between the ages of six and nine with ASD. Behavioral issues ranged from vocal stereotypy to flattened affect and limited compliance with requests. Targeted behaviors in the case studies reflected common atypical behavioral characteristics present in individuals on the autism spectrum. In the case studies conducted by Brownell (2002), social stories were presented to individuals in sung and spoken contexts. Target behaviors were observed and recorded during the sessions. The purpose of the study was to determine if greater reductions in inappropriate or undesirable behavior were observed during the sung or spoken versions of the social story. The study also examined whether musically adapted social stories were more effective than no intervention. Lastly, Brownell sought to determine if any significant differences in efficacy between the treatment types were present (Brownell, 2002).

Consultation with teachers occurred to determine the target behavior. The classroom teacher or an instructional associate collected baseline data on the operationalized target behavior determined to be most problematic for each child. Five days of data collection took place in each
of the conditions (read and sung social stories). A multiple-treatment design was utilized where (A) indicated baseline data, (B) indicated traditional social stories, and (C) represented musically adapted social stories. Data were collected immediately following intervention in the general education classroom. The theoretical framework then reflects a single-subject, multiple baseline design with the purpose of determining intervention effectiveness and comparing interventions (Brownell, 2002).

For the first individual, the target behavior was echolalia, as the participant frequently repeated phrases he had heard from his favorite shows on the television. He received intervention in an ABAC format. The participant would often follow along with the sung or spoken words with his finger and mouth along with the interventionist. During baseline data collection, an increase in “TV Talk” was observed. During the social stories intervention in the spoken condition, the target behavior significantly decreased. Even fewer instances of the target behavior were observed in the music condition of the intervention; however, no significant difference existed between the sung and spoken conditions (Brownell, 2002).

In the second case study, the target behavior was noncompliance; the individual was not following teacher instructions. The social story in this case reviewed the importance of listening to teacher instruction in an ACAB format. Baseline data included a very high frequency of noncompliance. A sharp decrease in the target behavior between the baseline and the music condition was present. Behaviors did not significantly increase during the next baseline condition. Behaviors were at similarly low levels during the reading condition as well; no significant differences between spoken and sung conditions were observed (Brownell, 2002).

The target behavior in the third case study was the use of a loud voice, as this was very disruptive in the classroom. The social story in this study focused on teaching the importance of
using an “inside voice.” The format was ABAC. Reductions in the target behavior were lower after both the reading and sung conditions. Unlike the previous case studies, significant differences were present between the sung and spoken conditions, with lower instances of the loud voice present in the sung condition (Brownell, 2002).

The final case study also had the use of a loud voice as the target behavior. The social story used was different than the one described in the previous case study, although the target behavior was the same. His treatment order was ACAB. Overall, reductions in the use of a loud voice were observed in both the sung and spoken conditions; no significant differences between the two conditions were present. Overall, reductions in target behaviors were observed for all participants; however, no significant differences existed between the music and non-music conditions (Brownell, 2002).

Like Brownell (2002), Pasiali (2004) utilized Gray’s model for social stories in a musical context. The purpose of Pasiali’s (2004) intervention was to promote social skills in children with autism using therapeutic songs in the children’s home environment. Three individuals with ASD were included in the study; all three responded positively to music and had no prior music therapy experience. Using an ABAB intervention design, parents, a paraprofessional, or both collected data on the target behavior. Operationalized definitions were created for each participant for the target behavior, and then the researcher composed a therapeutic song, which involved using the melody of the child’s favorite tune and inserting new words. Each intervention session lasted 15 minutes; immediately after the intervention, data were collected. During each session, participants listened to songs, played rhythmic instruments, and sang; the intervention flowed from more passive activities to more active participation. The data were
graphed, and t-tests were utilized to compare baseline scores to scores at the completion of the intervention (Pasiali, 2004).

The first participant in Pasiali’s (2004) study was a seven-year-old who engaged in echolalia and humming behaviors in order to avoid situations or tasks he did not enjoy; therefore, the target behavior was aberrant vocalizations. The researcher implemented the intervention, and all data were collected during dinnertime by the participant’s mother. Also, inter-rater reliability data were collected by the father. During the intervention phases of the study, the researcher would carry out the intervention immediately before dinner. Results indicated an overall decrease in inappropriate vocalizations during dinnertime. During the second baseline phase, the aberrant behavior fell in the baseline range on only one out of seven days. While some overlap was present between baseline and intervention, the number of aberrant vocalizations decreased throughout the course of the study. A significant decrease in vocalizations was present between the baseline condition and the first treatment condition (Pasiali, 2004).

The second participant in Pasiali’s study was a 9-year old male who often used the VCR equipment inappropriately. For example, he would repeatedly watch particular movie scenes, leading to damaged videos and equipment. The researcher conducted the intervention and the child’s mother collected data during his snack time when he would typically watch a movie. A paraprofessional collected inter-observer reliability data. A decrease in the targeted behavior was observed between baseline and the first intervention phase. The decrease in target behaviors was statistically significant between the two baseline phases, indicating the intervention effectively taught the skill. The effects of the intervention remained even without prompting, indicating the intervention has staying power. The decrease in target behaviors also was statistically significant between the first baseline and the first treatment condition (Pasiali, 2004).
The third and final participant in Pasiali’s (2004) study was an eight-year-old female who often went into the kitchen to get food when bored or hungry. The targeted behavior then was rummaging behavior and the time of the intervention was after school, as the participant typically desired a snack at that time. Although there was a decrease in rummaging behaviors, the reduction in the target behavior was not significant (Pasiali, 2004).

Overall, the use of therapeutic songs demonstrated a decrease in targeted behaviors. However, decreases in the targeted behaviors were not always significant. When interpreting the results, it is important to remember caretakers typically collected the data (Pasiali, 2004).

A study conducted by Finnigan and Starr (2010) sought to determine whether or not music therapy positively impacted social responsiveness and whether or not it reduced socially avoidant behavior using a single-subject alternative research design. A music intervention was compared to a non-music intervention to determine if any significant differences arose. Also, the study aimed to determine if intervention results were generalizable. Targeted behaviors in the intervention included eye contact, imitation, and turn taking. Socially avoidant behaviors included pushing a toy away and moving away. Only one participant was included in the study, a three year old Filipino female with ASD. A measure of adaptive functioning, rating scales for autism spectrum disorder, structured observation for autism spectrum disorder, and a measure of early learning skills were used to assess the presence and severity of symptoms. These assessments were only administered prior to the intervention. Behaviors were coded, and inter-observer reliability averaged 87% matched during observations. An ABCD design was used. Phase A was the baseline phase. Phase B was an alternating intervention phase, meaning the participant received both music and non-music intervention over 12 sessions. The order of the sessions was random; for example, she received one day of music intervention, followed by two
sessions in the non-music condition. Phase C included the intervention deemed most effective in phase B; the music condition was determined to be most effective, as a greater number of target behaviors occurred during the music session. D was the follow up phase of the intervention (Finnigan & Star, 2010).

Results were recorded as percentages by taking the number of times the child engaged in imitation and dividing that by the number of times the child was provided with a prompt to do so (# of times engaged in imitation/# of times prompted). There was no overlap between the number of times the participant engaged in imitation in the baseline phase compared to the music intervention stage in Phase B and the music intervention in Phase C. While gains in imitation were still made from baseline to the non-music condition, the percentage of imitative behaviors the child engaged in did not increase as drastically as in the music condition. Lastly, turn taking behaviors increased in both the music and non-music conditions. The percentage scores for turn-taking behavior in the music condition were considerably higher than the percentage of turn-taking behavior in the non-music condition. High percentages of turn-taking behavior also were exhibited in Phase C (Finnigan & Starr, 2010).

Lastly, when looking at socially avoidant behavior, no instances of pushing a toy away or moving away were exhibited during the music condition in Phases B and C. Very few instances were observed overall, but the only instances of socially avoidant behavior occurred only in the baseline and non-music conditions. Zero instances of eye contact and a low percentage of imitative responses were observed at follow-up. For turn taking, follow-up demonstrated that instances of turn-taking behavior were higher than in the baseline condition. The music condition appeared to elicit more imitative and turn-taking behaviors and fewer socially avoidant behaviors.
than the non-music condition. These behaviors may not generalize to other situations and results may not be maintained over time (Finnigan & Starr, 2010).

Peer-mediated intervention was utilized during music therapy with the intention to support outdoor play for young children with ASD in a community child care program (Kern & Aldridge, 2006). Four participants, all males with ASD ranging from three to five years old, enrolled in a community child care program, were the target participants in the study. Additionally, 32 classmates with and without disabilities were included. A sandbox on the playground was transformed into a music area through the addition of musical instruments such as drums and bongos, and other materials, such as a CD player and sound tubes constructed from PVC pipes. Four songs were composed, one for each participant. Each song included goals to increase appropriate social behavior (Kern & Aldridge, 2006).

The baseline condition was the playground without the music hut. The adaptation of the playground into the music hut was the second phase of the intervention. In the second phase, the participants were walked to the music hut and given a drumstick by their teacher without additional instructions. The third phase of the intervention included teacher-mediated instruction conducted in the music hut. During this phase, children were asked to find at least one other peer buddy to play with in the music hut. Once in the music hut, the teacher sang songs and modeled content for the participants. Additionally, the teacher assisted in the initiation and continuation of play. Lastly, peer-mediated instruction in the music hut comprised the fourth phase of the intervention. The largest difference between the third and fourth phrase included the increased role of the students and the decreased role of the teacher. While time was structured the same in both phrases, the teacher gradually reduced their role until they were only providing prompts as necessary in the fourth phase (Kern & Aldridge, 2006).
As a result of participating in the intervention, small increases in social interactions were realized for all four participants. The largest increases in social interactions were found during the teacher-mediated instruction phase of the intervention. Although interactions decreased slightly from the teacher-mediated phase to the peer-mediated phase, the number of interactions remained higher than baseline. This study indicates peer-mediated instruction at recess may increase positive social behaviors in individuals on the autism spectrum (Kern & Aldridge, 2006).

Chapter Summary

This chapter outlined the presentation and symptomology associated with ASD and provided a review of social skills and music interventions commonly used with individuals on the spectrum. Autism was first observed and acknowledged by Leo Kanner in 1943, and Asperger’s Syndrome was identified by Hans Asperger a year later (Lai, Lombardo, & Baron-Cohen, 2014). In 2013 in the DSM-V, autism and Asperger’s Syndrome were put under the same umbrella (APA, 2013). Whereas the prevalence of the disorder was 1 in 150 ten years ago, 1 in 68 individuals is diagnosed with ASD today (CDC, 2014). A growing understanding of the disorder has aided in the diagnosis and earlier identification of ASD. Prior to 24 months of age, children can smile, engage in joint attention, and imitate the actions of others. Routine surveillance and the reported concerns of parents are important in the early diagnosis of ASD (Gabovitch & Wiseman, 2005).

Because of the increase in ASD diagnosis, interventions to reduce symptom severity are essential. Early intervention has been shown to reduce symptoms associated with ASD, further supporting the wide-spread use of intervention with individuals on the spectrum (Matson, 2007). Although intervention has been identified as effective in reducing symptom severity, selecting
appropriate interventions is more challenging, particularly as there are several different types of interventions (Scott & Baldwin, 2005).

Biological interventions, applied behavior analysis, cognitive behavioral therapy, and social learning interventions are commonly utilized with persons with ASD (Mesibov, 1997). Effective interventions are those in which the focus is on the deficits associated with ASD directly (Brady et al., 1987), namely the social and communication deficits, in a highly structured, routinized format (Taylor & Jasper, 2001).

Because the social and communication deficits characteristic of ASD are commonly the behaviors targeted in intervention, social skills interventions are conducted in one of five categories: ecological variations, collateral skills training, child-specific interventions, peer behavior, and comprehensive interventions (McConnell, 2002). The use of social stories interventions has been found to increase socially appropriate behaviors in the classroom (Laushey & Heflin, 2000; Delano & Snell, 2006), increase social interactions (Kamps et al., 2002; Barry & Burlew, 2004), reduce maladaptive behaviors (Kuttler et al., 1999), and increase socially appropriate responses (Thieman & Goldstein, 2001).

With a large variety of intervention options, it becomes challenging to identify appropriate interventions for different people. When selecting interventions, the preferences of the persons receiving the intervention is important to consider (Scott & Baldwin, 2005). Many individuals with ASD have a special interest, aptitude, or both for music (Graham, 2001). Music is a pervasive, cross-cultural experience (McPherson et al., 2012). The use of music therapy and music intervention to reduce symptomology of ASD has been found to increase social and communication behaviors (Edgerton, 1994) and increase instances of joy, emotional synchronicity, and shared emotional affect (Kim et al., 2009). Music therapy intervention has
been found to increase parent-child interactions (Edwards, 2011), reduce problem behaviors (Brownell, 2002; Pasiali, 2004), improve social responsiveness (Finnigan & Starr, 2010), and increase peer interactions on the playground (Kern & Aldridge, 2006).

According to the evidence-based practices manual for individuals with ASD, cognitive behavioral interventions, peer-mediated instruction and intervention, social skills training, and structured play groups have been identified as evidence-based, effective interventions (Wong et al., 2013). While interventions using music therapy or musically adapted social stories have been conducted, this category of intervention has not yet been identified as evidence-based due to the absence of a control group and only one research group when conducting research (Wong et al., 2013). The lack of sufficient research in this area (Wong et al., 2013) in conjunction with the increased music interests and aptitude of many individuals with ASD (Graham, 2001) supports increased research in the area of music therapy and music intervention.

To further current research and gain further insight into the impact of music intervention, the current study aimed to compare a group of individuals receiving music intervention to a group of individuals exposed to music in an unstructured format. Many single-subject research designs only measure treatment effects for individuals and do not examine the relationship between peers who receive a specific intervention with those who do not. Finnigan and Starr (2010) utilized an ABAB intervention design where all individuals received the music intervention, followed by a phase without a music component. Although Finnigan and Starr (2010) compared one individual’s performance in music and non-music phases, the authors did not make comparisons across individuals or groups. To further understand the overall impact music intervention can have, the current study aimed to identify differences between groups who did and did not receive musically adapted social stories.
Chapter III

Research Methodology

This study examined whether or not musically adapted social stories administered in a group setting would increase targeted behavior social behaviors in individuals with ASD. This chapter offers a description of the participants, the setting, procedures, and instrumentation used in the present study. Data collection methods and training information are outlined. The visual analysis techniques utilized in the study also are described.

Participants

This research was conducted during a fine arts program for individuals with autism spectrum disorders. The program was held at a Midwestern university and served about 30 individuals between the ages of 5 and 17. Most participants had a diagnosis of ASD, but individuals with other disabilities also were involved in the program. However, only children with a diagnosis of ASD participated in the study. Individuals enrolled in the program were divided into groups of 7-10 participants based on age and level of functioning. Participants involved in the 2-hour program circulated through dance, theater, and music rotations. Each rotation lasted approximately 20-25 minutes, and the program was held once weekly for nine weeks.

All individuals enrolled in the fine arts program were divided into three different groups based on current level of functioning. Children in the lowest functioning group displayed the more severe symptoms of ASD and/or a greater number of characteristics associated with the disorder. Typically, members of this group had reduced language skills or required one-on-one assistance to participate in the program. Members in the middle group typically had expressive
language, but often required assistance to perform and attend to the tasks in the program.

Individuals in the third group were children who, for the most part, engaged in the activities of the program with minimal to no assistance.

A total of four participants (two in the intervention group and two in the control group) were included in the study. The participants were selected from the middle level group, which included around 15-20 participants. For the music portion of the program, individuals included in the fine arts program were divided into two groups, each with about eight to 10 participants. A recommendation from the program director in conjunction with the completion of parental consent forms determined which four individuals from the middle functioning group were included in the study. Members from this group were selected as the intervention group because of their level of expressive language and functioning. Two of the participants received the musically adapted social stories intervention. Although only two participants were selected for each group to participate in the study, the participants selected for the study engaged in the intervention among other individuals not included in the study. Participants were described by age, sex, ethnicity, and diagnosis. A pseudonym was used to differentiate the participants in the results portion. The control group consisted of two individuals who did not receive the musically adapted social stories and instead received general music instruction. Participants in both groups received musical instruction 20-25 minutes once weekly for a total of nine weeks.

Consent to conduct the study was provided by the program director, Dr. Ryan Hourigan. Prior to beginning the study, approval was obtained from the Ball State University Institutional Review Board. Parental consent was obtained prior to the initiation of the program.
Instrumentation

Parents of the four participants completed a Demographic Questionnaire (Appendix B), the Social Skills and Problem Behavior Scales of the Social Skills Improvement System (Gresham & Elliot, 2008), and the Participant Behavior Checklist (see Appendix C), which was designed by the researcher. Eye contact, social smiling, and imitation behavior data was collected on participants in the control and experimental groups throughout the baseline, intervention, and reversal stages of the intervention.

Demographic Questionnaire

Parents completed the Demographic Questionnaire, which provided information about the participants. Each participant’s age, birthdate, sex, and ethnicity were identified through the questionnaire. Parents or guardians also indicated when the participant was diagnosed with ASD and by whom the diagnosis was made.

Social Skills Improvement System (SSIS)

The Social Skills Improvement System (Gresham & Elliot, 2008; SSIS) is used to identify the presence and severity of social impairment in individuals ages 3 to 18. The SSIS contains three scales: Social Skills, Problem Behaviors, and Academic Competence. The present study utilized the first two scales. The problem behaviors scale of the SSIS contains five subscales: Externalizing, Bullying, Hyperactivity/Inattention, Internalizing, and Autism Spectrum. The social skills scale includes seven subscales: Communication, Cooperation, Assertion, Responsibility, Empathy, Engagement, and Self-Control. The SSIS is a 79-item rating scale that takes between 15 and 20 minutes to complete (Gresham & Elliot, 2008). Validity scales identify raters who provide an unusual pattern of responses, over-endorse problem behaviors, or who provide inconsistent responses. Forms can be completed by teachers, parents,
and students. In the present study, only parents completed the rating scale. The SSIS can be repeatedly administered because it was designed to monitor behavior before and after the initiation of intervention. At least four weeks should elapse before administering the SSIS again. Results provide information about changes in behavior over time; scoring software can provide visual and statistical analyses of data (Spies, Carlson, & Geisinger, 2010). The SSIS was normed using a nationally representative sample including 4,700 individuals. Persons with ASD evaluated using the SSIS scored on average 1.5 standard deviations below the mean compared to the nonclinical sample, indicating the SSIS is able to effectively identify social deficits present in individuals with ASD (Gresham & Elliot, 2008). Internal consistency reliability was present across all subdomains, and total scale scores and coefficient alphas ranged between .74 and .96 on the parent scale. Test-retest reliability also was considered appropriate. Validity was found between scales and subscales and between the SSIS and related scales, such as the Social Skills Rating System and the Behavior Assessment System for Children (Spies et al., 2010).

Prior to the start of the study, parents of all four participants were asked to complete the SSIS. This information was utilized to obtain a sense of each participant’s level of functioning and ascertain more information related to their presentation of autism spectrum related symptoms.

**Participant Behavior Checklist**

Parents of participants in the control and experimental groups reported the frequency and duration of behaviors targeted in the intervention on the Participant Behavior Checklist. Questions included a Likert rating scale allowing parents to indicate the frequency of behaviors, such as eye contact and smiling. Parents of the participants were asked to complete the forms
prior to the start of the intervention. This information provided additional baseline information related to each participant’s functioning on the targeted skills.

*Composition of the Social Stories*

The social stories (Appendix A) were written and included as a part of a community program. The program’s theme revolved around the idea of ‘mystery.’ Therefore, the lyrics were written to reflect the theme. For instance, lyrics such as “searching for clues” and “to crack the case” were included to align with the overarching theme. Additionally, as all three social stories were used in conjunction with one another as part of the program, there was a unifying theme: Happy. Displaying happiness, identifying happiness, and greeting someone with a smile were addressed in the social stories. All three social stories included original lyrics and the music was original for the first two social stories. The third social story, *How to Tell if Someone is Happy*, was sung to the tune of a common camp song, unaccompanied at each session.

Each social story was designed using Carol Gray’s intervention design. According to Gray’s design, social stories should include descriptive, perspective, directive, and affirmative sentences (Reynout & Carter, 2006). The songs for the present study were developed using the design of Carol Gray’s social stories, as social narratives are considered an evidence based intervention approach (Wong et al., 2013). Social stories fall under the category of social narratives, as social narratives contain a situational description, cues, and appropriate responses based on the needs of the participants. As previously described, social stories contain these elements.
Social Story One: Steps Song

The first social story was designed to teach how to approach, greet, and respond when seeing someone familiar in a public setting (i.e. the grocery store), using a step-by-step method.

The lyrics and accompanying motions are as follows:

<table>
<thead>
<tr>
<th>When I’m out</th>
<th>Arms out</th>
</tr>
</thead>
<tbody>
<tr>
<td>I may see someone I know</td>
<td>Point to head with one finger</td>
</tr>
<tr>
<td>And I don’t want to be scared to say “Hello!”</td>
<td>Cross arms and push out while shaking head</td>
</tr>
<tr>
<td>“Hello!”</td>
<td>Wave</td>
</tr>
</tbody>
</table>

| I’m happy to see the person I know | Thumbs up |
| So I want to make sure my face tells them so | Point to face |
| Step one: Put a smile on my face | Hold up 1 finger |
| Put a smile on my face | Smile big and point to mouth |
| Put a smile on my face | Same motion facing left |
| Put a smile on my face | Same motion facing right |

| Next, I need to say hello | Wave with right hand |
| And smile at them | Point to face and smile |
| While they say hello | Wave with left hand |
| Step two: Say hello! | Hold up 2 fingers |
| Say hello | Wave |
| Say hello | Wave facing right |
| Say hello | Wave facing left |

| Then I will ask, “How are you today?” | Shrug shoulders |
| And look at their face while I wait | Point to face |
| Step three: Ask, “How are you?” | Hold up 3 fingers |

| If they ask me how I am | Point to self |
| I can say a few different things | Palms up hands to chin and then out |
| If I’m happy and well, I can say, “I’m good, thanks!” | Smile |
| “I’m good, thanks.” | Thumbs up |
| “I’m good, thanks.” | Thumbs up facing right |
| | Thumbs up facing left |

| If I’m not feeling well, I can say, “I’m not feeling my best, But I’ll be ok!” | Frown and shake head |
| Step four: Answer their question! | Hands on stomach |
| | Smile and nod |
| | Hold up 4 fingers |

| To end the greeting I say, “It was so nice seeing you today!” | Hands on hips |

| With a smile and a wave | Smile and wave |
| I can walk away | Pretend to walk (not actually moving forward) |
| With a smile and a wave | Smile and wave |
I can walk away and say, Pretend to walk (not actually moving forward)
“Goodbye!” Wave
“Goodbye!” Wave facing right
“Goodbye!” Wave facing left

Social stories should include descriptive sentences, perspective sentences, affirmative sentences, and directive sentences (Reynhout & Carter, 2006). Over time, the construction of social stories has evolved. Directive sentences are now referred to as coaching sentences (Hutchins, 2012).

Descriptive sentences define the situation that will be addressed (Hutchins, 2012). The following lyrics introduce the musically adapted social story utilized in the intervention:

When I’m out
I may see someone I know!
And I don’t want to be scared to say hello!

The lyrics originally specifically stated different locations where one might see an individual he or she knows. Places included the grocery store, a restaurant, and the zoo. When setting the lyrics to music, these lines were removed. The phrase “When I’m out” allows the interventionist to utilize locations that are most fitting for the group of individuals utilizing the social stories. Small, laminated cards depicting a picture of the grocery store, the zoo, and a restaurant were shown to participants when they were introduced to this social story.

Perspective sentences provide insight into the physical and emotional state of the individual (Hutchins, 2012). This social story briefly addresses the emotional state of the participant at the beginning of the verbal exchange.

I’m happy to see the person I know
So I want to make sure my face tells them so
Additionally, the fourth step indicates that when in a social exchange, a person may be asked how they are feeling. The lyrics outline possible ways an individual may feel, giving them options for how to respond.

If they ask me how I am
I can say a few different things
If I’m happy and well, I can say,
“I’m good, thanks!”
“I’m good, thanks!”
“I’m good, thanks!”

If I’m not feeling well, I can say,
“I’m not feeling my best,
But I’ll be ok!”

Directive or coaching sentences provide individuals with ways to respond or specific cues to identify in social situations and help individuals recall information and respond (Hutchins, 2012). The main purpose of this musically adapted social story was to provide directives to allow competent responses when talking with someone unexpectedly. To assist in recalling each step, the steps of the social story were repeated in the lyrics.

Step One: Put a smile on my face
Put a smile on my face
Put a smile on my face
Put a smile on my face

Next, I need to say hello
And Smile at them
While they say hello
Step two: Say hello!
Say hello
Say hello
Say hello

Then, I will ask,
“How are you today?”
And look at their face while I wait
Step Three: Ask, “How are you?”

Step four: Answer their question!
To end the greeting I say,
“It was so nice seeing you today!

With a smile and a wave
I can walk away
With a smile and a wave
I can walk away and say,
“Goodbye!”
“Goodbye!”
“Goodbye!”

Social Story Two: Happy

The purpose of the second social story was for participants to understand how to display happiness with their face, body, and words as well as identify different things that might make them feel happy. The lyrics and accompanying motions are as follows:

A smile on my face
Is a clue to my friends
That I’m happy

When I laugh
I give friends a clue!
That I’m happy

What I say
Can give friends a clue
I can say with my words
That I’m happy
That I’m happy

When I’m happy
I can smile, laugh, and say,
“I’m really happy today!”

I may be happy
When I eat my favorite food
I may be happy
When I play my favorite game
I may be happy
When I see all my best friends

I may be happy
So very happy

Hold magnifying glass to mouth
Hold magnifying glass to eye
Thumbs up

Hold magnifying glass to ear
Hold magnifying glass to eye
Thumbs up

Hold magnifying glass to ear
Hold magnifying glass to eye
Palms facing up, hands to chin, and then out
Fist pump in the air with one arm
Fist pump in the air with the other arm

Point to face
Wave arms
Hold up arms

Fist pump
Pretend to eat
Fist pump
Act like kicking a ball
Fist pump
Open arms out

Fist pump
Fist pump with both arms
Unlike the first social story, the second social story did not outline a specific situation in which the individual would face. Rather, the song identified possible reasons a person may feel happy. The descriptive sentences (Hutchins, 2012) in this musically adapted social story indicate common reasons individuals feel happy.

\begin{verbatim}
I may be happy
When I eat my favorite food
I may be happy
When I play my favorite game
I may be happy
When I see all my best friends
\end{verbatim}

Regarding perspective sentences (Hutchins, 2012), the social story identified physical cues one may express indicating feelings of happiness. The song itself focused on the individual’s emotional state. The following lyrics outline the physical clues that indicate an individual may be happy.

\begin{verbatim}
A smile on my face
Is a clue to my friends
That I’m happy.

When I laugh
I give friends a clue!
That I’m happy

What I say
Can give friends a clue
I can say with my words
That I’m happy
That I’m happy

A brief account of how to respond when feeling happy are included in the lyrics and serve as the coaching sentences (Hutchins, 2012).

\begin{verbatim}
When I’m happy
I can smile, laugh, and say,
“I’m really happy today!”
I can smile, laugh, and say!
\end{verbatim}
The emotion of focus, ‘happy,’ was repeated several times in the song. In nearly every other line, the participant was again reminded of the emotion that was being taught. Additionally, the entirety of the lyrics were sung through twice on the song’s recording, again as a mechanism to reiterate how to display happiness and recognize different activities and situations that can make an individual feel happy.

**Social Story Three: How to Tell if Someone is Happy**

The third social story was written to help individuals identify when another individual is happy. Additionally, the song provided possible reasons another person may be happy. The actions and physical clues are similar to those in the second social story, which was done as a means to help the individual connect how others experience emotions similarly.

I want to know
If someone is happy
So I look for clues
To crack the case

Point to head
Thumbs up
Act like holding magnifying glass
Act like holding book

Singing oh-oh-oh
We’re gonna solve the mystery
Singing oh-oh-oh
We’re gonna solve the mystery

Move hands together from the left to right
Fingers clasped; do “the wave”
Move hands together from left to right
Fingers clasped; do “the wave”

First we use our eyes
To look for a smile
If they’re smiling
They just might be happy

Point to eyes
Hand to forehead and act like searching
Point to lips and smile
Thumbs up

Singing oh-oh-oh
We’re gonna solve the mystery
Singing oh-oh-oh
We’re gonna solve the mystery

Move hands together from the left to right
Fingers clasped; do “the wave”
Move hands together from left to right
Fingers clasped; do “the wave”

Next we use our ears
To search for a laugh
Are they laughing?
That could mean they’re happy

Point to ears
Hand to forehead and act like searching
Hold stomach and act like laughing
Thumbs up

Singing oh-oh-oh
We’re gonna solve the mystery
Singing oh-oh-oh
We’re gonna solve the mystery

Move hands together from the left to right
Fingers clasped; do “the wave”
Move hands together from left to right
Fingers clasped; do “the wave”
Then I use their words To search for a clue Are they saying hey! I’m really happy today! Point to mouth Hand to forehead and act like searching Yell “Hey” and fist pump Thumbs up

Singing oh-oh-oh We’re gonna solve the mystery Singing oh-oh-oh We’re gonna solve the mystery Move hands together from the left to right Fingers clasped; do “the wave” Move hands together from left to right Fingers clasped; do “the wave”

If they’re happy They may want to share good news If they’re happy They may want to play a game Thumbs up Arms out Thumbs up Act like kicking a ball

It’s good to know When someone is happy When I look for clues (hold out the word clues) I can be happy too Point to head Thumbs up Act like holding magnifying glass Thumbs up

As with the second musically adapted social story, this social story did not identify a particular situation. The first lyrics of the song defined the song’s purpose, acting as a descriptive sentence (Hutchins, 2012).

*I want to know*
*If someone is happy*
*So I look for clues*
*To crack the case*

The song only briefly addressed how the feelings and emotional state of the individual using the song. The perspective sentences (Hutchins, 2012) are found at the end of the social story.

*It’s good to know*
*When someone is happy*
*When I look for clues*
*I can be happy too*
The coaching sentences (Hutchins, 2012) outlined different environmental cues for the participant to identify in another person. This information could then be used to determine whether or not the other person in the interaction is happy.

First we use our eyes
To look for a smile
If they’re smiling
They just might be happy

Next we use our ears
To search for a laugh
Are they laughing?
That could mean they’re happy

Then I use their words
To search for a clue
Are they saying hey!
I’m really happy today!

While specific responses are not outlined, the song lyrics provide possible outcomes of another individual being happy. Also, the song is intended to be sung in a “repeat after me” style. This means the leader sings each line; the participants then echo each line immediately after it is sung.

If they are happy
They may want to share good news
If they’re happy
They may want to play a game

Affirmative sentences, or sentences that express values shared by individuals in the culture, were addressed more subtly in the intervention (Hutchins, 2012). The overarching themes of each social story addressed culturally relevant information, although it was not explicitly stated in this manner to the participants. Another type of sentence included in social stories is partial sentences. The purpose of partial sentences is to help individuals make predictions about what will happen next, how they will respond in a different situation, and how
other’s will respond (Hutchins, 2012). During the intervention, the interventionist frequently stopped the recording to encourage participants to guess the next step and had the participants apply what was learned in the song to the immediate environment.

Training

Five individuals were trained to collect data prior to the start of the study. Individuals trained to complete data collection included undergraduate students with a major or minor in psychology or a closely related field. Training included an overview of autism spectrum disorders, information about the study design and purpose, and basic responsibilities and expectations. Data collectors completed a commitment form (Appendix D), acknowledging acceptance of responsibilities and the time commitment required. Any conflicts in availability were documented so that the appropriate number of data collectors would be available for each session.

During the data collection training session, data collectors were provided with handouts including the target behaviors and operationalized definitions. Examples and non-examples of each of the target behaviors were discussed. Data collectors were familiarized with the data collection forms (Appendix E) and provided with opportunities to practice data collection in an elementary school classroom setting.

Data collectors observed in 5-minute time increments in an elementary classroom. Two observers were assigned to the same student for 5-minutes with the goal of obtaining inter-observer reliability. Prior to being considered research ready, inter-reliability between the two observers needed to be at least 85%.
Setting

The study took place in a classroom on the campus of a Midwestern university. Trained observers sat in chairs or stood to the sides of the participant she was assigned to observe. The participants were facing front, and the observers looked at the participants from the sides. Observers moved around the room as necessary to observe participants. All other materials that could pose as a distraction or a safety hazard were removed from the room. Participants were asked to stand or sit on the floor; therefore, all desks and chairs were moved to the side. Stacked chairs were placed facing the wall to discourage sitting. Any office supplies or classroom supplies in the room, such as pencils, dry erase markers, and electric pencil sharpeners were placed out of reach and put out of sight whenever possible.

Research Design

A single-subject reversal treatment design was implemented to evaluate the effects of the intervention. An advantage of single-case research includes the ability to monitor progress throughout all phases of an intervention. Single-case designs also allow researchers to examine not only the overall level of behavior change as a result of the intervention, but also the process by which change occurred (Horner & Odom, 2014).

The use of an ABA research design is common in single-case research. A baseline phase is conducted, following by intervention. The intervention is then withdrawn to determine whether or not intervention effects were sustained (Horner & Odom, 2014). The baseline reassessment phase in the ABA design “allows you to determine whether the observed changes in behavior after treatment introduction were caused by the treatment” (Bordens & Abbott, 2002). The ABA design is commonly referred to as a reversal or withdrawal design (Horner & Odom, 2014).
The use of a reversal design in single-case research indicates specific procedural considerations have been made. Behaviors must be clearly and operationally defined in such a way observers can identify and appropriately code behaviors. Secondly, a clearly defined time-sampling procedure must be outlined. This includes determining how data will be collected. Some single-case research collects data at specific intervals during an observation and others use frequency counts (Bordens & Abbott, 2002). Also, single-case research is designed to correct difficulties managing baseline data. In naturalistic research settings, it is often difficult to establish a stable baseline. Extending the number of data points until a stable baseline is reached is a simple solution (Bordens & Abbott, 2002).

An advantage of single-case design is the ability to visually analyze data. Throughout all phases of an intervention, including baseline, treatment, and reversal phases, data points are collected and visually represented graphically. Changes in the frequency of a particular behavior can be easily identified through a visual analysis. Data points can be plotted throughout the intervention, allowing the researcher to identify if changes are necessary during the intervention, rather than waiting until the intervention has been conducted in its entirety. Although visual representation provides advantages, the inability to conduct inferential statistics is often viewed as a disadvantage. Although large group effects are unable to be seen through single-case research, much more detailed depictions of an individual’s performance is possible; such detailed visual analysis of large samples would be unrealistic (Kratochwill, Levin, Horner, & Swoboda 2014).

**Data Analysis**

Visually inspecting the data is a very common method utilized in applied behavioral analysis, or ABA. However, there are criticisms regarding visual inspection of data, as
inconsistencies across raters and subjectivity in interpretation can result (Kahng, Chung, Gutshall, Pitts, & Girolami, 2010). Therefore other methods also were utilized to interpret the results.

Trend lines were utilized to determine the frequency of the target behaviors over the course of the intervention. The equation \( y = a + bx \) was used to determine the line of best fit for each of the data sets. The \( y \)-intercept is represented by \( a \) and \( b \) represents the slope of the line, The trend line either ascends, indicating there was an increase in the behavior over the course of the music program or it descents, indicating there was a decrease in the behavior over time. While larger slopes represented more rapid changes in behavior, smaller slopes represented slower changes in behavior (Bluman, 1995). The slopes were interpreted using the following descriptions:

- Minimal rate of change = 0-0.09
- Moderate rate of change = 0.1-0.5
- Substantial rate of change = higher than 0.5

The percentage of non-overlapping data between the baseline and intervention session was calculated for the participants as well, to determine whether exposure to the musically adapted social stories or continued exposure to the music-based program impacted the participants’ presentation of skills. To calculate the percentage of non-overlapping data, the baseline data points are compared to other conditions. Taking the most extreme data point during the baseline phase, it is then determined how many data points fall above or below that extreme during the intervention condition, depending on whether an increase or decrease in behavior is desired (Schneider, Goldstein, & Parker, 2007). In the present study, the number of data points
during the intervention phase that fell above the highest baseline data point were included in the calculation of non-overlapping data.

In instances where outliers occurred or notable repetitions were present in the data, mean and mode were used to further describe the data. The mean, or average, was calculated to help represent the participant’s overall performance during the intervention stage. It was also utilized to determine the impact of outliers in certain instances (Manikandan, 2011a). The mode, which is the number represented most frequently in a data set, was determined in cases where the frequency of the participant’s behavior was the same on two or more observations. It is an easily calculated number which provides basic information regarding nominal data (Manikandan, 2011b).

Study Implementation Plan

An anticipated routine was established prior to the start of the study indicating how each session would be conducted in the experimental group. The schedule was created intending each session to be about 25 to 30 minutes in length. The following table includes the intended plan.

Table A

Anticipated Intervention Session Schedule

<table>
<thead>
<tr>
<th>0:00-3:00 minutes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Assemble participants in appropriate locations</td>
</tr>
<tr>
<td>• Welcome participants (with a “hello,” smile, &amp; wave)</td>
</tr>
<tr>
<td>• Pass out instruments/materials</td>
</tr>
<tr>
<td>3:00-6:00 minutes:</td>
</tr>
<tr>
<td>• Participants read/sung the social story one line at a time</td>
</tr>
<tr>
<td>• Participants asked to repeat each line/engage in corresponding motions</td>
</tr>
<tr>
<td>6:00-9:00 minutes:</td>
</tr>
<tr>
<td>• Social story sung two times</td>
</tr>
<tr>
<td>• Participants encouraged to actively participate</td>
</tr>
<tr>
<td>9:00-11:00 minutes:</td>
</tr>
<tr>
<td>• Instruments/materials collected</td>
</tr>
<tr>
<td>• Instruments/materials administered for next social story</td>
</tr>
</tbody>
</table>
11:00-14:00 minutes:
- Participants read/sung the second social story one line at a time
- Participants asked to repeat each line/engage in corresponding motions

14:00-17:00 minutes:
- Social story sung two times
- Participants encouraged to actively participate

17:00-19:00 minutes:
- Instruments/materials collected
- Instruments/materials administered for next social story

19:00-22:00 minutes:
- Participants read/sung the social story one line at a time
- Participants asked to repeat each line/engage in corresponding motions

22:00-25:00 minutes:
- Social story sung two times
- Participants encouraged to actively participate

25:00-27:00 minutes:
- Instruments/materials collected
- Participants asked to give themselves a hand (everyone claps) or give themselves a pat on the back (pat their own back)
- Participants asked to line up to leave

Data were collected every week in both the experimental and control groups. Baseline data were collected during the second week of the program. Data were collected during two, five-minute time samples during the second week of the program. Baseline data were collected for all four participants during the music rotation of the program. Due to time constraints, intervention began during the third week of the program, even if participants did not have stable baseline data after the two baseline collection times.

Each week, two, 5-minute time observations were conducted for both the experimental and control participants during the music rotation. The 5-minute observations occurred within the 20 to 25 minute intervention segment at varying times. For participants in the musically adapted social stories intervention, similar activities were occurring at all points of each session.

Musical instruction in the control group varied during the 20 to 25 minute rotation.
Baseline

Baseline data were collected during the second week of the community program. Trained observers collected baseline data in the control and experimental groups. The baseline session included two, five-minute observations where the frequency of the target behaviors was collected.

Singing and music making occurred during the baseline session in the experimental group, but the musically adapted social stories were not included. Also, participants did not receive any instruction related to the target behaviors. During the baseline session, the occurrence of imitation, eye contact with others, and smiling were recorded. While opportunities to engage in the target behaviors were present, no direct prompts were provided by the researcher for participants to engage in the target behaviors.

Baseline data were collected in the same manner for the control group participants. Previously trained individuals collected data on the two target participants in the control group during music instruction. Two, 5-minute observations were conducted during the 20-25 minute music session for one week.

Intervention

Intervention occurred once weekly for 20-25 minutes for a total of six weeks. During each intervention session, participants were exposed to three musically adapted social stories in a group setting. Each social story (see Appendix A) was written to target eye contact, smiling, and imitation and the same three social stories were used throughout the six intervention sessions. Instruments, such as egg shakers and rhythm sticks, laminated and projected pictures, and choreographed motions were incorporated into the sessions.
Trained observers collected data during the intervention sessions for two, 5-minute time intervals during the music rotation. Data were collected every week of the program. Each observer was assigned to collect data on one participant. All instances of the three target behaviors occurring within the 5-minute observation session were recorded. Participants in the control group were observed in the same manner as participants in the experimental group.

**Reversal**

The reversal phase resembled the baseline phase, meaning individuals in the experimental group did not sing the musically adapted social stories. Both groups engaged in music activities. Opportunities to engage in the target behaviors were provided, but no direct prompts were given to engage in the target behaviors. Reversal data were collected during the final session of the program. Observers collected data; each observer was assigned to a participant and collected frequency data for two 5-minute time intervals.

**Target Behaviors**

1) **Eye-Contact/Looking at peer, researcher, or leader:** For a behavior to be considered eye-contact/looking at peer, the target participant must look at the face or in the eyes of their peer, the interventionist, or a group leader for at least three seconds while the peer is speaking. In order to be considered the target behavior, the participant must look into the face or eyes of their peer for at least three seconds. Attending to any other part of the body other than the eyes or face (e.g., the arms, legs, or torso) is not considered as looking at the peer. The behavior is not counted if the target participant looks at a peer while the peer is speaking, but then directs their attention to another object, area of the room, or part of the body before three seconds have elapsed. An instance of eye contact lasting at least three seconds is counted as one instance of the behavior. Eye contact
lasting longer than three seconds is still be considered one instance of eye contact. The behavior is considered complete once the participant looks away or attends to another part of the individual’s person.

2) *Imitation*. Imitation is defined as the participant observing and replicating a demonstrated behavior that is appropriate to the social context of the situation. Imitative behaviors that further play, conversation, or interaction with a peer, group leader, or interventionist should be counted. Any maladaptive behavior, such as imitating a peer pounding his or her fists on the table or engaging in self-injurious behavior, is not counted. Ambiguous behaviors should not be calculated. Examples of imitation are included below.

a. The leader claps his/her hands and looks in the general direction of the participant. If he or she claps in response, one instance of imitation is recorded.

b. If the researcher hits the rhythm sticks together, a participant who hits his/her rhythm sticks together would be engaging in imitation. Therefore, one instance of imitation would be recorded.

c. A verbal request to imitate a demonstrated behavior that results in the participant repeating the behavior should be counted as one instance of imitation. For example, if the interventionist requests all participants sit down, while also demonstrating sitting down, compliance with the request should be considered one instance of imitation. If the interventionist requested the participants sit down, but did not demonstrate the behavior, it would not be counted, regardless of whether or not the participant engaged in the behavior.

d. A peer playing with an instrument who looks in the face or eyes of another participant in an attempt to encourage him/her to play their instrument would be
considered an attempt at imitation from a peer. If the participant shakes their instrument, demonstrating the behavior of a peer, one instance of imitation should be calculated.

e. A verbal prompt from a peer requesting another participant to engage in a particular behavior that is given in conjunction with a physical demonstration of the task would be considered imitation.

f. If a leader or a peer is making a face (i.e., grimace, sticking his/her tongue out) or is engaging in an action, such as pretending to look through a magnifying glass, and the participant imitates this behavior, one instance of imitation is counted.

g. If the target participant engages in behavior that leads another individual to engage in imitation, this behavior will not be counted toward imitation. Behaviors considered imitation should only be the target participant’s responses to the behavioral initiations of another individual.

3) **Smiling.** Smiling is defined as an individual’s lips moving upward and appearing happy in response to a social interaction or activity. Smiling may be in response to an interaction initiated by a peer, group leader, or interventionist. It also will be considered an instance of smiling if the participant smiles in response to an activity occurring during the intervention session. For example, a child who enjoys a song may smile when the song is sung, but not direct the smile towards an individual. Although the participant is not directing the smile toward another individual, the social context of the situation elicited the smile; therefore, one instance of smiling would be counted. A participant is considered to be no longer smiling when his or her lips/mouth is in a neutral position.
Research Questions

1) Do musically adapted social stories increase eye contact, smiling, and imitation behaviors in individuals with ASD participating in a 9-week community art, music, and dance program designed specifically for individuals with ASD and other developmental disabilities when compared to individuals with ASD who do not receive the musically adapted social stories intervention?

2) What can be done to increase efficacy of a musically adapted social stories intervention?
Chapter IV

Results

This chapter presents the results of each participant following their participation in either a music based program. Two of the four individuals participated in a musically adapted social stories intervention, while the other two participants were exposed to a music program without musically adapted social stories. For each of the participants, basic demographic information and a behavior profile are provided. The target behaviors and the intervention procedures for the experimental treatment group and the control group are discussed. Additionally, data collection procedures, data, and results are discussed. Identifying information, including names and locations, were altered in order to maintain confidentiality.

**Target Behaviors**

Target behaviors included eye contact, imitation, and smiling. Eye contact was defined as looking at the face or in the eyes of a peer, the interventionist, or a group leader for at least three seconds while that individual was speaking. Imitation was defined as the participant replicating an observed behavior that was socially appropriate. Each time the participant replicated a behavior demonstrated by the interventionist, a peer, or a group leader, an instance of imitation was noted. Smiling was defined as the participant’s lips moving upward and appearing happy as a result of engaging in a social interaction or activity.

**Setting Information**

Participants in the control and experimental groups engaged in the theater and dance portions of the community program together. During the music portion of the program, participants were split into two groups, the control and experimental groups. Both music groups
were conducted in classrooms at a Midwestern university. Participants sat or stood on the floor and desks and tables were at the sides of the room.

Control Group

The activities in the music room included watching short video clips of the songs, singing as a group, singing individually, engaging in simple movement activities, and playing instruments, such as the rhythm sticks. Activities took place in a classroom and participants typically sat or stood on the floor. Desks and chairs were pushed to the sides of the room. Each participant had a college-aged buddy who led participants to each activity and assisted during rotations as needed.

Experimental Group

The anticipated schedule involved singing each social story one line at a time and having participants repeat each line. After repeating the song line-by-line, participants were to sing through the story and engage in the anticipated motions for each song. Recall that one advantage of single-case design is the ability to analyze the data visually throughout the intervention to determine whether or not changes need to be made from session to session (Kratchowill et al., 2014). During the baseline sessions, it became apparent that standing and singing each song in this routinized manner would not be engaging enough for many of the participants in the room. In addition, as this intervention occurred within the context of an overarching program that culminated in a stage performance, the needs and expectations of the participants in conjunction with the needs of the program dictated alterations to the anticipated schedule. Therefore, while all songs and corresponding motions remained consistent, the activities participants engaged in varied by sessions.
Activities in the music room included singing social stories, engaging in movement activities, playing egg shakers and rhythm sticks, and engaging in simple social interactions with one another. The first social story, The Steps Song, will be referred to as song one. The second social story, Happy, will be referred to as song two. The third social story, How to Tell if Someone is Happy, will be referred to as song three. Each participant was paired with a college-aged buddy who assisted during rotations as needed and directed participants to each rotation. A description of each of the music sessions in the experimental group follows.

Table B

Session Activities

<table>
<thead>
<tr>
<th>Session Number</th>
<th>Review of Activities</th>
</tr>
</thead>
</table>
| Baseline       | Repeat after me style songs  
|                | Kodaly hand sign  
|                | Happy/sad face (shake egg shakers high/low) |
| Intervention 1 | Vocal warm-ups  
|                | S1: Introduced motions and had them repeat  
|                | S2: Shake egg shaker when you hear the word ‘happy’  
|                | S3: Imitate rhythm patterns while interventionist says/sings words |
| Intervention 2 | S1: Reviewed social story picture cards for the song; repeated words & motions line by line; acted out steps with others in the room  
|                | S2: Shake egg when you hear ‘happy’  
|                | S3: Held magnifying glass to different parts of the face used to tell if someone is happy |
| Intervention 3 | Facial warm-ups  
|                | S1: Reviewed steps; listened to song  
|                | S2: Practiced different things people might do when happy; copy buddy’s move during song  
|                | S3: Sang through with motions |
| Intervention 4 | S1: Reviewed steps without music & then with music  
|                | S2: Shake egg shakers when you hear the word ‘happy’; do different moves you might do when happy during song  
|                | S3: Sang through with motions |
| Intervention 5 | Facial warm-ups  
|                | S1: Sang & motions without music; sang & motions with recording; earned sticker for showing at least one step to buddy  
|                | S2: Worked on motions for a specific section of the song; did different moves someone might do when happy with recording  
|                | S3: Sang through with motions |
| Intervention 6 | S1: Sang & motions; earned sticker for showing at least two steps to buddy  
|                | S2: Intervener and participants had a chance to be ‘leader’ and others repeated the leader  
|                | S3: Sang through with motions  
|                | Ask another person their favorite color |
| Reversal       | Learned a new song and motions with program director |

*Note. Steps Song = S1; Happy = S2; How to Tell if Someone is Happy = S3*
Baseline Session

The baseline session included about 20 minutes of musical activities. Participants were encouraged to engage in imitation through “repeat after me” style camp songs involving the repetition of both words and motions. Additionally, participants were given the opportunity to use egg shakers and rhythm sticks. Activities included copying simple rhythm patterns, following one another’s rhythm patterns, and shaking their egg shakers to a song without having to follow a specific rhythmic pattern. Songs did not include themes about social concepts, but did provide opportunities for the participants to look at the interventionist and their college-aged buddy and also engage in imitation. Participants were also taught Kodaly hand signs for Do, Re, Mi, and So during the baseline phase (Jeter, 2014). Participants were asked to copy the hand signs and sing along with the interventionist.

One activity had a theme related to emotional visual recognition. Participants were given egg shakers and asked to raise them up high when the interventionist held up a picture with a happy face and shake them down low when the interventionist held up a picture with a sad face. This same exercise was repeated with high and low notes (shaking the eggs up high when participants heard higher notes and shaking the eggs down low when they heard lower notes) and with major and minor chords (shaking the eggs up high when participants heard major chords and shaking the eggs down low when they heard minor chords).

Intervention Session One

During the first session of the intervention, participants were first asked to repeat actions to warm up their bodies and voices. Next, participants were shown pictures related to the first social story. Pictures of a grocery store, zoo, fast food restaurant, and the library were shown and it was described that participants may see someone they know at any one of these locations.
Then, the steps for greeting someone you know (outlined in song one) were reviewed. Each step had a corresponding picture. Four individuals had the opportunity to put up the number that corresponded with each step. The song was played and participants were prompted to imitate the motions corresponding with each song.

Egg shakers were passed out and each participant was asked to shake their egg shakers up high each time they heard the word “happy” in song two. It was reviewed that it is important to show people when you are happy. The interventionist provided prompting and guidance to help the participants know when to shake their egg shakers up high.

Lastly, rhythm sticks were passed out and participants were asked to repeat the phrases and rhythm patterns of song three.

On this particular day, the volume level of the participants was very high and not all participants were remaining on task. Many required redirection frequently. During the baseline sessions, the interventionist used a portable CD player to play the music. Therefore, the sound was coming only from the speakers on the CD player at the front of the room. During this intervention session, the interventionist used the speaker system in the room instead of the portable CD player. The music was playing from two large speakers on one wall of the room. This seemed to make it more difficult to for participants to hear. Therefore, the interventionist decided that in the future the portable CD player would be used exclusively to play music, as it was decided it allowed for better sound control and provided a superior audio experience for the participants.

*Intervention Session Two*

The session began by looking again at the social story cards for song one. Buddies held the cards up for the participants. The interventionist sang the song line-by-line and requested the
participants repeat the motions. After singing each step, the participants were prompted to engage in the step. For example, they were asked to smile, wave, and ask, “How are you?” to different people in the room. Next, the recording of the song was played and participants were prompted to complete each step. Buddies held up the social story cards for their buddy to see.

Next, participants were prompted to repeat the lines of song three with motions after the interventionist. No particular explanations were given, but participants sang the song together well. At the end of the session, participants were given magnifying glasses for an activity with the third social story. Participants were prompted to put the magnifying glass up to their eye, mouth, and ear depending on the lyrics of the song. Moving the magnifying glass to different parts of the face represented the different ways people can tell if someone is happy.

Then, the participants were asked to sit and egg shakers were handed out to do activities with song two. The CD was played and participants were asked to shake their egg shakers up high every time they heard the word happy.

Throughout the session, the participants were highly engaged and the overall noise level in the room was appropriate. Visual scanning of the room revealed many of the program participants were making appropriate eye contact. Many of the individuals in the room were observed to attempt to gain the interventionist’s attention, as noted by the interventionist during the session.

*Intervention Session Three*

The session began with facial warm-ups typical during vocal music instruction, as facial expression is very important to the intervention. Participants were asked to make a happy face, sad face, scrunch up their face, surprised face, angry face, and fish face.
The picture cards with the steps for song one were passed out to buddies to show to the participants as the song played. Prior to playing the CD, the participants were prompted to see if they remembered what each card meant. After saying what each card meant, participants were asked to imitate each step. The recording of the song was played. Each participant had a college-aged buddy who stood near them and assisted as necessary during the intervention. Buddies assisted during the music intervention by holding up the prompt cards for each step. As the buddies held up prompt cards, the interventionist provided verbal directions to the participants.

Prior to listening to song two, participants were told, “I’m going to ask you to do some different things you might do when you’re happy.” Participants practiced clapping, waving, jumping, dancing, smiling, nodding, giving high fives, pretending to laugh, walking proudly, and giving a thumbs up without music. Song two was played and the interventionist called out different moves for them to do from the list of aforementioned behaviors. Part of the song was then played and the participants were asked to copy the moves their buddy performed.

Next, song three was sung. Participants appeared to enjoy singing this song, characterized by increased participation and attention to the interventionist.

The activities of the day required high amounts of movement. Some participants were able to keep up with the intensity of the activity and others found it more challenging. Because of this, additional lower intensity activities (i.e., activities involving sitting) were incorporated into the next intervention session.

*Intervention Session Four*

The interventionist put X’s in masking tape on the floor to help direct the participants to particular areas of the room. During the previous sessions, the music rotation was first for these participants. However, the schedule was changed and the participants went to their dance
rotation prior to coming to music. The change in the order of the schedule was made by the program directors. A few of the participants began the session lying on the floor. To accommodate for the lower energy level, participants were asked to sit down first. Extra prompting was required for some participants who were typically very engaged in the musical experience.

Cards with the steps were given to the buddies for song one. Participants were shown large cards with each of the steps and asked if they remembered what each one meant. Then, each participant was prompted to engage in the steps. The recording of the song was played and the interventionist prompted the participants to engage in the movements corresponding to each step. Because of the lower energy level, all of the previously described activities occurred from a seated position.

Next, participants sang song three standing up. Participants generally did a good job following along with the content.

Participants sat on the floor again and were given egg shakers. They were asked to shake their egg shakes up high every time they heard the word happy during the second social story. Then, participants were asked to say what makes them happy. Song two was played and participants were prompted to engage in the movements done in the previous session that a person might do when they are happy (i.e., smiling, jumping, clapping, thumbs up, dancing, etc.).

To finish the day, participants sang the steps song again. Only the interventionist had the picture cues and showed them to the participants. Although the students were tired, sitting on the floor and slowly increasing the expectations during the session appeared to help most of the participants begin to participate. One of the participants in the treatment group went from a lying to a sitting position, but otherwise, did not partake in the activities of the day.
Musically Adapted Social Stories

**Intervention Session Five**

Again, X’s were placed on the floor with masking tape and participants were asked to find an X and sit down. The session began with facial warm ups including making a scared, excited, proud, happy, sad, and angry face.

Next, participants sang through song one without the CD (still sitting). Participation was high during this activity. Then, the participants were asked to stand and sing through the steps with the recording.

Participants remained standing and the interventionist sang through the “I may be happy” lines of song two. The participants were prompted to do the motions and think of games they enjoy playing. As in previous sessions, participants were asked to jump, clap, give high-fives, give a thumbs up, smile, and dance while the song played. Participants did an excellent job of doing the motions and were very engaged in the situation.

Then, participants were asked to sit. The participants were prompted to sing through song three. James, one of the study participants who typically did not engage actively in the sessions repeated one of the lines of the song. This is the first time he spontaneously provided verbal repetition. Typically, he required repeated prompting.

To finish the day, participants sang the steps song again. Prior to singing the song, participants were told if they showed their buddy one of the steps, they could earn a sticker. Every participant was able to complete at least one step and earned a sticker.

Overall, the participants were actively engaged in the lesson and participated actively. The order of the rotations was changed again and the participants engaged in the music rotation last. Therefore, the interventionist was concerned the participants may be tired once they reached
the music session. However, the participants did not appear to be fatigued and were able to engage appropriately with the content.

*Intervention Session Six*

The session began by standing and singing song two. Participants were given the choice between rhythm sticks and egg shakers and encouraged to follow the leader and do the “happy” moves. A few of the participants also took a turn leading the group.

Next, the participants sat down and sang song one. They were told that they would receive a sticker if they successfully completed two of the steps. All of the participants earned a sticker.

Then, the participants stood and sang song three. The participants did this well. The participants were encouraged to talk to someone near them and ask them their favorite color. Some prompting was required for the participants. One of the participants in the study answered rather than asked the question and required more prompting. To finish the session, participants sang the steps song again standing up.

*Reversal Session*

During the final session, participants did not have a music rotation. Rather, groups practiced different components that would be a part of the show. Therefore, participants in both the control and experimental groups did theater, dance, and music activities together. All participants learned the lyrics and movements to a new song. Participants were prompted to engage in certain movements that accompanied the song lyrics. Individuals were selected to sing solo lines for the performance.
### Table C

**Participant Descriptions**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Participant group</th>
<th>Gender</th>
<th>Ethnicity</th>
<th>Age</th>
<th>Who gave ASD diagnosis</th>
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<tbody>
<tr>
<td>Ben</td>
<td>Control</td>
<td>Male</td>
<td>Caucasian</td>
<td>8</td>
<td>Clinical Psychologist</td>
</tr>
<tr>
<td>Caleb</td>
<td>Control</td>
<td>Male</td>
<td>Caucasian</td>
<td>8</td>
<td>Clinical Psychologist</td>
</tr>
<tr>
<td>Tommy</td>
<td>Experimental</td>
<td>Male</td>
<td>Caucasian</td>
<td>9</td>
<td>Clinical Psychologist</td>
</tr>
<tr>
<td>James</td>
<td>Experimental</td>
<td>Male</td>
<td>Caucasian</td>
<td>12</td>
<td>Physician</td>
</tr>
</tbody>
</table>

#### Control Participant 1: Ben

**Demographic and Behavioral Information**

The first participant, “Ben” (not his real name), was an eight-year-old Caucasian male diagnosed with ASD by a clinical psychologist. Parent ratings on the SSIS and the Participant Behavior Checklist indicated Ben is cooperative and able to stay calm and resolve disagreements in an age-appropriate manner. Ben has difficulty communicating effectively with others, exhibited through impaired eye contact, nonverbal communication, and verbal communication. Lastly, parent ratings indicated Ben may have challenges with attention. During the sessions, Ben was generally engaged in the activities and was described by the data collectors as cheery, full of energy, and excited to participate. He was able to communicate effectively with his buddy and his peers and attempted to initiate play and interaction with others. Ben was able to and did participate in the activities in the music room when prompted to do so. He was occasionally distracted during sessions, characterized by looking at or attempting to engage with his college-aged buddy, rather than observe the leader of the group. However, generally he was very engaged in the music activities, volunteered to answer questions, and was motivated to learn his lyrics and interact appropriately.
Control Participant 2: Caleb

Demographic and Behavioral Information

The second participant, “Caleb,” was an eight-year-old Caucasian male diagnosed with autism spectrum disorder by a clinical psychologist. Parent ratings on the SSIS and the Participant Behavior Checklist indicated Caleb is cooperative. Ratings indicated Caleb has difficulty communicating effectively with others, exhibited through impaired eye contact, nonverbal communication, and verbal communication. Additionally, parent ratings indicated Caleb may have challenges with attention. Typically, Caleb wore headphones during music time and would position himself away from others in the group. For example, he often would look out the window, sit in the back, or lay down, rather than actively participate in the activities occurring in the room. He would become more animated when he had the opportunity to work with particular peers or sing particular songs, characterized by smiling, making eye contact, and engaging more actively in the content. A lack of effective prompting from his buddy and/or leaders in the music room may have contributed to Caleb’s lower level of engagement. For example, Caleb may not have been prompted to engage in the activities. He may not have been physically directed to engage in any of the activities, but only verbally prompted to engage in the tasks. Caleb was able to communicate effectively with others.

Experimental Group Participant 1: Tommy

Demographic and Behavioral Information

“Tommy” was a nine-year-old Caucasian male diagnosed with autism spectrum disorder by a clinical psychologist. Parent ratings on the SSIS and the Participant Behavior Checklist indicated Tommy does not have significant challenges with communication. Tommy may not always make appropriate eye contact with others or engage in joint attention behaviors
as expected. Tommy actively participated in the experiences in the music intervention. Generally, Tommy would look at the interventionist and engage in requested tasks without prompting. During one or two of the sessions, Tommy appeared tired, characterized by putting his head in his hands and looking down rather than looking at the interventionist. However, Tommy would typically begin to participate when prompted by either the interventionist or his buddy, even when he was tired. He approached the music experience rather seriously, meaning he was very attentive, but did not initially express how he was feeling on his face. As the experience continued, Tommy became increasingly expressive with his face, although he sometimes required prompting to do so. Throughout the phases, Tommy was engaged, followed directions, and participated actively.

**Experimental Group Participant 2: James**

*Demographic and Behavioral Information*

The fourth participant, “James”, was a 12-year-old Caucasian male who was diagnosed with autism spectrum disorder by a physician. Parent ratings on the SSIS and the Participant Behavior Checklist indicated James is cooperative and has an age-appropriate level of self-control. Ratings indicated James has difficulty communicating effectively with others, exhibited through impaired eye contact, nonverbal communication, and verbal communication. James often engages in echolalia and stereotypical motor behavior. James had more limited verbal communication, but was able to respond and ask questions with prompting. James’ participation increased when his college buddy and/or the interventionist would prompt him directly to engage in the tasks. At times, particularly when the group had been at another rotation prior to music, James would enter the music room tired, characterized by sitting or lying on the floor or making statements, such as “I can’t” when asked to engage in a particular activity. James often smiled
and watched others participate in the musical experiences. He was able to repeat phrases that were part of the intervention with prompting. For example, the participants were prompted to say hello and ask another participant “How are you.” When prompted, James was typically able to greet others successfully. Without prompting, James typically observed the activities of the group, but did not engage in physical imitation (i.e. put your hands up, jump, etc.) or eye contact. Variability in James’ data may be due to the amount of prompting he received from the interventionist and his college buddy. James did not always have the same buddy. The lack of consistency in the person working with him could also have contributed to variations in the data.

Data Collection Procedures

Five undergraduate students collected data throughout the nine weeks of the program. All data collectors utilized a frequency data collection procedure for the three target behaviors. Data were collected for a total of 10 minutes for each participant during each 20-minute intervention session. Additionally, data collectors were asked to make any relevant notes about the participant after the data were collected. For example, indicators of specific behavior, such as a lying on the floor or engaging in repetitive behaviors were noted.

After the observation was complete, the number of instances of each behavior was totaled and graphed by the data collectors. This was then checked by the author and entered into the computer. A graph was created for each participant for each behavior.

A stable baseline was not established for each of the participants due to the finite number of sessions available to conduct the intervention. Collecting data on more than one child within the groups also necessitated continuing to the intervention phase, rather than waiting for each participant to attain a stable baseline. Therefore, one week of baseline data was collected on each
participant, and regardless of whether or not a stable baseline was reached, the intervention began the next week of the program.

Results

A graph displaying the data intervention points in the baseline, intervention, and reversal phrases is present for each participant for each of the target behaviors. The method of visual analysis used in the present study was linear regression. Trend lines were created to demonstrate the relationship between time and the target behaviors to determine what, if any changes were visible. The slope of the trend line indicated whether there was an increase or decrease in the target behaviors over the course of the intervention. The percentage of non-overlapping data, the mean, and the mode also were utilized to further evaluate the results.

Smiling

Table D

Frequency of Smiling Behavior

<table>
<thead>
<tr>
<th>Participant</th>
<th>B1 1</th>
<th>B1 2</th>
<th>I1 1</th>
<th>I1 2</th>
<th>I2 1</th>
<th>I2 2</th>
<th>I3 1</th>
<th>I3 2</th>
<th>I4 1</th>
<th>I4 2</th>
<th>I5 1</th>
<th>I5 2</th>
<th>I6 1</th>
<th>I6 2</th>
<th>G1 1</th>
<th>G1 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ben</td>
<td>3</td>
<td>2</td>
<td>13</td>
<td>7</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>12</td>
<td>4</td>
<td>8</td>
<td>6</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Caleb</td>
<td>2</td>
<td>0</td>
<td>--</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>11</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Tommy</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>6</td>
<td>7</td>
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<td>2</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td>5</td>
<td>2</td>
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<td>0</td>
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<tr>
<td>James</td>
<td>11</td>
<td>4</td>
<td>3</td>
<td>9</td>
<td>9</td>
<td>8</td>
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<td>6</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>12</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note. B = Baseline; I = Intervention; G = Generalization; first number denotes session number; second number denotes observation number during session.

Table D includes the number of instances smiling was recorded during each observation.

Figures 1.1, 1.2, 1.3, and 1.4 provide a visual representation of smiling behaviors exhibited throughout the intervention and Figures 1.5, 1.6, 1.7, and 1.8 include trend lines for smiling data.
Each individual participant’s performance is represented graphically as well as comparisons between participants in each group and between groups.

Figure 1.1 displays the frequency of smiling behavior for Ben, the first participant in the control group. While the number of instances of smiling varied greatly throughout the intervention, the frequency of smiling behaviors was greater than baseline during 75% of the observations. Additionally, the number of instances of smiling remained above baseline during the reversal observations. Figure 1.5 demonstrates a downward trend line \( m = -0.3182 \), indicating that throughout the intervention, Ben’s smiling behaviors decreased at a moderate rate. It should be noted that Ben displayed the highest number of smiling behaviors during the first observation of the intervention session. The mean number of smiles exhibited during the intervention session was 6.25 and the mode was eight. Because there does not appear to be a consistent pattern to Ben’s smiling behaviors, it is possible he found some of the music activities more engaging than others, impacting the number of smiles exhibited during each observation.
Figure 1.2 demonstrates that Caleb showed a relatively low level of smiling behaviors throughout the program, aside from one day when he displayed 11 instances of smiling. He typically displayed zero or one instance of smiling throughout all phases of the intervention and the mode was zero. The percentage of non-overlapping data is 36%. Figure 1.6 displays the moderate downward trend ($m = -0.3364$) in smiling behaviors displayed throughout the intervention. It should be noted that the spike in smiling behaviors towards the beginning of the assessment may have contributed to the downward slope in smiling behaviors.
The first participant in the experimental group, Tommy, exhibited a minimal positive rate of change in smiling behaviors \( (m = 0.0175) \) as a result of his participation in the musically adapted social stories intervention. During the baseline observations, Tommy exhibited a very low frequency of smiling behaviors. Observation notes indicated Tommy was highly engaged, but appeared to take the music session very seriously. The social stories specifically prompted the participants to engage in smiling and other social behaviors. The percentage of non-overlapping data between the baseline and intervention sessions was 67%. Additionally, his total number of smiling behaviors remained greater than zero for each of the intervention observations. The mode was one and the mean was 3.4 for the number of smiles produced during each observation. The trend line in Figure 1.7 reveals a slightly upward slope in smiling behaviors, further supporting the intervention appeared to increase his smiling behaviors somewhat. During the reversal sessions, Tommy’s smiling behavior returned to zero.
As shown in Figure 1.4, the frequency of James’s smiling was in the same range as in the baseline observations during eight of the 12 treatment observations. On one occasion, James engaged in more instances of smiling during an observation session than observed during the baseline observation session where he exhibited the greatest number of smiles. Therefore, the percentage of non-overlapping data is very low, at eight percent. He engaged in a high level of smiling behaviors during baseline, suggesting he “ceilinged out” in the number of instances of
smiling that would be expected during a five-minute observation that followed. The mean number of smiles exhibited by James during the intervention was 5.4. Three different numbers were the mode: Nine, five, and four. During two observations, James smiled nine times. He smiled five times during two other observations. He also smiled four times on two occasions. The average number of smiles, 5.4, appears to be an appropriate approximation of his smiling. Figure 1.8 demonstrates a downward trend line \( m = -0.1503 \), indicating that his smiling behaviors decreased at a moderate rate as the intervention progressed. As previously mentioned this downward trend may be explained, in part, by James “maxing out” on the number of smiles likely to be seen during the observation.
Figure 1.9 examines the trends for the control participants. Ben typically displayed a higher level of smiling behaviors than Caleb. There did not appear to be a pattern when comparing the number of smiles each participant exhibited. Differing levels of interest in the musical activities may have explain the varying results. A downward trend was evident for both participants, indicating that participation in musical activities did not increase the number of smiles exhibited. This downward trend may be attributed to an initial feeling of excitement related to the new activities and experiencing a different environment that waned as the intervention continued, otherwise known as the Hawthorne effect (Colman, 2015).
Figure 1.10 demonstrates the trends for the participants in the experimental group. Tommy displayed an increase in smiling behaviors, whereas James displayed a slight downward trend in the number of smiling behaviors observed. While the specific prompting that occurred during the intervention appeared to be helpful to Tommy, it did not appear to have the same effect on James. Therefore, it cannot be determined whether exposure to the musically adapted social stories or simply Tommy’s overall interest in the music activities contributed to the increase in his smiling behaviors.
Figure 1.11 displays the trends for smiling exhibited by Ben from the control group and Tommy from the experimental group. These two individuals displayed a similar level of functioning and similar levels of engagement during the music program. Ben exhibited a decline in smiling behaviors, while an upward trend was present for Tommy. This indicates that the explicit prompting to smile present in the experimental group may help higher functioning individuals increase this behavior. Figure 1.12 displays the trends for smiling behavior exhibited by Caleb from the control group and Tommy from the experimental group. These two individuals displayed lower engagement overall during the program and downward trends were evident in the frequency of smiling behaviors for both individuals.
Table E outlines the instances of imitation for each of the participants. Figures 2.1, 2.2, 2.3, and 2.4 display all phases of the intervention while Figures 2.5, 2.6, 2.7, and 2.8 display the trend lines for each of the participants regarding instances of imitation.

Similarly to his presentation regarding smiling, Ben displayed variance throughout the sessions regarding imitation, as evidenced in Figure 2.1. His percentage of non-overlapping data
from the baseline to the intervention sessions was 58%. While the mode was two, he typically displayed a higher level of imitative behaviors than the mode implies. The mean for Ben’s intervention data was 7.6. About half of the data points fell above and about half of the data points fell below the mean, indicating it provides a relatively accurate picture of Ben’s average performance. However, the overall trend in imitation behaviors was downward at a moderate rate of change ($m = -0.1294$), as displayed in Figure 2.5. The instances of imitation were more frequent during the beginning and ending sessions of the intervention and lower in the middle sessions. The activities during the middle sessions may not have included as many opportunities to engage in imitation as the beginning and ending sessions.

![Ben Imitation Graph](image)
As is evident in Figure 2.2, Caleb did not engage in imitation during either baseline observation. He engaged in at least one instance of imitation during seven of the intervention sessions. Therefore, the number of instances of imitation were higher than baseline 64% of the time. Zero was the mode for Caleb’s imitative behaviors and there were four observation sessions where he did not engage in any imitation. He did not engage in any imitative behaviors during 36% of the observation sessions. The mean number of imitative behaviors was 1.27, which appears to be an appropriate representation of the data. The trend line, as shown in Figure 2.6, is relatively flat but negative ($m = -0.0545$). Unlike Ben, Caleb did not display higher levels of imitation during the beginning and ending sessions. Rather, his imitation fluctuated, but remained low (<5) during each observation. This could indicate Caleb was inconsistently engaged in the musical activities in the room.
During the first baseline observation, Tommy engaged in a high frequency of imitative behaviors, causing him to “ceiling out” on his instances of imitation. As can be seen in Figure 2.3, Tommy did not surpass the initial baseline frequency of imitation behaviors at any time during the intervention or reversal sessions. Sixty-seven percent of the data point fell between the two baseline data points, indicating he engaged in similar levels of imitation throughout the
course of the intervention. The mean number of imitations Tommy exhibited during the intervention was 24.9 and a little over half of the data points during the intervention phrase fell above the mean. The number of instances of imitation was lowest during the first reversal observation, however, the second data point fell within the expected range. It appeared Tommy engaged in a similar number of imitative behaviors throughout the intervention. The trend line in Figure 2.7 indicates there was a decline in the number of imitative behaviors throughout the course of the intervention and the rate of change was moderate ($m = -0.4371$). He displayed a lower number of imitative behaviors during some of the later sessions of the intervention, which may have contributed to the downward slope. Although there was a downward slope in the number of imitative behaviors, the number of imitative behaviors fell within a similar range throughout the course of the intervention.
As is evidenced in Figure 2.4, James displayed a relatively low level of imitative behaviors overall. His percentage of non-overlapping data from baseline to intervention was 41.7%. The mean number of imitative behaviors exhibited by James during the intervention was 4.9 and the mode was four. During the reversal phase, the frequency of imitation remained at or above baseline. The trend line in Figure 2.8 demonstrates an increase in imitative behaviors as the intervention progressed and the rate of change was moderate ($m = 0.2972$). Aside from displaying no imitative behaviors on the eighth observation, the number of imitative behaviors appeared to increase consistently throughout the intervention. Participation in the intervention appeared to increase James’ imitative behaviors, even when the musically adapted social stories were withdrawn.
Figure 2.9 shows that for the participants in the control group, there was little change overall in the number of imitative behaviors. There was a slight decline in the number of imitative behaviors displayed by both Ben and Caleb over the course of the intervention. Therefore, it appears that engaging in music activities alone does not appear to result in changes in imitative behaviors.
Differences in the trends were evident for the participants in the experimental group regarding imitation, as evidenced in Figure 2.10. As previously mentioned, Tommy appeared to ‘ceiling out’ toward the beginning of the assessment, given he displayed a very high number of imitative behaviors. Therefore, while he still consistently engaged in relatively high levels of imitation, a downward slope was evident in the number of imitative behaviors displayed during the intervention. James, on the other hand, displayed a low number of imitative behaviors at the beginning of the intervention. As the intervention progressed, the number of imitative behaviors increased somewhat and an upward trend was evident. Participation in the musically adapted social skills group appeared to encourage imitation, although the amount of imitative behaviors exhibited varied between the two participants.
Figure 2.11 compares the trends for Ben and Tommy relative to imitative behaviors. Downward trends were present for both Ben and Tommy and both showed a dip in the number of imitative behaviors exhibited during the second half of the intervention observations. Figure 2.12 demonstrates the trends for Caleb and James in regards to imitative behaviors. While there was a slight downward trend in imitation behaviors for Caleb, an upward slope was present for James’ imitative behaviors. This indicates that the musically adapted social stories may help increase the frequency of imitation for individuals who are overall less engaged and who have lower skills initially.
Table F

*Frequency of Eye Contact*

| Participant | B2 | B2 | I1 | I1 | I2 | I2 | I3 | I3 | I4 | I4 | I5 | I5 | I6 | I6 | G1 | G1 |
|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Ben         | 2  | 1  | 8  | 7  | 1  | 4  | 5  | 1  | 0  | 0  | 0  | 1  | 10 | 2  | 6  | 6  |
| Caleb       | 5  | 1  | -- | 3  | 5  | 2  | 8  | 12 | 0  | 1  | 7  | 9  | 5  | 2  | 1  | 1  |
| Tommy       | 0  | 3  | 1  | 3  | 2  | 22 | 2  | 6  | 3  | 2  | 3  | 1  | 2  | 3  | 1  |
| James       | 0  | 0  | 0  | 0  | 0  | 0  | 9  | 4  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |

*Note.* B = Baseline; I = Intervention; G = Generalization; first number denotes session number; second number denotes observation number during session.

Table F outlines the instances of eye contact for each of the participants. Figures 3.1, 3.2, 3.3, and 3.4 display all phases of the intervention while Figures 3.5, 3.6, 3.7, and 3.8 display the trend lines for each of the participants regarding instances of eye contact.
Figure 3.1 demonstrates that the frequency of Ben’s eye contact behaviors was above baseline during 41.7% of the intervention observations. The number of instances of eye contact remained above baseline during the reversal phase of the intervention. He displayed higher levels of eye contact towards the beginning of the intervention, but eye contact reduced to zero for three observations in a row. The number of instances of eye contact again increased during the last two intervention observations. Therefore, while there was an overall moderate downward trend in eye contact ($m = -0.2622$), as evidenced in Figure 3.5, the overall instances of eye contact were in the same range as baseline or above baseline in 50% of the observations. Although he displayed an increase in eye contact behaviors, he most frequently did not make eye contact or only made one instance of eye contact during the observation sessions.
In Figure 3.2, it is apparent Caleb displayed a range in the frequency of eye contact behaviors throughout the phases of the program. The percentage of non-overlapping data from the baseline to the intervention phrase was relatively low at 36%. However, it should be noted Caleb displayed a relatively high number of eye contact behaviors during the baseline observations. During the first baseline observation, Caleb displayed five instances of eye contact; he displayed only one instance of eye contact during the second observation. Due to the broad range in the frequency of eye contact during the baseline sessions, the frequency of his eye contact fell below baseline during only one observation session of the intervention. His eye contact returned to be rather low during the reversal observation sessions. Figure 3.6 demonstrates a minimal upward trend in the instances of eye contact behavior for Caleb ($m = 0.0273$). Therefore, it appears that as the sessions progressed, Caleb was better able to make eye contact with others. Overall, the number of instances of eye contact were higher during the latter part of the intervention compared to the beginning sessions. Therefore, it appears that...
participation in the music program minimally improved Caleb’s ability to maintain eye contact with others.

Figure 3.2 demonstrates that Tommy displayed a low level of eye contact throughout all phrases of the intervention. The percentage of non-overlapping data was 16.7%. During one observation, Tommy displayed a much higher frequency of eye contact behavior. Figure 3.7
displays a moderate downward trend in the frequency of eye contact ($m = -0.3427$). However, this may be best attributed to the outlier in the data that occurred during one of the earlier intervention sessions. Removing the outlier from the data, the frequency of Tommy’s eye contact was relatively stable over time. The number of instances of eye contact during the reversal phase was a mirror image of the baseline phases. The mean of the intervention data was 4.2. However, he only displayed at or more than four instances of eye contact during two of the 12 observation sessions. Removing the outlier, the mean number of instances of eye contact was 2.5. Examining the data as a whole, the average without the outlier is much more indicative of Tommy’s overall performance, as about half of the data points fall above and below the mean. Additionally, the mode was three, further supporting that an average of 2.5 more accurately depicts what occurred during the sessions. Taking the outlier out of consideration, the total number of instances of eye contact was relatively consistent throughout all phases of the intervention.

![Tommy Eye Contact](image_url)
Figure 3.4 displays the number of eye contact behaviors exhibited by James. Aside from two intervention sessions, James did not make eye contact with others. As the spike in eye contact behaviors was near the middle of the intervention, an overall slight downward trend (m = -0.1084) with a moderate rate of change was present, as exhibited in Figure 3.8. It is possible he was receiving more direct one-on-one prompting during the two observation sessions where higher instances of eye contact were observed.
As demonstrated in Figure 3.9, the participants in the control group displayed opposite trends in the frequency of eye contact behaviors. While there was a downward trend in the frequency of Ben’s eye contact behaviors, Caleb displayed an upward trend in the number of eye contact behaviors exhibited.

In Figure 3.10, a downward trend was evident for both Tommy and James regarding the frequency of eye contact. Again taking the outlier into consideration and the overall low level of eye contact behaviors exhibited by Tommy and the few instances of eye contact exhibited by
James, participation in the musically adapted social stories intervention did not appear to make a significant impact on the frequency of eye contact.

![Experimental Group Eye Contact](image)

Downward trends in eye contact were present for both Ben and Tommy, as demonstrated in Figure 3.11. In Figure 3.12, an upward trend in eye contact was evident for Caleb, whereas a downward trend was evident for James. The presence of the intervention did not appear to increase eye contact behaviors.
Table G

<table>
<thead>
<tr>
<th>Participant</th>
<th>Smiling</th>
<th>Imitation</th>
<th>Eye Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ben</td>
<td>-0.3182</td>
<td>-0.1294</td>
<td>-0.2622</td>
</tr>
<tr>
<td>Caleb</td>
<td>-0.3364</td>
<td>-0.0545</td>
<td>0.0273</td>
</tr>
<tr>
<td>Tommy</td>
<td>0.0175</td>
<td>-0.4371</td>
<td>-0.3427</td>
</tr>
<tr>
<td>James</td>
<td>-0.1503</td>
<td>0.2972</td>
<td>-0.1084</td>
</tr>
</tbody>
</table>

Chapter Summary

The four participants included in the study were divided into two groups. Two of the participants were exposed to musically adapted social stories and two of the participants engaged in musical activities without social stories. All four participants were Caucasian males; two were eight years old, one participant was nine years old, and the last participant was 12 years old. While the participants in the control group engaged in different musical activities throughout the entirety of the program, individuals in the experimental group participated in six weeks of intervention including the musically adapted social stories. In the experimental group, one of the participants was consistently engaged in the activities. The other participant typically required additional prompting in order to participate actively. Similarly, in the control group, while one of the participants was typically actively engaged, the second participant often stayed on the periphery and did not actively participate in the musical activities.

Regarding smiling behaviors, a downward trend was observed for both participants in the control group. The number of instances of smiling was above baseline 75% of the time for Ben whereas the percentage of non-overlapping data was 36% for Caleb. Ben displayed the highest frequency of smiling behaviors during the first intervention session, which may explain the downward trend observed. Overall, Caleb displayed a very low number of smiling behaviors. Comparing the participants in the control group, there did not appear to be a pattern, indicating
the participants may have been interested in different musical activities. In the experimental group, Tommy displayed an upward trend in smiling behavior. However, the increase in smiling behaviors observed was minimal. The percentage of non-overlapping data was 67% for Tommy. Unlike Tommy, James displayed a slightly downward trend in smiling behaviors. He appeared to “ceiling out” during the beginning of the intervention, resulting in a downward trend. Given the mixed results seen in the experimental group, it cannot be determined whether the increase seen in James’s smiling behaviors was due to participation in the musically adapted social stories or due to other factors.

The frequency of imitative behaviors was recorded during the study. A moderate downward trend was observed regarding Ben’s imitative behaviors and the percentage of non-overlapping data was 58%. Caleb displayed a minimal downward trend. He did not engage in imitation during the baseline or reversal phases. He engaged in at least one instance of imitation during 64% of the intervention sessions. Comparing the two participants, the rate of change was slight for both. Tommy displayed a very high number of imitative behaviors during baseline, suggesting he “ceilinged out.” Because he displayed such a high number of imitative behaviors during baseline, the percentage of non-overlapping data was zero. The frequency of imitative behaviors exhibited by James was rather low overall. The number of imitative behaviors increased moderately during the intervention. Although Tommy displayed the highest frequency of imitation during one of the baseline observations, he engaged in high levels of imitation throughout. This, in combination with the upward trend in imitation for James, suggests the intervention may encourage participants to engage in imitation. Comparing participants in the control and experimental group, it appears the musically adapted social stories may be beneficial for individuals who are less engaged overall.
Lastly, instances of eye contact were recorded. A moderate downward trend was observed for Ben, while a minimal upward trend was observed for Caleb. The frequency of eye contact was above baseline 41.7% of the time for Ben and 36% of the time for Caleb. The percentage of non-overlapping data was relatively low for both participants in the control group, indicating participating in musical activities was not particularly beneficial in increasing eye contact. The increase in Caleb’s eye contact during the latter part of the intervention may be explained by his increasing comfortability in the environment. Downward trends in the frequency of eye contact were also observed for both participants in the experimental group. While a moderate downward trend were observed for both Tommy and James The percentage of non-overlapping data was very low for both participants. Overall, participating in music activities and exposure to the musically adapted social stories did not appear to increase eye contact.

There were no notable differences present between the control and experimental groups. When upward trends existed for one participant, the other participants presented with downward trends. Therefore, one cannot conclude the results seen were the result of participation in either the musical programming or the musically adapted social stories intervention. Although the results were inconclusive, this study serves as a pilot study to guide future research in this area. Considerations for future research of this nature will be discussed in chapter five.
Chapter V
Discussion

This chapter reviews the rationale for this study and the research questions. A summary of the results for each of the participants is included. Limitations to the present study and considerations for future research also are discussed.

Review of Rationale

This study investigated using musically adapted social stories to teach social skills to individuals with autism spectrum disorder. Social narratives, or “Narratives that describe social situations in some detail by highlighting relevant cues and offering examples of appropriate responding” are an evidence-based practice (Wong et al., 2013). In addition, social stories are widely used in intervention to support individuals with ASD (Hutchins, 2012) and utilize the principles of social narratives. Music interventions in general, as well as music interventions using musically adapted social stories, have not been identified as evidence-based. The current study sought to further investigate the effectiveness of utilizing musically adapted social stories to build social skills in individuals with ASD and to indicate the validity, usefulness, and practical implications of this type of intervention. The behaviors targeted in the intervention included smiling, eye contact, and imitation. One objective of the present study was to determine if using musically adapted social stories in intervention would increase the occurrence of targeted behaviors.

Another objective of the present study was to define potential challenges that may arise when conducting a study of this nature and practical ways to address these concerns when completing similar studies in the future. When implementing an intervention, unforeseeable
challenges are bound to occur. As few interventions of this nature have been conducted, the present study provides beneficial information to inform future studies. Additionally, as this is an emerging area of research, this study aimed to outline the practical concerns associated with conducting a music intervention to provide guidance for future studies.

Summary of Results

Participants in both the control and experimental groups displayed mixed results from participating in the community based fine arts program and participating in the musically adapted social stories intervention. Of interest was the pattern of behavioral change throughout the course of the music program. The author examined changes in the target behaviors over time and the strength of changes observed. As this is an emerging area of research, the current study should be considered a pilot study. Therefore, the results should be interpreted with caution. In the future, similar studies must be conducted in order to ascertain more conclusive information regarding the use of musically adapted social stories in intervention to build social skills. The possible conclusions of this study will be examined and recommendations to guide future research will be included.

Regarding smiling behavior, the control group participants, Ben and Caleb, exhibited downward trends. One of the participants in the experimental group, James, also displayed a downward trend. A slight upward trend in smiling was demonstrated by Tommy. In terms of imitation, Ben, Caleb, and Tommy demonstrated downward trends. James displayed an increase in imitation. Lastly, Ben, Tommy, and James displayed downward trends in eye contact behavior, while Caleb displayed an upward trend in this behavior. The results reveal that participation in the musically adapted social stories intervention produced an increase in one of the target behaviors for each participant. However, the participants in the experimental group did
not display growth on the same target behavior. Therefore, it cannot be ascertained whether the positive results were directly related to participation in the music intervention or due to other extraneous factors.

Discussion of Results

The first participant in the control group, Ben, was an eight-year-old Caucasian male. Parent ratings indicated he has difficulty communicating effectively with others, exhibited by both verbal and nonverbal deficits. Behavioral observations noted by the data collectors indicated he was typically very engaged, followed directions, and participated appropriately. Overall, Ben displayed decreases in the target behaviors throughout the course of his involvement in the music program. However, further examination of the data revealed Ben often displayed vast fluctuations in the frequency of the target behaviors. When examining all of Ben’s graphs together, he displayed a relatively stable trend in the number of behaviors exhibited. Further examination of the behavioral notes indicated that during two of the observation sessions where lower behaviors were exhibited, Ben was participating in less interactive and directed activities. For example, the group watched a short video and were sorting lyrics during the observation. During one of the observations, Ben was actively participating with the group, but was focused on looking at the lyrics on his paper, rather than interacting with his peers. During observations with higher instances of the target behaviors, the data collector noted he enjoyed the session, volunteered to answer questions, and appeared excited to participate. The downward trend in the data may be better explained by the activities in the room, rather than his level of engagement or interest in participating. Although Ben did not appear to make progress on any of the target skills, he appeared interested and engaged in the music activities. Because of his
functioning level and interest in music, Ben would likely be an appropriate participant for a music-based intervention with multiple opportunities to engage in target behaviors.

The second participant in the control group, Caleb, was an eight-year-old Caucasian male. Parent ratings on the SSIS indicated he has difficulty with both verbal and nonverbal communication and challenges with attention. Although the data displayed fluctuations in Caleb’s performance, there did not appear to be patterns across behaviors to indicate environmental triggers, which may have altered his participation. Although downward trends were present in smiling and imitation, Caleb’s eye contact appeared to improve as his participation in the program continued at a minimal rate. For most days, Caleb’s participation level was low. His behavioral notes indicated he would often refuse to participate and attempted to escape the situation by moving away from the group, hiding under items, or sitting by himself. During the third intervention session, Caleb displayed higher levels of smiling and eye contact behavior. The behavioral notes indicated he was highly engaged and enthusiastic on this particular day. Regarding his eye contact, it was noted he often attempted to gain the attention of his college aged buddy and would often make eye contact with this individual. Overall, engaging in music activities did not appear to be particularly reinforcing for Caleb. When selecting interventions in the future, Caleb may achieve greater gains working one-on-one with a person he enjoys, engaging in activities with less sensory stimulation. Participating in the group music setting may not have been the most appropriate setting for Caleb in terms of building specific skills.

The first participant in the experimental group, Tommy, was a nine-year-old Caucasian male. Parent ratings indicated deficits in nonverbal communication. Tommy’s imitative behaviors remained relatively high throughout the intervention. While fluctuations in smiling
were indicated, his smiling was typically higher during the intervention compared to baseline. His amount of eye contact was relatively consistent throughout the intervention, with the exception of one observation, where his eye contact was rather high. Behavioral observations indicated he was generally very responsive, focused, and attentive during the sessions. He would frequently attempt to answer questions and remained engaged throughout the intervention session. The observational notes were similar for all of the sessions. During two of the observations, Tommy was noted to appear less engaged and tired. Although he did not appear as engaged, the frequency of the target behaviors remained high. It is unclear whether the small gains Tommy made in smiling were due to his involvement in the musically adapted social stories designed to build these skills or due to his increased comfortability with the leader and the intervention activities. However, because of his high level of engagement, interest in musical activities, and active participation, music intervention would likely be an appropriate avenue to help Tommy build skills. An environment in which he had opportunities to engage with peers with similar skill levels would likely help further spur his skills.

James, the second participant in the experimental group, was a 12-year-old Caucasian male. Parent ratings indicated he has difficulty communicating with others verbally and nonverbally. Behavior observations indicated James smiled often and it was noted when he did not smile as frequently. Overall, James displayed a decrease in smiling behaviors. It is possible high levels of smiling observed toward the beginning of the intervention were related to his interest in being in a new environment and engaging in new activities. As the intervention progressed and James became more accustomed to the environment and the activities, his interest and initial excitement may have waned. Aside from one observation, James appeared to display slow and steady increases in imitation. Observational notes indicate that during the observation
in which he did not engage in any imitation, he was lying on the floor with his buddy, uninterested in participating. He did not engage in eye contact unless specifically prompted. Providing additional prompting to James may have helped increase his performance on the target behaviors.

Limitations of the Study and Recommendations for Future Research

Due to the finite nature of the intervention, stable baselines could not be established for the participants. The same skills were targeted in each participant and participants received the same intervention, as it was presented in a group format. The limited number of intervention sessions and implementation of the intervention in a group format limited the practicality of reaching a stable baseline. Additionally, it would be unrealistic to assume all of the participants would reach a stable baseline at the same time.

To address the limitation of not reaching a stable baseline, other intervention designs could be utilized. For example, a multiple baseline design could be implemented. Multiple baseline study designs include at least three behaviors and the intervention is applied to each behavior consecutively. This study design is an appropriate way to collect data on behaviors in a group setting (Rudolph & Wendt, 2014). The study design in the current study was ABA. To further understand the impact of the intervention, future research may wish to include an additional treatment phrase and potentially an additional reversal phrase (Horner et al., 2005).

Eye contact was defined as the target participant looking at the face or in the eyes of their peer, the interventionist, or a group leader for at least three seconds while that individual is speaking. Eye contact had to be held for at least three seconds in order to be considered engaging in the target behavior. Eye contact held for longer than three seconds was still considered only
one instance of eye contact. The behavior was considered complete once the participant looked away.

While the definition of eye contact used in the study indicates that instances of eye contact have a social quality, using time as a measurement to indicate appropriate eye contact has limitations. Consider the Autism Diagnostic Observation Schedule, 2nd Edition, or the ADOS-2 (Lord, Rutter, DiLavore, Risi, Gotham, & Bishop, 2012). One of the key areas identified in this assessment is eye contact. To be considered appropriate eye contact, the individual must exhibit “appropriate gaze with subtle changes meshed with other communication.” Individuals who do not exhibit appropriate eye contact are described as using “poorly modulated eye contact to initiate, terminate, or regulate social interaction.” Considering this definition of appropriate eye contact, the behavioral definition outlined in this study is problematic. It is possible participants in the study made appropriate eye contact with others in a socially appropriate manner for fewer than three seconds. Other participants who held eye contact for three seconds or longer may have been engaging in staring behavior. In other words, eye contact may be poorly modulated. However, observation would indicate individuals who did not hold eye contact for three seconds were not making eye contact with others and it implies that individuals who engage in staring behavior are making appropriate eye contact on several instances. This suggests an inherent problem with using time as an indicator of the behavior, as it cannot account for the social quality of that behavior.

While considering the social quality of eye contact is valuable and important, social quality cannot be practically and operationally defined in a simple manner. It is especially challenging to identify the social quality of eye contact in a group setting, even when a person is only collecting data on one individual at a time. By definition, individuals with ASD will display
deficits in nonverbal communication, with many displaying deficits in eye contact (APA, 2013), making it relevant and valuable to target this behavior in intervention. However, it is important to understand the potential limitations and identify the ways in which data related to eye contact may be misleading. Future studies may wish to define appropriate eye contact using something other than time or further define an instance of eye contact by placing parameters on the length of time eye contact can be held in order to be considered an instance of this behavior. Outlining a minimum and maximum time limit for eye contact would account for individuals who hold eye contact for longer than considered normal. While time may not account for social quality, it is a feasible and practical method for collecting data on the frequency of eye contact.

While additional training for data collectors on what qualifies as socially appropriate eye contact may be beneficial, it may create other challenges. The social quality of eye contact is difficult to operationally define. Even with training, data collectors may not conceptualize socially appropriate eye contact in the same manner, leading to inconsistencies in the data. Increasing fidelity checks and using technology to record sessions could be beneficial in collecting data on eye contact taking social quality into account.

Imitation was defined as the participant observing and replicating a demonstrated behavior that was appropriate to the social context of the situation. Interactions that furthered play, interaction, and conversation were considered appropriate. Maladaptive behaviors, such as imitating a negative behavior exhibited by a peer, were not considered instances of imitation.

Each activity included movement and imitating the actions of peers and the interventionist. However, certain songs and activities involved higher levels of imitation than others. Observations occurred randomly during different portions of the intervention. Therefore, the number of opportunities to engage in imitation may have varied greater from session to
session. To address this incongruity, having observations of imitation occur during the same songs and activities during each intervention session would improve the consistency and validity of the results.

Comparing the frequency of imitated behaviors against the total number of opportunities offered to engage in the target behavior is another possible solution to this challenge. Although determining what percent of the time the participant engages in imitation is an appropriate solution, other challenges would result. It would be very challenging to tally the frequency of opportunities to imitate behavior while also recording the number of times the target participant engaged in the behavior. Furthermore, the definition of imitation in this study indicated that participants could imitate peers, leaders, or the interventionist. It would be very challenging to account for the number of times each participant had the opportunity to engage in imitation in a group setting. One possible solution would be to limit the number of individuals involved in the interaction. Conducting the music intervention with only two or three children and the interventionist would be more manageable. Another option available is limiting the calculation of imitation to the number of times the participant imitated the interventionist. Using a camera to record the interventionist or having one observer dedicated to observing the interventionist and tallying the number of opportunities the participants had to engage in imitation is another possible solution.

Smiling was defined as an individual’s lips moving upward and appearing happy in response to a social interaction or activity. Smiling did not have to be directed toward an individual in order to be counted. During the intervention, observers were advised to consider each participant’s “baseline” facial expression. This is important because some individuals may
have a resting face that is smiling. When this was the case, an instance of smiling was only to be counted if the child’s smile became bigger.

In this intervention, participants were explicitly asked to smile during certain songs. The interventionist often said things such as, “Show me your smile” as it fit within the song and activities. Although these instances were counted as smiling during the intervention, it is important to consider the potential caveats of this approach in interpretation. When the interventionist explicitly asks participants to smile and models this behavior, this could be viewed as an instance of imitation, rather than smiling. Therefore, it may be valuable to only consider instances of smiling without provocation in the total frequency count in future research.

While the method of observing each behavior individually presents with challenges, it is very important to consider the challenges of observing three behaviors simultaneously. A participant could potentially engage in all three behaviors at the same time, making it challenging for the observer to record the length of eye contact while simultaneously recording other behaviors. If it was decided that measuring the frequency of the observed behaviors against the total opportunities to engage in specific behaviors was the best method for recording imitation, it would be unrealistic to observe two other behaviors simultaneously. Similarly, if it was decided instances of imitation should be recorded during the same activities each week, recording all three of the target behaviors at the same time would limit the scope in which observers would have the opportunity to identify other behaviors. Although a certain song or activity may highlight imitation, another song may provide greater opportunities to engage in eye contact or smiling. A potential solution to this challenge would be to conduct separate observations of each behavior. The present intervention was only about 25 minutes in length. If two, five minute observational periods were designated for each target behavior, at least 30
minutes of intervention time would be needed in order to conduct all of the observations. Therefore, this was not a realistic option for the present intervention. However, for intervention periods lasting at least 35 minutes, this is a potential solution. Along with needing more intervention time, more observers would likely be necessary in order to observe multiple individuals at one time.

The absence of inter-rater reliability checks during the intervention is a limitation of this study. Because of the limited time period afforded to conduct the observations and having a limited number of observers was a challenge in conducting fidelity checks during the intervention sessions. Prior to each session, the interventionist reviewed data collection and asked observers if any questions related to the observation were present. About halfway through the intervention, data collectors were asked to complete a quiz with questions related to conducting the observations. After observers completed the quiz, the interventionist discussed each question and the correct response with the data collectors.

The quiz was used as a relatively informal way to “check-in” with the data collectors and provide reminders about appropriate data collection technique. Although it was a quiz, the researcher did not collect and review the quizzes. Rather, after each data collector completed the quiz independently, it was reviewed and discussed in a group setting with the researcher. In future studies, regular quizzes used as a “check-in” would likely be beneficial. Although discussing the quiz was a valuable approach, it may be more beneficial to collect the quizzes after completion for the researcher to review. This would ensure data collectors were coming prepared to engage in expected tasks and could also identify weaknesses in data collection. Reviewing information in a group discussion in conjunction with the quizzes would likely be beneficial.
Because of the limited length of time to observe participants in each session and the limited number of individuals to collect data, it was realized that fidelity checks in the moment would be rather challenging. To address limitations related to checking the fidelity, using technology should be considered in future studies. While the use of stationary cameras placed throughout the room was discussed as a potential means to obtain fidelity data, the probability of the camera capturing all instances of each behavior would have been rather limited. Even if there were three or more different cameras capturing the intervention sessions, reviewing the footage and determining the sequence of time between two or more different cameras would be arduous and impractical. Having an individual start and manage the use of a stationary camera would also present challenges, particularly if the participant did not stay in the view of the camera. Using bulky equipment, such as stationary cameras limits the mobility of the camera operator and limits the practicality of successfully capturing the participants.

Implementation of the sessions revealed using other more portable technological devices may be beneficial in capturing the target behaviors. Using an iPad or something similar to record the sessions would increase the ease with which one could move around the room to capture all behaviors exhibited by each participant. All recordings for each participant would be captured in one observational period with one video, eliminating the need to combine camera footage from multiple cameras.

Although mobility is increased when using more portable pieces of technology, there are other considerations that must be made. One option for observation would be to have the data collector collect the data in the moment while another individual is operating the camera. Later, the interventionist or another data collector could review the video footage and record data in the same manner as is done in the moment during the intervention session. Inter-rater reliability
percentages could be ascertained after both observations were complete. While this creates a practical way for fidelity data to be collected, it necessitates that two individuals are available during that observational period. To reduce the number of individuals needed during the session itself, the data collector could video the participant for the duration of the observational period. After the session, both the data collector who conducted the recording and another individual (i.e., the interventionist or another data collector), could conduct observations using only the video footage. In this way, both observational data and inter-rater reliability data could be obtained without increasing the number of individuals needed during each observation session.

In the present study, different leaders were present in the control and experimental groups because of time constraints and group structure. In this case, the leader in the control group did not have a vested interest in using music activities specifically to enhance the skills of the participants. As a result, any significant differences found between the control and experimental groups would be related to the use of musically adapted social stories.

Although bias may be reduced by having two different leaders, one who does not know the skills being targeted, there are limitations present in this approach. The structure of each session was not outlined, known, or dictated in any manner by the interventionist. In this way, it is challenging to know whether or not the same targeted skills were taught explicitly or through a “hidden curriculum” in the control group. Having the same leader for both groups would reduce uncontrollable variables. Having the same interventionist for each group or having a specified plan for each group would help to control for different variables. The interventionist would have a defined knowledge of the activities that occurred in each group, increasing the ability to meaningfully discuss why differences may have existed. This would also reduce the reliance on
data collectors to write notes during the observational periods related to the participant’s behaviors and activities occurring in the control group.

When selecting participants, it is valuable to consider each participant’s level of functioning and presentation of ASD. In the present study, participants were divided by their level of functioning. The participants chosen for the study were selected from the middle group because of their level of functioning and general age. However, as individuals with autism spectrum disorder may present very differently from one another, even individuals in the same group may exhibit different challenges, strengths, and characteristics of the disorder. While the Participant Behavior Checklist and the SSIS were used to ascertain each participant’s level of functioning, it was used at the study’s conclusion to describe the participants. To improve the matching of participants in the control and experimental groups, using information from the Participant Behavior Checklist and the SSIS prior to selecting the participants would be beneficial. This information could be used not only to determine which participants would be most appropriate for inclusion in the study, but also to match participants in the control and experimental groups based on functioning and presentation. This would increase the ability to make meaningful comparisons between participants within and between groups.

The present intervention took place as part of a larger fine arts program. Therefore, it was necessary for the control and experimental groups to occur simultaneously. Further, the lesson plans were created by the individuals who led each group. In future studies, having the same person not only lead both groups, but also design the program structure for both groups may help to reduce uncontrollable variables and increase the ability of the researcher to determine the effects of the musically adapted social stories.
The participants appeared to be responsive to the first social story, *Steps Song*, engaging in each step and repeating the motions of the interventionist. During the first few weeks of the intervention, laminated cards depicting each step of the musically adapted social story were given to each child’s college age buddy. The laminated cards were typically used prior to singing the song with accompaniment. When the interventionist showed her card and demonstrated the accompanying action, the college age buddy would present the small laminated cards to the participants and encourage imitation of the step. As the intervention progressed, the cards were discontinued. However, the interventionist would provide verbal and visual cues to the participants while singing. The use of laminated cards may have been further beneficial if hole-punched at the top and put on a metal ring for the participants to hold and refer to during the song. The cards were kept in an envelope with each participant’s name and handled mainly by the college buddies.

While the other two musically adapted social stories did not have visual cards depicting information, all three social stories had motions. The interventionist modeled the motions and stood in front of the participants. It was then possible for the interventionist to encourage and monitor engagement.

While *Happy* had accompanying motions, other activities were often done during this song in place of the motions. The participants were prompted to engage in particular actions one might display when happy. Changing between specific actions and having participants engage in actions without a predictable order did not appear to cause distress to participants. However, individuals on the autism spectrum often have difficulty adjusting to changes in routine and work well within established routines (Hall, 2013). When developing a music intervention, a specified schedule is an important component. Although it cannot be ascertained from this particular
intervention, it would be valuable to consider the difference in growth when comparing groups with an established and predictable routine without minor fluctuations to a group with an established set of songs and motions, with changes in activities, such as the present intervention.

Many individuals with ASD are visual learners and may have difficulty understanding information heard verbally (Hall, 2013). Therefore, future interventions using music may also wish to consider including a visual component to reinforce concepts taught.

The *Steps Song* could be done sitting or standing, which was beneficial, as the interventionist could read the energy level of the participants and decide whether the song should be sung from a seated or standing position. At times, however, the long pauses between each step resulted in lowered participant engagement. The interventionist used the musical interludes to prompt the participants for what was coming next in the song. Although this was a valuable tool for teaching, it appeared to hinder independence. When the interventionist withdrew in an attempt to have the participants sing independently, many individuals became unfocused. In contrast, the unaccompanied piece *How to Tell if Someone is Happy* required sustained attention, as participants needed to watch and listen to the interventionist and then repeat what was said and done.

In future music interventions, keeping the songs shorter with less intermittent music may help participants to remain focused throughout the song’s entirety. Creating songs with flexibility related to the amount of physical energy necessary should also be considered when developing these interventions. For instance, developing songs that can be sung from a seated or standing position is recommended. Additionally, if including multiple songs in the intervention, pairing a song with a faster tempo that is lively with a song that has a slower tempo and more melodious tune may be beneficial.
The accompanied pieces were written in a pop style, including electric guitars, keyboard, and drums in the accompaniment. Although it was believed the participants would be most drawn to the accompanied selections, visually scanning of the participants during the intervention sessions indicated participants were collectively most responsive to the unaccompanied piece. Future research should aim to identify if any significant differences in performance and engagement are realized with accompanied verses unaccompanied pieces. To assess this difference, using the same lyrics, melody, and motions would help to eliminate extraneous variables.

Future studies could investigate the impact of music and musically adapted social stories on the building of specific skills. For example, comparing the growth of individuals who receive instruction without a musical component, a group who receives musical instruction, and a group that receives musically adapted social stories instruction could help to better understand the role of music in intervention and further identify the potential role of musically adapted social stories. Listening to popular music and creating simple, yet interesting songs and providing recordings to participants at the beginning of the intervention may also be beneficial. Conducting a pretest and posttest at the start and conclusion of the intervention with a specific number of predetermined opportunities to engage in certain behaviors would be helpful in better determining growth in the area of imitation or another target behavior where the opportunities to respond can be easily calculated. Talking with parents and educators to determine the skills they believe would be most helpful for their children or students to learn would also be beneficial when composing the musically adapted social stories. Both the control and experimental groups had about eight children each. Creating groups that were even smaller in future studies may be beneficial in order to enable each individual to have more attention from the interventionist. Additionally, paring
larger groups down into smaller groups may also help to match participants with similar presentations of ASD. This would help the interventionist to lead the group based on the needs of that particular group. Implementing a skills test could help to determine which group would be the best fit for each participant.

Chapter Summary

The present study sought to determine whether the use of musically adapted social skills would increase eye contact, imitation, and smiling behaviors in individuals with autism spectrum disorder. As music interventions are not currently considered evidence-based, the present study aimed to build the research base in this area. Another objection of the present study was to identify potential challenges that may arise during musically based interventions and identify practical ways in which to manage these concerns in the future.

The first participant in the control group, Ben, displayed wide variations in the frequency of the target behaviors. Behavioral notes revealed he was typically engaged in the content and attentive to instruction. Further, observations revealed Ben may not have had as many opportunities to engage in the target behaviors during observations where lower frequencies of imitation, smiling, and eye contact occurred. The first participant in the experimental group, Tommy, displayed a similar level of engagement and attentiveness to Ben. An upward trend in smiling behaviors was present. Although Ben displayed a downward trend in imitation behaviors, he presented with a high number of imitative behaviors overall. Therefore, it appears he “ceilinged out” on this skill. When conducting musically adapted social stories in the future, it may be beneficial to select individuals similar to Ben and Tommy, as they may be more capable of adjusting to the group setting and actively participating.
The second participant in the control group, Caleb, presented with upward trends in eye contact and imitation. However, the overall frequency of the target behaviors was rather low. Behavioral observations indicated Caleb often did not actively participate in the music activities. Therefore, while he displayed increases in the target behaviors, this is likely because he displayed such low levels of engagement initially. The second participant from the experimental group, James, presented with an increase in imitative behaviors. Similar to Caleb, James displayed a low frequency of imitation and eye contact. Although both Caleb and James displayed increases in specific target behaviors, participating in music based activities did not appear as reinforcing to them. Therefore, more individualized instruction with outside prompting may be more appropriate.

There were limitations in the present study, including selecting meaningful target behaviors and accurately observing those behaviors. Individuals with ASD present with limitations in the appropriate use of eye contact (APA, 2013), making it a valuable behavior to observe. However, the practicality of observing eye contact in a group setting and training data collectors to determine the social quality of eye contact proved challenging. Although tallying the frequency of imitative behaviors was practical for the observers, participants did not always have equal opportunities to engage in imitation during observations. Observing imitation during the same song or activity during each observation or comparing the total number of imitative behaviors observed against the total number of opportunities to engage in imitation are possible ways to remedy this challenge. Regarding smiling, an instance of smiling was recorded even when the participant was explicitly told to smile by the interventionist. In future studies, it may be valuable to count instances of smiling only when they occur unprovoked. Observing three behaviors simultaneously can also be problematic. Lastly, a lack of inter-rater reliability checks
throughout the intervention is a limitation of this study. The use of technology, such as an iPad, is a possible solution to observing behaviors simultaneously and conducting inter-rater reliability checks. In future research, selecting participants based on their level of functioning using a rating scale would be beneficial in matching participants when both a control and experimental group are present. If possible, having the same person lead both the control and experimental groups also may be beneficial. Considering the response of the participants to the music in the present study, composing or selecting songs that are simple, engaging, and involve constant action may increase engagement.

The results of this study provide potential avenues of future research. For example, future research could compare the growth of individuals receiving instruction on specific skills without a musical component, with a musical component, and with musically adapted social stories. This would provide more opportunities to determine the role of music and the musically adapted social stories in building specific skills. The inclusion of pretests and posttests with specific opportunities to engage in the target behaviors may also be beneficial in future research. Although the results of the present study were mixed, valuable information regarding the implementation of similar interventions in the future resulted.
References


Musically Adapted Social Stories


Appendix A

Social Stories

Steps Song

When I’m out
Arms out
I may see someone I know
Point to head with one finger
And I don’t want to be scared to say
Cross arms and push out/shake head
hello!
Wave

I’m happy to see the person I know
Thumbs up
So I want to make sure my face tells
Point to face
them so
Step one: Put a smile on my face
Hold up one finger
Put a smile on my face
Smile big/point to mouth
Put a smile on my face
Same motion to the left
Put a smile on my face
Same motion to the right

Next, I need to say hello
Wave with right hand
And smile at them
Point to face and smile
While they say hello
Wave with left hand
Step two: Say hello!
Hold up two fingers
Say hello
Wave front
Say hello
Wave to the left
Say hello
Wave to the right

Then, I will ask,
Shrug shoulder
“How are you today?”
Point to face
And look at their face while I wait
Hold up three fingers
Step three: Ask, “How are you?”

Then, I will ask,
Shrug shoulder
“How are you today?”
Point to face
And look at their face while I wait
Hold up three fingers
Step three: Ask, “How are you?”
If they ask me how I am
I can say a few different things
If I’m happy and well I can say,
“I’m good, thanks!”
“I’m good, thanks!”
“If I’m happy and well I can say,
“If I’m happy and well I can say,
 (“I’m good, thanks!”
 (“I’m good, thanks!”
 “I’m good, thanks!”
 “I’m good, thanks!”
 “I’m good, thanks!”

If I’m not feeling well I can say,
“I’m not feeling my best,
“but I’ll be ok!”
Step four: Answer their question!
To end the greeting I say,
“It was so nice seeing you today!”
With a smile and a wave
I can walk away
With a smile and a wave
I can walk away and say,
“Goodbye!”
“Goodbye!”
“Goodbye!”

Point to self
Palms up hands to chin then out
Smile
Thumbs up
Thumbs up to the left
Thumbs up to the right
Frown; shake head
Hands on tummy
Smile and nod
Hold up four fingers

Hands on hip
Smile and wave
Pretend to walk
Smile and wave
Pretend to walk
Wave front
Wave to the left
Wave to the right
Happy

A smile on my face
Is a clue to my friends
That I’m happy

When I laugh
I give friends a clue
That I’m happy

What I say
Can give friends a clue
I can say with my words
That I’m happy
That I’m happy

When I’m happy
I can smile, laugh, and say,
“‘I’m really happy today!’”
I can smile, laugh, and say!

I may be happy
When I eat my favorite food
Act like eating

I may be happy
When I see all my best friends
Magnifying glass to eye and look around

I may be happy
So very happy
Shake egg shaker up high
Fist pump
How to Tell if Someone is Happy

I want to know
If someone is happy
So I look for clues
To crack the case

Point to head
Thumbs up
Act like holding magnifying glass
Hold out palms like a book

Singing oh-oh-oh
We’re gonna solve the mystery
Singing oh-oh-oh
We’re gonna solve the mystery

Fists together move from left to right
Lace fingers move left to right
Fists together move from left to right
Lace fingers move left to right

First we use our eyes
To look for a smile
If they’re smiling
They just might be happy

Point to eyes
Hand to forehead, look around
Point to lips and smile
Thumbs up

Singing oh-oh-oh
We’re gonna solve the mystery
Singing oh-oh-oh
We’re gonna solve the mystery

Next we use our ears
To search for a laugh
Are they laughing?
That could mean they’re happy

Point to ears
Hand to forehead, look around
Hold tummy and act like laughing
Thumbs up

Singing oh-oh-oh
We’re gonna solve the mystery
Singing oh-oh-oh
We’re gonna solve the mystery

Then I use their words
To search for a clue
Are they sayin’ hey!
I’m really happy today!

Point to mouth
Hand to forehead, look around
Yell “hey” and fist pump
Thumbs up

Singing oh-oh-oh
We’re gonna solve the mystery
Singing oh-oh-oh
We’re gonna solve the mystery

Fists together move from left to right
Lace fingers move left to right
Fists together move from left to right
Lace fingers move left to right
If they’re happy
They may want to share good news
If they’re happy
They may want to play a game

It’s good to know
When someone is happy
When I look for clues
I can be happy too

Thumbs up
Arms out
Thumbs up
Pretend to kick a ball

Point to head
Thumbs up
Act like holding magnifying glass
Thumbs up
Appendix B

Basic Demographic Questionnaire

Participant Name: _________________________________________________

Who is completing this form? _________________________________________

What is your relationship to the participant? ________________________

Participant’s age: _________________

Birthdate: _______________________

Sex: ___________________________

Ethnicity (i.e. Caucasian, African American, etc.): _________________________

When was your child diagnosed with autism spectrum disorder? _____________

And by whom was the diagnosis made? _________________________________
Appendix C
Participant Behavior Checklist

1) When I call my child’s name to get their attention, they turn their head and look at me:

- Rarely
- Sometimes
- Usually
- Almost Always

2) When I make eye contact with my child, he/she looks at me in the face or eyes:

- Rarely
- Sometimes
- Usually
- Almost Always

3) When I point to an object or attempt to direct my child’s attention to an object (i.e. pointing at an airplane in the sky and prompting child to look), my child looks in the same direction I am pointing:

- Rarely
- Sometimes
- Usually
- Almost Always

4) When my child is scared or sad, he/she seeks comfort from another individual:

- Rarely
- Sometimes
- Usually
- Almost Always

5) When I smile at my child, he/she smiles back:

- Rarely
- Sometimes
- Usually
- Almost Always

6) When my child meets a new person, he or she greets them appropriately (i.e. says hello, waves) without prompting:

- Rarely
- Sometimes
- Usually
- Almost Always

7) When my child meets a new person, he or she greets them appropriately (i.e. says hello, waves) with prompting:

- Rarely
- Sometimes
- Usually
- Almost Always
8) When my child is participating in an activity he/she enjoys, he/she smiles:

<table>
<thead>
<tr>
<th>Rarely</th>
<th>Sometimes</th>
<th>Usually</th>
<th>Almost Always</th>
</tr>
</thead>
</table>

9) My child’s facial expression seems to reflect his/her current emotional state. For example, my child smiles when happy and frowns when sad:

<table>
<thead>
<tr>
<th>Rarely</th>
<th>Sometimes</th>
<th>Usually</th>
<th>Almost Always</th>
</tr>
</thead>
</table>

10) When I do an action or gesture, such as clapping, shaking my head, shaking someone’s hand, stomping my feet, etc., my child repeats the action:

<table>
<thead>
<tr>
<th>Rarely</th>
<th>Sometimes</th>
<th>Usually</th>
<th>Almost Always</th>
</tr>
</thead>
</table>

11) When I model a behavior, such as brushing teeth, washing hands, etc. my child is able to perform the modeled behavior:

<table>
<thead>
<tr>
<th>Rarely</th>
<th>Sometimes</th>
<th>Usually</th>
<th>Almost Always</th>
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</thead>
</table>

12) When my child is playing with another child, he/she engages in pretend play:

<table>
<thead>
<tr>
<th>Rarely</th>
<th>Sometimes</th>
<th>Usually</th>
<th>Almost Always</th>
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</table>

13) My child engages in repetitive motor movements (i.e. hand flapping, spinning, rocking, snapping, etc.):

<table>
<thead>
<tr>
<th>Rarely</th>
<th>Sometimes</th>
<th>Usually</th>
<th>Almost Always</th>
</tr>
</thead>
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14) My child repeats sounds, words, and/or phrases repeated he or she hears:

<table>
<thead>
<tr>
<th>Rarely</th>
<th>Sometimes</th>
<th>Usually</th>
<th>Almost Always</th>
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</thead>
</table>

15) My child responds to a question by repeating the question:

<table>
<thead>
<tr>
<th>Rarely</th>
<th>Sometimes</th>
<th>Usually</th>
<th>Almost Always</th>
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Appendix D
Commitment Form

I, ___________________________ agree to attend all training sessions and assigned data collection sessions. I agree to commit to the dates and times listed below. When I am collecting data, I will arrive on time and prepared to do the work expected. I understand that showing up late, missing shifts, or not putting forth appropriate effort may result in removal from the data collection team. When collecting data, I will put forth my best effort to ensure the information I obtain is as accurate as possible.

I am committed to the following dates/times:

___________________________________________
___________________________________________
___________________________________________
___________________________________________
___________________________________________
___________________________________________
___________________________________________
___________________________________________

My signature indicates I agree to the information and terms outlined above.

_______________________________________________________________
Signature                                             Date

_______________________________________________________________
Printed Name                                             Date
Appendix E
Data Collection Form

Participant Number: ___________________________

Observation Time: ___________________________

<table>
<thead>
<tr>
<th>Behavior</th>
<th>0:00-1:00</th>
<th>1:00-2:00</th>
<th>2:00-3:00</th>
<th>3:00-4:00</th>
<th>4:00-5:00</th>
<th>Totals:</th>
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</thead>
<tbody>
<tr>
<td>Eye Contact</td>
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<tr>
<td>Smiling</td>
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<tr>
<td>Imitation</td>
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</tbody>
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Notes: