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Increasing Social Responsiveness in a Child with Autism: A Comparison of Music and Non-Music Interventions

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by

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ABSTRACT

Many children with autism have difficulty engaging in social interaction with others. This study sought to determine the effects of using both a music intervention and a non-music intervention on the social responsive and social avoidant behaviours of a preschool child with autism. A single-subject alternating treatment design was used in which the two interventions were presented in a similar fashion except for the addition of music during the music intervention. Data were collected over a total of 12 treatment sessions for various social responsive and avoidant behaviours. Results indicated that the music intervention was more effective than the non-music invention in increasing all three social responsive behaviours. Furthermore, no social avoidant behaviours were observed during the music condition. It is suggested that because music was a preferred activity, the participant was motivated to engage in more social responsive behaviours during the music intervention.

For

children with autism everywhere

who share my love for music

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CHAPTER I

INTRODUCTION

Autism is a pervasive developmental disorder which occurs in approximately 62 out of every 10, 000 births (Fombonne, 2003). In order to meet the criteria for a formal diagnosis of autism, a child must exhibit the following by three years of age: (1) Impairments in communication involving a delay or lack of spoken language, an inability to initiate or sustain conversation with others, stereotyped or repetitive use of language, and a lack of developmentally appropriate make-believe play; (2) Impairments in social interaction, including a marked impairment in the use of non-verbal behaviours (e.g., eye contact, facial expression, and body postures), failure to develop relationships with peers, a lack of spontaneous interaction with other people, and a lack of social or emotional reciprocity; and (3) Restricted and stereotyped patterns of behaviour, interests, and activities including persistent preoccupation with specific parts of objects, and strict adherence to specific routines and stereotyped motor movements (e.g., hand flapping) (American Psychiatric Association, 2000).

Various interventions have been used to address these impairments including peer training (Kamps, et al., 2002), social stories (Delano & Snell, 2006; Gray & Garland, 1993), and pivotal response training (Koegel & Koegel, 2006; Koegel & Frea, 1993; Koegel, Koegel, Hurley, & Frea, 1992; Koegel, Schreffirnan, Good, Cerniglia, Murphy, & Koegel, 1989). Another intervention that has been used to increase social skills in children with autism is music therapy.

Music therapy is an established healthcare profession that uses music to address physical, emotional, cognitive, and social needs of individuals of all ages (American Music Therapy Association, 1999). Bruscia (1987) states that the music therapist implements a goal-directed

process using musical experiences to help the client improve, maintain, or restore a state of well-being. This process involves assessment, treatment and evaluation procedures which aim to meet the specific needs of each client. Musical experiences are broad and may include improvising, performing, composing, notating, verbalizing, and listening to music (Bruscia, 1987).

Several improvisational models of music therapy exist, including, creative music therapy, free improvisational therapy, analytical music therapy, experimental improvisation therapy and Orff improvisation models. The creative music therapy model (Nordoff-Robbins Model) has been found most suitable for young children with special needs, including those with autism. It was first developed in the 1960s by Paul Nordoff, a composer and pianist, and Clive Robbins, a special educator who used music *as* therapy rather than *in* therapy. This refers to the fact that music is used primarily for the purpose of motivating and effecting the child's therapeutic growth (Bruscia, 1987). It is considered a creative approach because the therapist first creates and improvises music which will be used as therapy. This music is then used in each therapy session for the purpose of seeking out, and gaining and maintaining contact with the client throughout the session. The therapist creates a progression of therapeutic experiences across several sessions to support the client's development (Bruscia, 1987). Creative music therapy involves an active approach that emphasizes the importance of music-making rather than music-listening. Nordoff & Robbins believe that active music making engages children's attention, draws them into active involvement, and directs inner experiences outward. Furthermore, as the children remain active, the music changes which in turn changes and transforms the children's experiences promoting growth and development (Bruscia, 1987).

Although the literature is limited, music therapy has been used as an intervention with children with autism to increase a variety of skill areas including communication (Edgerton,

1994; Holck, 2004; O'Loughlin, 2000; Watson, 1979; Wood, 1991), cognition (Carroll, 1983; Clauss, 1994; Laird, 1997; Litchman, 1976; O'Loughlin, 2000), memorization of information (Gfeller, 1983; Jellison & Miller, 1982; Wolfe & Horn, 1993), behaviour (Gunter, Brady, Shores, Fox, Owen, & Goldzweig, 1984; Gunter, Fox, McEvoy, Shores, & Denny, 1993; Levinge, 1990; Mahlberg, 1973; Schmidt, Franklin, & Edwards, 1976; Staum & Flowers, 1984), self-help skills (Gevin, 1991; Michel, 1976; Nordoff & Robbins, 1992) and imitation (Buday, 1995).

Although these studies demonstrate the potential of music therapy interventions, many methodological problems such as small sample sizes, lack of statistical analysis, and use of measures for maintenance and generalization have made it difficult to draw firm conclusions. Furthermore, very few studies exist that have specifically examined the effects of music therapy on the social responsiveness of children with autism could be found. In a clinical description, Woodward (2004) describes a music therapy program in which the focus was on the use of music therapy to develop social interactions between children with autism and their parents. The main goals of this program were to develop the children's communication and interaction with both peers and adults, and further, to nurture relationships between parents and children. Although not empirical research, the majority of parents involved in the program indicated that they were able to explore new ways of engaging with their children in a safe and supportive environment. Unfortunately, the lack of empirical evidence derived from this pilot project makes it difficult to understand the true efficacy of the music therapy intervention. It does, on the other hand, suggest its potential.

Because music therapy is being used on an increasing basis for children with autism, it is necessary to establish its effectiveness as an evidence-based intervention in addition to its use for pure fun for children with autism. The current study first seeks to add to the literature on the use

of music therapy for developing social skills in children with autism as well as to address some of the methodical shortcomings as listed above. Thus, the purpose of the current study is to determine the effect of using music therapy on the social responsiveness and social avoidant behaviours of a preschool child with autism.

CHAPTER II

REVIEW OF LITERATURE

Although limited in number, there are some studies that have examined the use of music therapy to increase social skills in children with autism. The chapter begins with an outline of the social deficits found in children with autism, followed by a general description of music therapy and its use with children with autism. Subsequently, a review of studies which evaluate the effects of music therapy interventions on the social skill development of young children with autism will be presented. Next, the use of motivation as a pivotal area to target increases in socialization is considered, followed by a discussion of the limitations in previous music therapy research. The chapter concludes with a description of single-subject treatment design and its use in the current study.

Social Deficits in Children with Autism

Deficits in the social skills of children with autism were first described by Kanner in 1943, who referred to this lack of skills as "autistic aloneness" (Scott, Clark & Brady, 2000). Children with autism have often been seen as being in their "own worlds" or isolated from others. Unlike most typically developing children who initiate interaction with others, children with autism tend to remain isolated and typically do not acknowledge the people in their environment for social contact. Instead, many children with autism typically only interact with others to satisfy a want or need, such as to obtain a desired object or to satisfy hunger (Scott et al., 2000). This lack of social acknowledgement also affects areas such as engaging in eye contact, body language, imitation and play.

Many children with autism have difficulty making eye contact with others and are often unable to use it appropriately for communication purposes. For example, during a conversation

some children with autism may look at the other person too closely, for too long, or not at all which tends to be unnatural and awkward (Jordan & Powell, 1995).

This in turn leads to problems with joint attention, which is the difficulty to coordinate attention between people and objects. The National Research Council (2001) further describes joint attention as the following:

> Deficits in orienting and attending to a social partner, shifting gaze between people and objects, sharing affect or emotional states with another person, following the gaze and point of another person, and being able to draw another person's attention to objects or events for the purpose of sharing experiences. (p. 48)

Joint attention is believed to be an important predictor of language outcomes in children with autism, and because they typically do not use gestures such as waving, pointing, or nodding to direct attention, these children often fail to develop age appropriate language skills (National Research Council, 2001).

Imitation of gestures or vocalization is another skill that is deficient in children with autism. Spontaneous imitation is often seen in typically developing children during play and interaction, whereas poor imitation skills or the lack of interest to imitate others is commonly observed in children with autism (Koegel & Koegel, 2006). Koegel & Koegel (2006) state that children with autism often demonstrate difficulty or a lack of interest in imitating others when presented as a demand-type situation (e.g., teacher saying "clap your hands"), but they often engage in echolalia (e.g., rote repetition of words, phrases or dialogues) when presented with a preferred task (e.g., watching a favourite video). Furthermore, they suggest that "there may be an underlying motivational issue when the children are engaging in less-preferred activities, rather than a generalized problem with the ability to imitate, for some children in the spectrum" (p.

172). This being said, problems with imitation do occur early on with most children with autism and persist throughout their childhood (Koegel & Koegel, 2006).

Finally, play skills comprise another group of social behaviours that are difficult for children with autism. Many of them lack the social reciprocity needed to engage in play activities with others, and therefore are unable to engage successfully in activities with their peers. Children with autism do not develop play skills such as sharing and turn-taking on their own; instead they must be taught these skills explicitly. Without these skills, it is difficult for them to build friendships with others (Scott et al., 2000).

In addition to these social deficits, many children with autism fail to generalize learned skills and knowledge into other areas of functioning. For example, if children are taught to share a toy with their peers at school, they may not share the same toy with his or her siblings at home. Jordan & Powell (1995) state that children with autism need to be specifically taught to transfer knowledge and skills to new situations in ways that will be meaningful for the child. Exposing children with autism to the same task used with different materials, in different locations and with different instructions will help the child acquire generalized learning (Scott, et al. 2000).

As a result of these deficits, children with autism have significant difficulty developing age-appropriate social skills that involve one or several different aspects of social behaviour. Therefore, they tend to engage in social avoidance behaviours such as gaze aversion, moving or pushing away from another person, hanging their head, or not coming when called (Koegel, Dryer, & Bell, 1987).

Music Therapy and Children with Autism

As mentioned in the introduction, music therapy has been used with children with autism to target a wide variety of skill areas. Davis et al. (1999) state that because music is an engaging

stimulus for children with autism, it is a positive activity in which they can participate successfully. Many children with autism have been shown to respond more frequently and appropriately to music than to other auditory stimuli (Davis, Gfeller & Thaut, 1999). For example, Thaut (1987) found young boys with autism to have a significant preference for auditory-musical stimuli (e.g., listening to children's songs) over visual stimuli (e.g., watching a slideshow of zoo animals) in contrast to typically developing boys who preferred to watch the slides.

The most common target areas in which music therapy has been used for children with autism are as follows: (1) improving fine and gross motor coordination, (2) increasing attention span, (3) developing body awareness, (4) developing concept of self, (5) developing social skills, (6) developing verbal and nonverbal communication skills, (7) facilitating learning of basic academic and preacademic concepts, (8) altering repetitive behaviour patterns, (9) reducing anxiety, temper tantrums and hyperactivity, and (10) increasing sensory perception (Davis et al., 1999). Examples of techniques that are commonly used by the music therapist to accomplish these goals include (1) vocalization exercises such as singing a single, or combination of, vowels or consonants, with proper inflection and breath support, (2) singing and chanting, often accompanied by body percussion, (3) movement such as dance, rhythmic exercises or imitation techniques, (4) instrument performance using imitation or improvisation techniques, and (5) music listening.

A study conducted by Kaplan & Steele (2005) analyzed the goals and outcomes of a variety of music therapy programs for 40 clients with autism spectrum disorder. The clients ranged in age from 2 to 49 years of age, with 70% being male and 30% female. Primary goal areas for the clients were identified and ranked as follows, language/communication (41%),

behavioural/psychosocial (39%), cognitive (8%), musical (7%), and perceptual/motor (5%). By analyzing the music therapy records recorded on these clients over a period of 2 years, it was determined that 100% of the participants met their initial objectives within a year or less of music therapy, while 77% of the secondary objectives were also reached within this same time. Furthermore, 100% of parents and caregivers indicated by means of general observation questionnaires that the skills the participants had acquired during music therapy were generalized to settings outside of music therapy such as at home, at school and in the community. The authors indicated that such high level of achievement could be attributed to the fact that the music therapists set realistic criteria for each client to meet his or her music therapy objectives (e.g., a 25% increase or decrease from the client's performance during baseline). It was also suggested that the responses on the questionnaires completed by the parents and caregivers could have been influenced by their desire for the participant to succeed. This overview of several music therapy interventions suggests that music therapy is effective in addressing several goal areas for children with autism and contributes to determining the efficacy of music therapy interventions for children with autism.

Music Therapy Interventions to Increase Social Skills in Children with Autism

A search of the literature found only seven studies that specifically examined the effect of music therapy on developing social skills in children with autism (see Appendix A for a summary of studies). An early study by Stevens & Clark (1969) used a pre-test/post-test method to examine the social effects of a music therapy intervention on five boys with autism between the ages of 5 and 7. Both the pre-test and the post-test consisted of two types of measurements (i.e., The Autism Rating Scale, described below, and video tape recordings with an accompanying rating scale) to determine if music therapy provided effective techniques for

improving prosocial behaviours, defined as a broad range of general socially acceptable behaviours in children with autism. The intervention consisted of individual music therapy sessions once a week for 18 weeks. Music was used to motivate each child to participate in tasks such as singing and playing instruments.

Instruments were used to gain the child's attention and to encourage participation, and progress was evaluated for each child, depending on his or her level of functioning. For example, for a child who was considered low-functioning, simply observing or attending to the therapist while he used an instrument was considered progress, whereas a higher functioning child was encouraged to keep a rhythmical beat on a percussion instrument or coordinate both hands at once while playing an autoharp. The therapist only used instruments that were preferred by the child and if the child appeared to be uninterested in an instrument, it was replaced with a new one.

Although the goals for the children were not operationally defined, it seemed that the focus was on the level of the child's engagement during an activity. When the children initiated new or creative material on an instrument they were reinforced for this behaviour with verbal praise. On the other hand, if the child's behaviour was considered resistive or ritualistic, the therapist would do one of the following: ignore the inappropriate behaviour, try prompting the child to change the behaviour, or as a last resort, change the music activity to one that was more reinforcing for that particular child.

The therapist primarily used singing activities to motivate vocalization and verbalization in the children. The familiar children's song "Pop Goes the Weasel" was used to encourage the children to fill in either the word "Pop" or the phrase "Pop goes the weasel" at the appropriate

time in the song. Songs that involved actions were also used to develop body awareness and coordination as well as to encourage interaction with the therapist.

The Autism Scale (Ruttenberg et al., 1966, as cited in Stevens & Clark, 1969) consisting of three subscales was used to measure (1) the nature and degree of relationship to an adult as a person; (2) communication; and (3) drive for mastery. Each of the three subscales is made up of ten items of progressive developmental maturity for which the child was scored for the percentage of time he interacted at a certain level. Video tape recordings were also made at the beginning, middle and end of the study in order to assess each child's degree of attention (intensity) and span of attention (duration) over the course of the study. A rating scale was developed for this purpose and the degree of attention (intensity) was classified according to the following three levels: (1) Level 0 (i.e., child withdrawn, solitary play, avoids adult, distracted by own thoughts, ambling around room, non-attentive, uninvolved with any other person, runs out of room); (2) Level 1 (i.e., child semi-involved, half-attending to adult, following instructions but also engaged in other self-initiated activity); or (3) Level 2 (i.e., child responding to therapist as directed, appropriate social interaction and attention, playing, talking, or following directions as requested). Attention span (duration) was defined as the length of time the child was engaged in any activity, throughout the session.

Results indicated that all five boys demonstrated significant improvements on all three subscales of Ruttenberg's Autism Scale. In addition, four of the five boys showed general improvements in their social behaviour (although specific behaviours were not identified) enabling three of them to attend regular kindergarten and first grade classrooms. Parents also noticed improvement in three of the five cases. Despite this, several limitations do exist including the limited use of descriptive details outlining the procedure of the intervention and

operational definitions of behaviour. Furthermore, despite the improvements on Ruttenberg's Autism Scale it is possible that these results could have been influenced by the "halo effect" (i.e., the tendency for the experimenters to see improvement in the treatment sessions while knowing the desired outcome). It is also noted that the improvement in the children's behaviour may be due to the growing familiarity with the therapist and their surroundings and it was not determined if these improvements generalized to other situations. Finally, the small sample size of the study brings to question the true efficacy of the results. Despite these limitations, Stevens & Clark (1969) provided the initial groundwork necessary to further expand and examine the use of music therapy to increase social behaviours in children with autism.

Wimpory, Chadwick, and Nash (1995) used musical interaction therapy (MIT), described as synchronizing live music to adult-child interactions, to increase the social participation, reciprocal interactions, and eye contact between a three-year-old girl and her mother. The child was described as almost totally non-communicative and met the diagnostic criteria for autism. MIT sessions were carried out by a musician whose role was described as similar to a pianist accompanying silent films (although in this case the musician used a harp), in that the music reflected and highlighted the mood, timing and meaning of the adult-child interactions. For example, if the child jumped during the session, the mother would also jump and sing the following words together with the musician, "jump, jump, jump away" The musician would also play the harp quietly if the child appeared to be avoiding her mother and with more excitement when the child approached her mother.

An ABC treatment design was implemented in which A was baseline, B was the music intervention and C was the follow-up measure. The baseline phase took place over a period of 4 months followed by 11 months of MIT sessions which took place in the child's home for 20

minutes, twice a week. Data were collected from these home visits and included six sessions from Phase A and seven of the MIT sessions in Phase B. This phase was followed by an additional 5 months of so-called "unmonitored" MIT session, implying that no data were collected during this phase. Finally, one follow-up session was conducted 20 months later in Phase C. The following five measures of social participation were considered, social acknowledgement (e.g., looking towards the mother with an accompanying vocalization, facial or gestural movement or by establishing physical contact), eye contact (e.g., number of eye contacts per minute), child-initiated interactive involvement (e.g., two or more consecutive reciprocal exchanges of turns comprising appropriate communicative actions or vocalizations), child's positive changes to interaction (e.g., frequency of behaviours such as teasing by the child, but excluded taught behaviours such as clapping), and the presence or absence of symbolic play.

Data were analyzed using a binominal test to see if there was a significant difference between the phases during the MIT sessions compared to the data collected at baseline. For "social acknowledgment", results indicated that during the baseline phase, an average of six minutes would elapse before the child would acknowledge her mother (although sometimes she would give no acknowledgement). When the MIT sessions were introduced the child was observed to always give a social acknowledgement and this occurred on average within 1 minute during the treatment phase and after 9 seconds during the follow-up phase. For eye contact, baseline data were observed to be low and stable, but once the MIT sessions began the child averaged a frequency of eye contact twice per minute and six times per minute during the follow-up phase. For child-initiated involvement, the child initiated 20% of interactive involvement during the baseline phase and this increased to 75% over the length of the treatment phase. Due to the fact that the initiations were sustained during the treatment phase, this measure was no

longer considered appropriate during follow-up since it depended on shorter interactions between the adult and child. For both the final two measures, child's positive changes to interaction and symbolic play, a developmental trend line was unavailable because such behaviours did not occur during baseline and were only observed on average once per session in the treatment phase and three times during follow-up for the child's positive changes to interaction and once during both treatment and follow-up for symbolic play.

Overall, the child did demonstrate some changes in social interaction including a decrease in the amount of time it took her to acknowledge her mother, an increase in eye contact and an increase in the number of times the child initiated interactive involvement with her mother. Furthermore, it appeared that these changes were sustained over a 20 month period. However, the authors concluded that it is unknown how much the child's development was a result of MIT and how much of it could be attributed to either changes in the mother's behaviour when interacting with her child or the child's maturation over the 20 month follow-up period. A further limitation lies in the implementation of the intervention by a musician who appeared to lack any specific therapy qualifications or prior training in music therapy. This being said, the increases found in the frequency of social acknowledgement, eye contact and child-initiated involvement during the treatment phase seem to suggest that the use of music alone is still influential on increasing social behaviours in the child with autism, however, had an accredited music therapist been used, the results of the study could have potentially been more significant.

Focusing directly on the specific social skill, "sharing", Starr & Zenker (1998) used a case example to illustrate a music therapy intervention with a 5 year old boy with mild to moderate autism. The boy was non-verbal, had poor eye contact and limited imitation skills. The primary goal of the intervention was to expand his socialization skills, by increasing the number

of minutes (e.g., from 0 to 2 minutes) he could share an instrument (e.g., play notes on the keyboard at the same time as the music therapist). A total of six music therapy sessions took place. Initially, the music therapist played the same unfamiliar song (e.g., "Mexican Hat Dance") on the keyboard and used a hand-over-hand approach to encourage the boy to play. Instead of playing with the therapist, the child appeared uninterested and unwilling to participate in sharing the keyboard with the therapist. In addition, he became engaged in social avoidant behaviours such as pushing random buttons on the keyboard or pushing the therapist's hand away from the keyboard when she attempted to play. This behaviour continued for three sessions. However, during the fourth session, the therapist chose to play the child's favourite song, "Winnie the Pooh", and by doing so was able to engage the child in sharing the keyboard with the therapist for 7 minutes. During the final session, the child was able to share the keyboard while playing music that was familiar to him for a total of 9 minutes, exceeding the original goal of 2 minutes that had been set out for him. Furthermore, he was engaged in a social responsive behaviour by making eye contact with the therapist while he played.

Starr & Zenker's study, (1998) also has similar limitations as those outlined in Stevens & Clark (1969) and Wimpory, et al. (1995), such as a small number of participants, and lack of measures for maintenance and generalization of skills beyond the specific music therapy setting. Had these limitations been addressed, the results of the study would have provided additional evidence of validity of this type of intervention.

To increase socially acceptable behaviours such as "using a quiet voice," and "following directions," Brownell (2002) used an ABAC/ACAB counterbalanced multiple treatment design to investigate the difference between using traditional social stories and musically adapted social stories, with four children having autism between the ages of 6 and 9. Together with the

classroom teacher, the therapist identified a target behaviour for each child which would be best suited for the social story intervention. Target behaviours included increasing the ability to follow directions and use a quiet voice, and to decrease the use of delayed echolalia. Each social story was written following Gray's guidelines relating to the social story ratio concerning the inclusion of descriptive, perspective and directive sentences (Gray, 2000). Following this, the music therapist composed original music for each of the stories using the sentences as song lyrics. Each treatment design began with the baseline (i.e., phase A) throughout which the therapist recorded the frequency of the target behaviour. This phase was followed by either the traditional spoken social stories (i.e., phase B) or the musical adaption of the stories (i.e., phase C). Two of the participants randomly received the ABAC treatment design and the remaining two participants received the ACAB treatment design. This counterbalanced design was used to avoid any learning or order effects associated with the order of the treatments. The results of this investigation indicated that the frequency of problem behaviour in all four children occurred less often during the music condition, although a statistically significant difference was evident with only one participant. Brownell (2002) was able to conclude that the musical adaptations of the social stories were at least as effective as the traditional spoken social stories.

This being said, some limitations do exist. Brownell (2002) used original unfamiliar melodies, which were paired with the social stories and sung with the students with autism. Brownell considered this a limitation because he believed that using a familiar melody would have further increased all of the students' ability to recall and convey the information in the social story. Furthermore, this study lacked measures for maintenance and generalization.

In another study using social stories, but this time with child-preferred melodies, Pasiali (2004) used music therapy to motivate and promote social skills acquisition in three children

with autism using a case study method. Similar to Brownell's method (2002), Pasiali (2004) specifically looked at decreasing socially unacceptable behaviours using an ABAB multiple baseline across participants design with children with autism. Three children with autism (ranging from high functioning to mildly impaired) between the ages of 7 and 9 years old participated in the study. An ABAB reversal design was used, where phase A represented the baseline, and phase B represented the treatment condition. Similar to Brownell (2002), the researcher, together with the parents of the children, identified a target behaviour for each child. For one child the target behaviour was decreasing aberrant vocalizations, for another, decreasing the number of times the child rewinds or fast-forwards the VCR, and for the third child the target behaviour was decreasing the number of times the child rummages through the kitchen cabinets. The therapist then asked the parents to identify their children's favourite songs. Using the familiar melody of the songs, the therapist replaced the traditional lyrics with new ones that followed Gray's guidelines for creating social stories (Gray & Garland, 1993), which aimed to address each of the child's target behaviours.

During the baseline phase one parent of each child collected data by recording the number of times the behaviour occurred during the 15-minute session in the child's home. After seven sessions had elapsed, the treatment phase was introduced in which the therapist incorporated the prescriptive therapeutic song by using three steps: (1) having the child listen to the song, (2) having the child play rhythmic instruments along to the song; and (3) having the child sing the song. Pasiali's (2004) rationale for using these three steps was to progress from a passive to an active position by stimulating multiple senses which would in turn increase awareness and responsiveness in the children with autism.

The results of the study showed a decrease in the occurrence of the problem behaviours for each of the three individuals, but similar to Brownell (2002), a statistically significant difference was found in only one individual between the baseline and the treatment conditions. Unlike several of the previous studies, Pasiali (2004) did conduct a follow-up with the participants three weeks after the completion of the final treatment phase and found that the frequency of the target behaviours for each child remained at a lower level than prior to the start of the study.

To address Brownell's (2002) limitation of using unfamiliar melodies, Pasiali (2004) used social stories set to child-preferred melodies in order to motivate and promote social skills acquisition in children with autism using three case studies. Still, limitations in this study include once again the limited number of participants as well as the possibility of bias as a result of having the parents of the children collect data on their own children. Future studies should consider having only individuals naïve to the intervention involved in data collection.

Duffy & Fuller (2000) implemented a music therapy social skills intervention and a non-music social skills intervention with two groups of children diagnosed as having a moderate intellectual disability. Although these children did not have autism, this study was included for its comparison between music and non-music interventions to increase social skills. The children were between the ages of 5 and 10, and each attended an intellectual disability day centre that provided day programmes for children and adults with mild to profound intellectual disabilities. The children were matched on age and intellectual ability and assigned randomly to either the music group or the non-music group. Both interventions were carried out by staff members at the day centre twice a week over an 8 week period and aimed to increase the following five target social skills: initiation, turn-taking, vocalization, imitation and eye contact.

The music intervention involved the use of a 30-minute pre-recorded cassette tape. A therapeutic manual accompanied the tape that provided detailed instructions for the child care staff to follow during each song on the tape. The non-music intervention was identical to the music intervention except for the addition of music. The activities used in both interventions were designed to promote the development of the selected social skills listed above by providing opportunities for learning through repetition and rehearsal. Examples of the activities include, turn-taking in a circle, imitation of the actions of the facilitator, interactive free play and relaxation.

Each music group session consisted of: a "signature tune", opening song, instrumental music, relaxation to music, action song, and a thank-you song, and used materials such as a drum, a keyboard, four shakers, a tambourine, two cymbals, two hand bells and scented lotion. Similarly, in the non-music group included an opening verse, free play, relaxation, action verse and a thank-you verse and involved materials such as a large ball, six small sponges, three tubs of play-doh, one telephone, one cash register and pretend money, one magic drawing board, one magnetic form board, three toy cars and scented hand lotion.

A social skills test was created to measure both the presence and quality of each of the five target social skills throughout a series of tabletop activities with each child. The quality of the social skills was measured using a five-point Likert scale where 1 represented "skill very poor" and 5 represented "skill well developed" The test lasted approximately 5 minutes and was administered prior to the intervention and again after the intervention was complete.

Following the 8 week intervention, results of the pre-test/post-test clearly indicated that significant improvements were made in each of the five target social skills for both the music and the non-music interventions. When the two interventions were compared, a significant difference

was found for only one target social skill (imitation) in which the music intervention appeared more effective. Duffy & Fuller (2000) proposed that "the synchronization of acts to musical rhythm helped both stimulation and coordination, enabling greater skill development than in the non-music condition" (p. 86). They further suggest that the sounds produced in the rhythmic repetition provide both corrective as well as motivational properties which tend to guide the timing and accuracy of the child's response (Duffy & Fuller, 2000).

One explanation for the lack of significance between the two interventions in most areas is that the music therapy intervention that was used was simply a pre-recorded cassette tape, not one that was designed and implemented by a trained music therapist. Duffy & Fuller (2000) acknowledge that a music therapy intervention put into practice by a trained music therapist may elicit more positive results due to the improvisational nature of live music in comparison to the pre-recorded music used in this study. King (2004) also suggests that live music is infinitely flexible which allows for change, cueing and reflection of the child's emotion or behaviour, all of which do not exist in pre-recorded music. This seems to suggest that although the pre-recorded music appeared to be effective for increasing imitation skills, the use of live music may have a greater effect on increases in initiation, turn-taking, vocalization, and eye contact. Duffy & Fuller (2000) go on to further suggest that in addition to the improvisational qualities of live music, the therapeutic relationship between the child and the music therapist may be what promotes progress in the client as well as maintains the client's interest over time. Had the intervention involved a trained music therapist, the results may have had greater significance in the four remaining areas of social skills.

To improve peer interactions and meaningful play in children with autism, Kern & Aldridge (2006) used a music therapy intervention with four boys between the ages of 3 to 5

enrolled in a community-based childcare program. The music therapy intervention was designed to motivate children with autism to participate in playground activities as well as to improve their social skills while interacting with their same-aged peers. The intervention took place on a typical children's playground during the preschool's daily morning scheduled outdoor play-time. An outdoor "music hut" (i.e., a structure made up of musical instruments such as an ocean drum, bongo drums, sound tubes, and a wind gong) was added to the playground for the purpose of expanding learning opportunities and therapeutic playground activities, primarily for the children with autism. Prior to the start of the study, the music therapist composed songs for each child in order to structure and engage the children in the activities taking place in the music hut. The songs focused on the children's strengths and aimed to address their individual education goals such as turn taking, choice making, and use of appropriate body contact.

A multiple-baseline across participants design was used with four conditions (baseline, adaptation of the playground, teacher-mediated intervention and peer-mediated intervention), and replicated across the 4 participants. The baseline condition (i.e., Phase A) determined the natural interactions of the children with autism and their peers on the playground. Any interactions that occurred were completely spontaneous and were not encouraged or supported by the therapist or staff members. Throughout this condition, no musical adaptations had been made to the playground.

The music hut was present during Phase B, and throughout this phase the child's teacher walked each child to the hut, gave him a drumstick and asked him to play in the music hut. Each child's behaviour was observed, and any changes relating to the addition of the music hut were noted. Thus, this phase essentially served as a second baseline. The music hut was introduced to all the children at the same time. Due to the cost, effort and time involved in its installation, it

was not possible to introduce it in a time-lagged fashion (as would normally occur in a multiple baseline design). Therefore, an experimental evaluation of the music hut in the first two conditions is not possible. The remaining phases were carried out as a multiple baseline design across participants.

During Phase C (i.e., the teacher-mediated intervention) each child chose two "peer-buddies" to play with on the playground. The teacher then followed through with the following five steps: (1) entering the music hut with the child and at least one peer-buddy; (2) initiating play, including both children on their level; (3) singing the song composed by the therapist and playing instruments in the music hut; (4) modeling the content of the song (e.g., choosing an instrument, naming peers, waiting for turns, and making appropriate body contacts); and (5) continuing to play in the music hut for 10 minutes at a time. During this phase the teacher's task behaviours were observed and analyzed.

Phase D (i.e., the peer-mediated intervention) was almost identical to Phase C except that the teachers withdrew their support once the peer-buddies and the child with autism had learned the song and play routine. The goal of this phase was to have the children play with each other independently.

Video-taped segments of each session were analyzed for categories of interaction behaviours as well as play and engagement. The categories for the children with autism included initiating interaction, displaying positive interaction, staying in the music hut, and engaging and playing with material and equipment. Categories for the same-aged peers included initiating interaction, displaying positive interaction and staying in the music hut. Finally, the categories for the teachers included supported interactions and unsupported interactions.

Results indicated that all of the children with autism were attracted to the sounds produced by the instruments in the music hut and would explore their sounds for short periods of time (Kern & Aldridge, 2006). Although it was determined that the addition of the music hut alone did not improve social interaction, it was considered necessary to have the combination of both the music hut and the teacher and peer-mediated interventions to assist in increasing peer interactions and meaningful play on the playground. Furthermore, Kern & Aldridge (2006) state that the attractiveness of the hut and the opportunity to participate in joint musical activities facilitated motivation in the children with autism to interact socially with their peers on the playground. Finally, it appeared that using music enabled the children to reach their specific therapeutic goals, thus supporting similar application of songs for skill development in early childhood settings (Kern & Aldridge, 2006).

Similar to Stevens & Clark (1969), Wimpory, et al. (1995), Starr & Zenker (1998), and Brownell (2000) limitations of the Kern & Aldridge study (2006) include the small number of participants involved, as well as the lack of maintenance or generalization measures in relation to the children's skill acquisition across settings and whether or not the teacher and the peer interventions would continue in absence of the collaboration from the therapist. That being said, this study clearly illustrates the potential of a music therapy intervention to increase the social interactions of young children with autism.

The Role of Motivation in Music Therapy

One recurring aspect found in several of the above music therapy interventions seems to be the significance of motivation as a pivotal area which, when targeted, increases several areas of socialization. Pivotal areas are described by Koegel & Koegel (2006) as areas such as motivation, responsivity to multiple cues, self-management, self-initiations, and empathy which

are targeted to produce changes in other untargeted areas of functioning and responding. Koegel, et al. (1987) found that child-preferred activities (such as playing with a ball, or puzzle, listening to popular songs or playing musical instruments) increased motivation in children with autism and therefore they spent less time engaging in social avoidance activities. Thus, using music as a motivational tool may have the potential for the music therapist to create change in other areas of functioning and responding.

Children with autism are typically not motivated to perform a task or engage in an activity to simply satisfy the demand of an adult (Kern, Wakeford & Aldridge, 2007). Instead, they often need an incentive or self-motivating purpose to follow through with a less preferred task or demand, and for many children, music can offer such an incentive. Oldfield (2006) states that children are drawn to music in the most basic physical way that does not require intellectual ability or social skills to elicit a physical or emotional response; making music may be particularly relevant for young children with autism who may not be able to communicate effectively through speech. Furthermore, she suggests that music may be particularly motivating for children with autism because:

> Unlike painting, for example, or putting puzzles together which require attention and interest from the child to be successful, the music making can accompany the child even if he does not play any instruments himself or appear interested in any way. Children who are very isolated can be allowed to roam freely, but the improvised music will accompany their movements and perhaps motivate them to take an interest in where the sound is coming from. (p. 66)

The use of music to connect with the child at his or her own level of functioning is important in order to produce some level of motivation within the child to follow through with an activity or to complete a desired task.

Kern et al. (2007) used music to teach several self-care tasks (e.g., hand-washing, toileting and cleaning up) to a young boy with autism. Acknowledging the fact that children with autism may not find inherent value in completing self-care tasks, Kern et al. (2007) state that these children are unlikely to be self-motivated to perform the self-care task simply because they have been asked to do so, or for the reason of meeting what is considered a social standard. Kern et al. (2007) incorporated pre-existing routines and songs used by the classroom teacher into the intervention. Two of the songs used familiar melodies with lyrics relating to the self-care tasks (i.e., the melody of "Row, Row, Row Your Boat" with lyrics that state the steps of hand-washing such as "turn the water on", "wet your hands", "get the soap" etc), while the third song was an original song outlining the 10-steps required for toilet training. The songs were implemented by teachers in the child's classroom during the children s regular routines of hand-washing, toileting and cleaning up. When compared to an identical non-music intervention, it was found that although both interventions were beneficial for completing all three of the self-case tasks, the music intervention was clearly more effective than the non-music intervention during the self-care task of "cleaning up" The song used during the task of cleaning up seemed to be most effective because unlike the original song, the cleaning up song was already familiar to the child. It was also thought to be more effective than the hand-washing song because it was also used more frequently throughout the day. Kern et al. (2007) state that, as previously suggested in past literature (Brownell, 2002; Kramer, 1978), using songs for daily classroom routines seems to make the tasks more enjoyable and motivating for children rather than just using verbal

reminders to encourage them to complete the task. Furthermore, Kern et al. (2007) suggest that because music is a naturally occurring part of children's daily lives, it can be used as a means to motivate and enliven engagement during challenging tasks. This seems to imply that other skills, including social skills may be enhanced if music is used in such a way to motivate the child to complete tasks, which without music are otherwise considered less preferred.

Several early studies examined the influence of motivation on the performance of young children with autism. Rincover, Newsom, Lovaas & Koegel (1977) assessed the reinforcing properties of sensory stimulation for four children with autism. Three different sensory stimuli were used as response-contingent reinforcers. These were pre-recorded music, a low-intensity strobe light, and a windshield wiper enclosed in a wooden box with a Plexiglas front. Phase I of the experiment determined whether each of the children would respond to all of the reinforcers, some of the reinforcers or none of the reinforcers by recording the rate of each child pressing a "response bar", which in turn would maintain the stimulus. Each child demonstrated an obvious preference for one type of stimuli, which was determined by the fact that their response rate was consistently above the response rate for any of the other stimuli.

Two of the same children went on to participate in Phase II where each child's preferred stimulus was used to determine the durability of each stimulus (e.g., if the stimulus could be maintained over a long period of time without satiation occurring) using the same contingency of the response bar. Results indicated that both of the children produced high response rates for each of their preferred stimuli over a six week period and even when their response rate began to drop, it was discovered that when small changes were made to the stimuli, such as changing the music or increasing the oscillation speed of the wiper blade, the children's response rate immediately began to increase. The child who preferred the music stimulus averaged 14

responses per minute by session one, which then increased to 32 responses per minute in session five. His results fluctuated over the following 20 sessions, but were generally maintained until the 26th session. At this time, his response rate dropped and remained at a low level (e.g., less than 5 responses per minute) for the following eight sessions. A new pre-recorded song was then introduced in place of the first song and as a result his response rate immediately recovered to 30 responses per minute. Although, music was not the preferred stimulus for every child, it is clear that when the stimulus is child-preferred, it elicits a consistent and on-going response from the child. Rincover et al. (1977) suggest that the problem with satiation of items such as food could be solved by using child-preferred sensory stimuli, which seems not only capable of eliciting large amounts of desired behaviour, but also sustains a high level of motivation which can be applied to treatment goals.

Dunlap & Koegel (1980) continued to explore the effects of motivation on the task performance of two children with autism by comparing a constant task condition with a varied task condition. The constant task condition involved repeated presentation of a single task selected from the child's current program (e.g., colour identification – "what colour is this?"). Only the desired target behaviour was taught throughout the session and the child was prompted and reinforced for correct responses. The varied task condition was conducted in an identical fashion, but several tasks that were taken from the child's current program were introduced (e.g., Colour identification – "what colour is this?"; Object identification – "touch your right leg"; Picture labeling – "what is this?" etc.). A multiple baseline design across behaviours was utilized in order to evaluate the effectiveness of the two methods described above.

Results indicated that the varied task condition was clearly more effective in producing higher levels of correct responses than the constant task condition, yet the effectiveness of

response acquisition between both the constant task condition and the varied task condition was not clear. High levels of correct responding throughout the early sessions of the constant task condition suggested the possibility that some of the responses could have been learned previously (Dunlap & Koegel, 1980). Therefore, Dunlap & Koegel (1980) suggested that the varied task condition may have influenced the children's level of motivation when responding to the tasks, but may not have influenced their ability to learn the tasks in the first place. This being said, it does seem that by varying the tasks throughout a therapy session, the child with autism is both motivated to complete the task, as well as being positively reinforced for correct responses with the novelty of a new task to complete.

In an effort to specifically examine the influence of child-preferred activities on the social behaviour of children with autism, Koegel, Dyer, & Bell (1987) measured the frequency of social avoidance behaviours of nine children with autism when engaged in preferred and less preferred play activities. Social avoidance behaviours were defined as those that reduced the amount of interaction between the adult and the child including gaze aversion, moving away from the adult, pushing the adult away, pushing the toy away, hanging head, closing eyes, and not coming when called. In addition, child-preferred play was defined as appropriate play behaviour that was initiated by the child (e.g., shaking a maraca), whereas less preferred play was considered to be adult-determined activities guided by verbal, gestural or physical prompts. An adult who was unfamiliar to the child conducted each session. The adult was given the instruction to play with the child and to change toys about every minute. Examples of toys included a maraca and a toy phone. Results indicated a positive correlation between child-preferred play and the child's level of social interest and involvement (Koegel, et al., 1987). In particular, low levels of social avoidance behaviours occurred when the children were engaged in

child-preferred activities. On the other hand, social avoidance behaviours increased when the activities were considered less-preferred. Once again, it seems that by utilizing activities that are child-preferred, children with autism are motivated to follow through with tasks and may in fact demonstrate a higher level of social interest as well as social involvement.

Despite the fact that many children with autism are often considered to be unmotivated when it comes to completing tasks (especially those which are considered to be less-preferred), research has indicated that child-preferred activities result in better performance on tasks and improvement in general social behaviour. Furthermore, many children with autism appear to be happier, more enthusiastic, more interested and better behaved when engaged in preferred tasks (Koegel & Mentis, 1985). This would suggest that by implementing more child-preferred activities, such as music, into children's routines, they will be motivated to engage in tasks that may produce higher levels of social responsive behaviours.

Limitations of Music Therapy Research

Although the extant research suggests that music therapy can be a positive therapeutic intervention for children with autism, numerous limitations exist in studies in the literature. First, in a meta-analysis of music therapy research conducted with children and adolescents with autism, Whipple (2004) concluded that although music therapy was effective for people with autism spectrum disorders, many studies were poorly designed and lacked quantitative data to support their findings. This finding is clearly evident in the research outlined above. The descriptions of the method in several of the studies discussed above (Starr & Zenker, 1998; Stevens & Clark, 1969; Wimpory et al., 1995; Woodward, 2004) were extremely vague, therefore prohibiting replication of the study. This should encourage future researchers to be meticulous when choosing and describing a treatment design in order to strengthen and validate

the results of their research. In another review, Ball (2004) states that the effects of music therapy are unknown and limited by the poor quality of the evidence. This review, however, failed to include several relevant studies and furthermore, in the studies that were reviewed, the music therapy intervention was often implemented by a therapist that was described as having "no specific therapy qualifications" (p. 7). The importance of having an accredited music therapist conduct the music therapy intervention is emphasized by Gold, Wigram & Elefant (2006) who state that the music therapist's academic and clinical training is a necessity which ensures that the intervention is put into practice responsibly. Gold, et al. (2006) also noted the importance of using larger sample sizes as well as standardized and published tools when evaluating the efficacy of a music therapy intervention. It was also suggested that more research is needed to determine the long-term effects of a music therapy intervention as many of the current studies only focus on the results of short-term interventions. Finally, Accordino, Comer & Heller (2007) reviewed several studies involving music therapy and children with autism, only to conclude that the studies consistently lacked statistical analyses, maintenance and generalizability measures, and that many studies failed to compare the music therapy interventions with other forms of therapy when treating children with autism.

In the studies described above, one shortcoming that seemed to recur most is the small number of participants used in each study. Many of these studies (Brownell, 2002; Kern & Aldridge, 2006; Pasiali, 2004; Starr & Zenker, 1998; Stevens & Clark, 1969; Wimpory, et al., 1995) used sample sizes ranging from one to five participants, which unfortunately, limits the possibility of generalizing the results to a larger population. This ultimately challenges the true efficacy of a music therapy intervention with children with autism in general.

Another common problem is that much of the body of research involves retrospective analyses of clinical music therapy sessions, rather than well-designed research with appropriate controls and measures for generalization and maintenance (Kern, 2007; Starr & Zenker, 1998; Woodward, 2004). In addition, all but two of the studies reviewed above (e.g., Pasiali, 2004; Wimpory et al., 1995) failed to include a follow-up phase to determine whether or not the skills the child learned had been maintained over time. Furthermore, none of the studies described above examined the possibility of whether or not the results could be generalized to other settings. Finally, although none of these studies compared a music therapy intervention with other forms of therapy, Brownell (2002) and Duffy and Fuller (2000) did compare a music therapy intervention to non-music intervention and Kern & Aldridge (2006), evaluated the effects of both a teacher-mediated music intervention as well as a peer-mediated music intervention with children with autism.

Rationale of the Current Study

A common recurring factor in these studies appeared to be the significance of using music as motivation to increase social skill development in children with autism. Several studies suggested that child-preferred activities, such as music, could produce some level of motivation within the child to follow through with a task or activity that was otherwise considered undesirable. Furthermore, many children appeared to have a more positive affect when engaged in the preferred activity. Therefore, as noted in the previous chapter, the purpose of the current study is to determine the effect of using music therapy on the social responsiveness and social avoidant behaviours of a preschool child with autism. Specifically, it is hypothesized that the child will engage in a greater number of social responsive behaviours and fewer social avoidance behaviours in a music therapy condition than in a non-music condition in which the same

activities are done, but without music. Furthermore, this study will add to the growing body of literature of music therapy and its effect on the social development of children with autism.

Given the previously discussed limitation in the extant research regarding small number of participants, it was originally intended to conduct a multiple-baseline across participants study. However, due to logistical difficulties (e.g., finding children who did not already possess the specific skills that were intended to be taught) this was not possible. Therefore, the current study used a single-subject alternating treatment design in which the participant acted as her own control (Barlow & Herson, 1984; Kennedy, 2005) to evaluate the effect of a music therapy intervention, on the social responsive behaviours of a pre-school child with autism. Kennedy (2005) states that single-subject alternating treatment designs "are used to demonstrate experimental control within a single participant" (p. 12). This design allows for two treatments to be administered, alternating with one another while the effects on behaviour of a single participant are observed. This flexibility allows for experimental control-and-contrast conditions that are not possible with other types of single-subject designs (Kennedy, 2005). By alternating the two treatments, the researcher can observe not only the trend towards improvement, but also compare the effectiveness of each individual intervention on the participant (Barlow & Herson, 1984). Single-subject designs have been widely used with children with autism in the past to evaluate a variety of interventions such as adult-directed teaching, differential reinforcement, peer-mediated interventions, visual supports and positive behavior support (Odom, et al., 2003).

By using a single-subject alternating treatment design, the current study was able to control for some of the limitations found in previous music therapy research as discussed above. For example, in contrast to much of the music therapy research involving case studies, the current study implemented a single-subject alternating treatment design that uses quantitative

data to support its findings. Second, the current study compared two interventions (e.g., music and non-music conditions), which addressed the existing criticism that comparison between two interventions is often lacking in previous music therapy research (Accordino et al., 2007). Additionally, in response to the lack of maintenance measures in previous studies, a follow-up phase was incorporated to determine if the results of the study could be maintained over time. Finally, although the current study has only one participant, the single-subject alternating design as described above allows for both interventions to be observed and compared effectively with one participant which cannot be done using any other type of single-subject design (Kennedy, 2005).

CHAPTER III

DESIGN AND METHODOLOGY

Participant

One, 3 year and 8 month old girl with autism, Anna[1], participated in this study. Anna was attending an early intervention program for children with autism and had no prior exposure to on-going music therapy sessions at the time of the study. Parental permission was obtained to review all assessments and evaluations to confirm diagnosis, and to enable thorough descriptions of the child. Anna is Filipino and was diagnosed as having autism by a psychologist. Using standardized assessment tools, she met criteria for Autistic Disorder specified in the DSM-IV-TR (American Psychiatric Association, 2000). The following assessments were administered to Anna over a period of several months by three different psychologists: The Mullens Scales for Early Learning (MSEL), the Vineland Adaptive Behaviour Scales – Second Edition (VABS-II), the Childhood Autism Rating Scale (CARS) and the Autism Diagnosis Observation Schedule (ADOS) – Module 1.

Mullens Scales for Early Learning (MSEL). This scale assesses children's language, motor and perceptual abilities. Anna scored an early learning composite score of less than 52 which corresponds to less than the 1st percentile rank relative to her peers and represents a developmental age of 1 year, 6 months (Mean= 100; SD= 15). Anna demonstrated relative strengths in visual reception and fine motor skills, but had significant deficits in both receptive and expressive communication skills with score of less than 55 in both areas, which corresponds to a 7-8 month level.

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[1]Name has been changed to protect confidentiality.

Vineland Adaptive Behaviour Scales – Second Edition (VABS-II). This scale is designed around four behaviour domains: communication, daily living skills, socialization and motor skills. Anna received an adaptive behaviour composite score of 62 which again corresponds to the 1st percentile compared to her same age peers and represents an age equivalent of 1 year, 6 months. Her fine motor skills were considered adequate at an age equivalency of 2:5 years, while she scored lower on daily living skills were with an age equivalent of 1:5 years. Communication and socialization received scores corresponding to an age equivalent of 0:11 months and 1:3 years respectively.

*Childhood Autism Rating Scale (CARS).*The CARS is a 15-item behaviour scale designed to help identify children with autism. Children's behaviour is rated in 15 areas on a scale of 1 (appropriate) to 4 (severely inappropriate/atypical). Anna's overall score was 42 placing her in the "severely autistic range" (scores over 37 are considered severe autism range).

Autism Diagnosis Observation Schedule (ADOS) – Module 1. The ADOS is an observational scale that assesses communication, social interaction and play or imaginative use of materials. Anna's total score on the ADOS was 20, which puts her in the autism range (e.g., total score = 20, autism cut-off = 12, autism spectrum cut-off = 7, maximum possible score = 24). During clinical observation, Anna was described as a pleasant girl who was fairly easy to engage. She responded well to verbal praise and reinforcement and was able to transition well from activity to activity. Anna was observed to have poor eye contact and limited social interaction with others. Her facial expressions tended to be bland and solemn with occasional smiles. She demonstrated significant deficits in her language skills and had difficultly responding to simple verbal input such as her name, and one-step instructions (e.g., "Pick up the book"). For the most part considerable prompting and showing was necessary to elicit a response from her.

She was non-verbal, but engaged in babbling and single consonant sounds. Anna was not observed to play with toys often, but when she did she would not use them for their intended purpose (i.e., she would spin the wheels on a car with her hands, flip pages in a book or occasionally line things up). Anna demonstrated some repetitive behaviours such as grinding her teeth.

Anna was selected for participation in this study on the suggestion of her behavioural therapist, based on her diagnosis of autism and her difficulties with engaging in social responsive behaviours.

Materials

A total of six toys were used throughout the course of the study for the purpose of offering the child opportunities to engage in social responsive behaviours using either a spoken script or a sung melody. The toys were ones considered "neutral" in that they were not associated with characters from movies or television shows, and did not have any buttons or switches that light up or play music or that otherwise might be inherently attractive or that require the therapist to "activate." All six toys were used during the baseline and follow-up phases, but during each intervention phase three toys were randomly assigned to each intervention (e.g., music or non-music). In accordance with Dunlap & Koegel (1980) as discussed above, a variety of toys was used for the purpose of motivating the child to complete the task, as well as to positively reinforce the child for correct responses with the novelty of a new toy. The toys used during the music intervention included a large ball, a plastic car with two plastic people, and a large gathering drum. The non-music intervention toys included five plastic farm animals, colourful stacking cups and two plastic maracas. During the music intervention, familiar melodies were sung with lyrics appropriate for the specific toy that was being used. The non-music intervention

used spoken scripts using words which were similar to those used in the melodies (see Appendix B). During the music therapy condition, the therapist used a guitar to accompany the songs.

Procedure

To ensure the efficacy of the procedures as described below, a pilot study was conducted by the researcher with two children, and procedures were adjusted as necessary prior to conducting the study proper.

A single-subject alternating treatment design as described in the previous chapter (Barlow & Herson, 1984; Kennedy, 2005) was used to evaluate the effects of both music and non-music interventions. All sessions were videotaped for later coding.

Anna was seen individually for a total of four times a week; twice a week the sessions were held at the preschool in a large empty room, and the remaining two sessions were held at home in the family's living room. Each 15-minute session took place with the music therapist and the child sitting on a large mat on the floor in the corner of the room. The child's behaviour therapist (e.g., when at the centre) or mother (e.g., when at home) sat directly behind Anna during each session and would re-direct her when needed (e.g., if she stood up, they would help her to sit back down). However, neither the behaviour therapist nor Anna's mother prompted Anna to complete tasks in any way. Each session was videotaped and later coded for social responsive and avoidance behaviours, and for determining inter-observer agreement (described below).

The experimental design involved the four following phases, each of which were implemented sequentially:

Baseline phase (A). In the baseline phase, Anna was seated on the floor with the music therapist and was randomly presented with each of the six toys for 3 minutes. The therapist

offered opportunities for imitation and turn-taking such as tapping on the ball or shaking the maraca up high, but no instruction or prompting was given to her at this time. The purpose of this was to observe and evaluate the naturally occurring social responsive and social avoidant behaviours of the child. Once a stable baseline of social responsive and social avoidance behaviours was attained (i.e., 8 sessions), the alternating phase (Phase B) was introduced.

Alternating Phases (B). During this phase, both the music and non-music conditions were randomly conducted over a total of 12 sessions. The music condition used three toys (i.e., the drum, the car and the ball) and each one was presented to the child sequentially for 5 minutes. In this phase, unlike during baseline, the therapist interacted with Anna by offering her a certain number of opportunities to engage in socially responsive behaviours and, when necessary, would gesturally and/or verbally prompt her to follow through with the task. For example, while taking turns playing the drum, the therapist would take a turn with the mallets and say "Emily's turn" She would then pause and wait for Anna to initiate her turn. If Anna did not respond the therapist would hold the mallets out towards Anna. If Anna still did not respond by taking the mallets, the therapist would give the verbal prompt, "Anna's turn" and wait again to see if Anna would take the mallets. The number of opportunities given versus the number of correct responses from Anna were scored and turned into a percentage (e.g., 3 correct responses out of 5 opportunities given is 60%.)

Similar to the music invention, the non-music intervention used the other three toys (i.e., stacking cups, farm animals, and the maracas), and each one was presented to the child sequentially for 5 minutes. The therapist interacted with the child during this condition in the same way described above during the music condition. The activities used in both the music condition and the non-music conditions were conducted in a similar fashion, except with the

addition (or deletion) of music. This phase continued until a change in behaviour was observed (i.e., number of social responsive and/or social avoidance behaviours began to increase or decrease respectively, or alternatively, until 10 sessions elapsed).

Music II (C). Once a total of twelve sessions had elapsed, the toys used in the less effective intervention were then paired with melodies and presented to the child for an additional 7 sessions. Similar to Phase B, the therapist interacted with the child by offering her a certain number of opportunities to engage in socially responsive behaviours and when necessary would gesturally and/or verbally prompt her to follow through with the task. The purpose of this was to determine if there would be a difference when the same toys that were used in the non-music intervention were used with music.

Follow-up (D). Two follow-up sessions were conducted one week apart beginning two weeks after the final intervention phase. Similar to baseline (A), Anna was randomly presented with each of the six toys for 3 minutes with no instruction or prompting from the therapist. The purpose of this was to determine whether or not the social responsive behaviours Anna had demonstrated during the intervention phase had been sustained.

Measurement

Two classes of behaviour were measured for frequency: social responsive behaviours and social avoidance behaviours. The social responsive behaviours that were measured were adapted from Duffy & Fuller (2000), and are defined as behaviours that increase the amount of interaction between the child and the therapist. They included: a) eye contact (i.e., the presence of eye contact with the researcher for a minimum of 3 seconds); b) imitation (i.e., the ability to respond to and copy repeated actions of the researcher); and c) turn taking (i.e., the ability to wait for a turn, take a turn and pass on turn to the researcher). Eye contact was recorded as a

frequency count, whereas both imitation and turn-taking were scored as a percentage (e.g., the number of responses as a percentage of the number of opportunities given).

The social avoidant behaviours that were measured were adapted from Koegel et al. (1987), and were defined as behaviours that reduced the amount of interaction between the child and the therapist. They consisted of active attempts to avoid the therapist and included the following: a) gaze aversion (the child's gaze is directed away from the therapist and, at the same time, the gaze is not directed at a particular object for more than 3 seconds, or the child's eyes are closed eyes for 2 or more seconds, not blinking); b) pushes toy away (the child pushes or throws the toy away); c) pushes adult away (the child pushed the adult away with his hands); and d) moving away (the child gets up and walks or runs away from therapist). All social avoidant behaviours were scored using frequency count.

A data collection form was created to record and monitor these behaviours and is included in Appendix C.

In addition, the Rating Scale for Child Affect (Interest and Happiness) and General Behaviour was used to determine the general effects that the intervention may produce (see Appendices D & E). This scale was adapted from Dunlap & Koegel (1980) and was implemented to determine and compare Anna's level of interest, happiness and general behaviour during the baseline and the intervention phases.

Anna's level of interest was scored as either a 1, suggesting that she was "uninterested" in the activity, a 2, suggesting she had a "neutral interest" (e.g., neither particularly interested or disinterested) in the activity or a 3, suggesting she was "interested" in the activity. Similarly, for "happiness", Anna was given a score of 1 if she appeared "unhappy" during an activity, a 2 if she appeared "neutral" (e.g., neither happy or unhappy) during an activity, or a 3 if she appeared

"happy" during an activity. Finally, for general behaviour, Anna received a score of 1 if she was "poorly behaved" during the activity, a score of 2 if her behaviour was "neutral" or a score of 3 if she was "well-behaved" during the activity.

Data Analysis

The most common form of data analysis in investigating changes in behaviour is visual data analysis. Data are collected, displayed on a graph and analyzed for specific types of patterns in which to draw conclusions for what the data may represent (Kennedy, 2005). Visual data analysis has proven to be one of the most powerful and useful techniques in science, which Kennedy (2005) suggests offers a method of exploring and describing the results of a study in several ways. He proposes that the visual inspection of data allows the researcher to not only monitor the data on a daily basis and make any necessary updates or adjustments to the experimental procedures, but also to investigate various patterns and aspects of the data which leads to greater understanding of the results. This being said, one of the strongest criticisms of visual data analysis is that several researchers analyzing the same graph may draw different conclusions, which results in an inconsistent and therefore, less reliable analysis of the results. The current study, therefore, used a systematic analysis of visual inspection, as well as an examination of the Percentage of Nonoverlapping Data (PND), to calculate the effectiveness of the treatments implemented in this study and to minimize any inconsistencies which may occur as a result of visual data analysis.

PND is a common method of analysis used in single-subject research. It is based on the calculation of percentage of nonoverlapping data between the baseline and treatment phases (Scruggs, Mastropieri & Casto, 1987). It is suggested that the effects of a treatment are considered reliable when the performance during the intervention phase does not overlap with

the performance during the baseline phase. Furthermore, the effects of the treatment are strongly supported when such nonoverlapping data are replicated during different treatment phases (Kazdin, 1978 as cited in Scruggs & Mastropieri, 1998). PND aims to synthesize single-subject research and has been found to be versatile and systematic in determining covariation of study characteristics and outcomes. As it is simple to calculate and interpret meaningfully, PND is widely used, allowing researchers to focus on one meaningful outcome, which can be applied to a large body of individual studies (Scruggs et al., 1987).

The proportion of nonoverlapping data found in this study was calculated based on the procedure described by Scruggs et al. (1987). First, the number of treatment data points exceeding the highest baseline data point was determined and then divided by the total number of data points in the treatment phase and finally, multiplied by 100 to determine a percentage. The lower the percentage of overlap between the baseline and treatment phases, the more impact the intervention had on the target behaviour (Tawney & Gast, 1984 as cited in Scruggs & Mastropieri, 1998). In the current study, PND was determined for both the music and non-music conditions for each category of social responsive behaviours.

Inter-observer Agreement

Inter-observer agreement was calculated for each of the social responsive and avoidant behaviours as well as for the rating scale for child affect and general behaviour. A behaviour therapist at the early intervention centre who was naïve to the purpose of the intervention acted as the second observer. The music therapist explained the operational definitions of the social responsive and avoidant behaviours, as well as the categories on the child affect and general behaviour rating scale. The behaviour therapist was then shown examples of these behaviours from the videotapes. Following this, the behaviour therapist independently coded the behaviours

from 5 sessions (e.g., 20%) which were selected randomly from the course of the study. Inter-observer agreement levels for each category were calculated by dividing the number of agreements by the total number of agreements plus disagreements multiplied by 100 (Kennedy, 2005). Inter-observer agreement for social responsive behaviours was 87% (range 85% to 96%), while for social avoidant behaviours it was 86% (range 85% to 86%). Collective agreement was 87% (range 85% to 96%).

CHAPTER IV

RESULTS

Results of this study indicate that the number of social responsive behaviours increased considerably during the music therapy condition. Results for each social responsive behaviour are presented in the following order: eye contact, imitation and turn-taking.

Social Responsive Behaviours

Eye Contact. As seen in Figure 1, in the baseline phase (Phase A), Anna did not display any occurrences of direct eye contact with the music therapist. During the alternating treatment phase (Phase B), eye contact did not occur during any of the non-music sessions. Eye contact however was observed in 5 of the 6 music intervention sessions, ranging from 1 to 3 occurrences. Furthermore, when the non-music toys were set to music in Phase C, eye contact was noted in 6 of the 7 sessions and ranged from 3 to 5 occurrences. During the follow-up phase, however in which no music was used, the frequency of eye contact returned to zero.

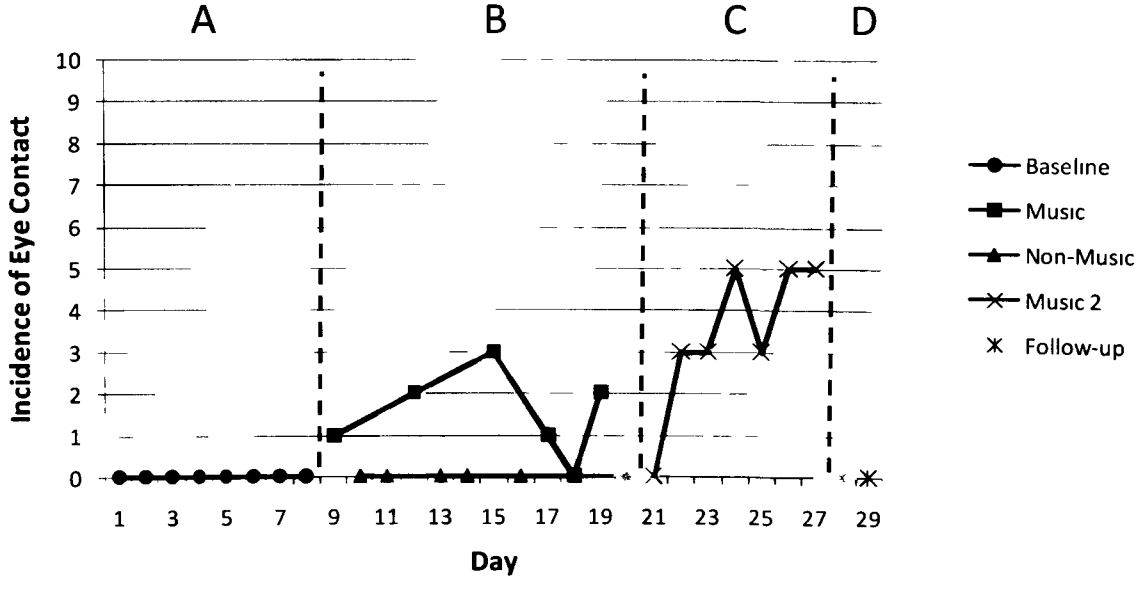

Figure 1. Incidence of eye contact.

The Percentage of Nonoverlapping Data (PND) was calculated for the music condition in Phase B and resulted in 83.3%. This means that the percentage of overlap with the baseline was only 16.7% suggesting that the music condition was influential in increasing the frequency of Anna's eye contact. Furthermore, the second music condition resulted in a PND score of 85.7%, with an overlap of only 14.3% with the baseline. As mentioned in the methods chapter, the lower the percentage of overlap between the baseline and treatment phases, the more impact the intervention had on the target behaviour. Therefore, this strongly suggests that the music intervention was effective in increasing the frequency of eye contact. As seen in Figure 1. the frequency of eye contact remained at zero throughout the non-music intervention and therefore, the PND could not be calculated for this condition.

Imitation. In the baseline (Phase A), Anna's imitation skills were quite low and variable ranging from 0% to 20.7% (see Figure 2). In 3 of the 8 sessions no imitation was observed, while in the remaining 5 sessions her imitation skills appeared inconsistent and ranged from 4.2% to 20.7%. During the Alternating Treatment Phase B, Anna demonstrated lower percentages of correct responses of imitation in the non-music condition than in the music condition.

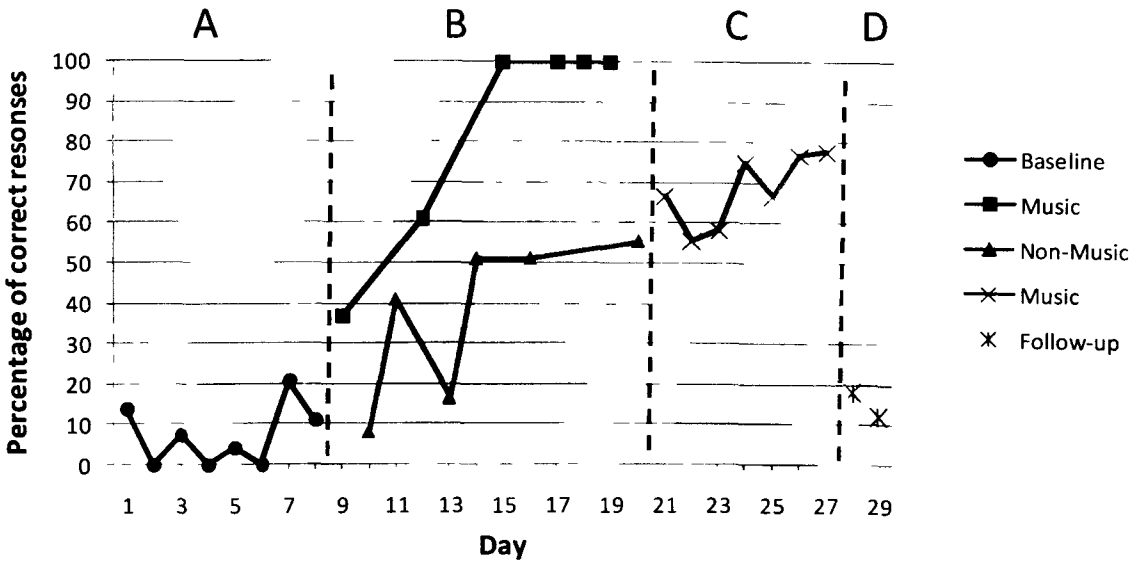

Figure 2. Percentage of correct responses for imitation.

In the non-music condition the percentage of correct responses of imitation ranged from 8.3% to 55.3%. The final three sessions appeared relatively constant with percentages of 51%, 51% and 55.3% respectively. In the music condition, however, the percentage of correct responses of imitation increased steadily from 36.7% to 100% and remained stable at 100% for the final four sessions.

During Phase C, the use of music with the toys that were previously used in the non-music condition, showed an increase in the number of correct responses of imitation. Although varied, the scores ranged from 55.6% to 77.7%. During the follow-up phase the percentage of correct responses of imitation displayed a large decrease with percentages of 18.1% and 12.2% for the first and second sessions respectively.

The PND was calculated for the both the non-music and music conditions in Phase B. The non-music condition resulted in 66.7% indicating an overlap with the baseline of 33.3%. This suggests that the non-music condition was somewhat effective in increasing Anna's imitation skills. The music condition however, resulted in 100% meaning zero overlap occurred between music and the baseline suggesting that the music condition was more effective in increasing imitation. Furthermore, the second music condition in Phase C also resulted in 100% meaning that no overlap occurred between the baseline and Phase C. The fact that no overlap was found between baseline and both the music condition in Phase B and the music condition in Phase C strongly indicates that the music condition was successful in increasing Anna's imitation skills. It also further supports the finding that the music condition was more effective than the non-music condition in increasing imitation.

Turn-taking. As seen in Figure 3, in the baseline (Phase A), Anna demonstrated very low percentages of turn-taking skills which ranged from 0% to 8.3% with all but two sessions at 0%.

During the alternating treatment phase, Anna again demonstrated lower percentages of correct responses for turn-taking in the non-music condition compared to the music condition.

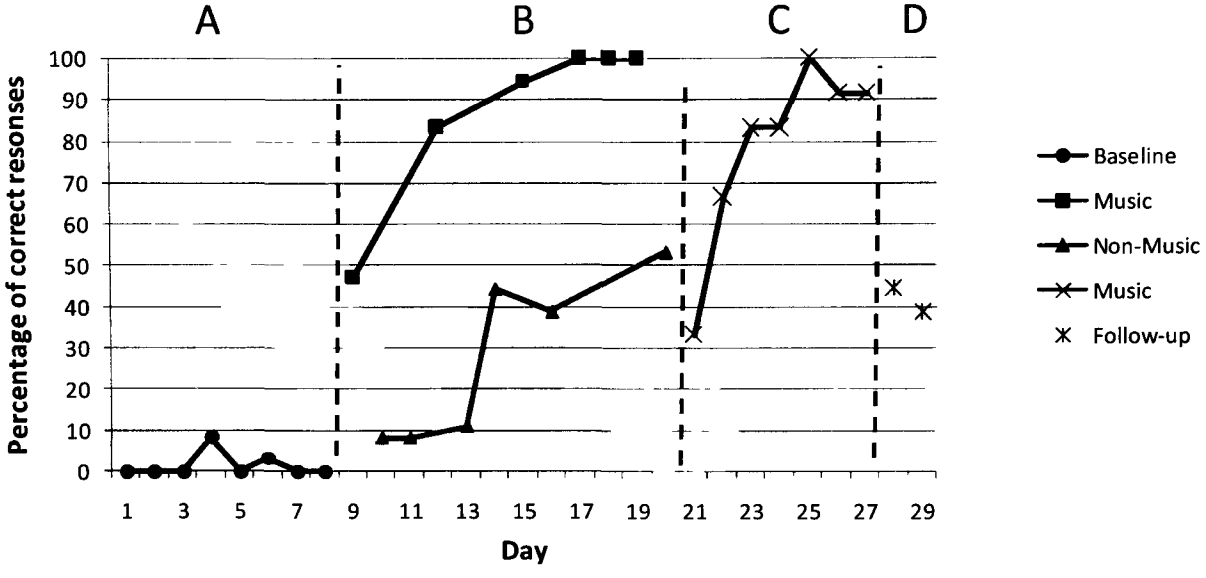

Figure 3. Percentage of correct responses for turn-taking.

In the non-music condition the percentage of correct responses for turn-taking increased quite steadily and ranged from 8.3% to 53.3%. In the music condition the percentage of correct responses of turn-taking steadily increased from 47.2% to 100% with the last three sessions stable at 100%. During Phase C the correct responses for turn-taking increased from the non-music condition and ranged from 33.3% to 100% with the final two sessions stable at 91.7%. Similar to eye contact and imitation, a lower percentage of correct responses for turn-taking was observed during the follow-up phase with the final two sessions beginning a downward trend of 44.5% and 38.9% respectively. This being said, the percentage remains considerably higher than the scores in the non-music condition.

The PND was calculated for turn-taking in both the non-music and music conditions in Phase B as well as for the second music condition in Phase C. The non-music condition resulted

in 66.7%, indicating an overlap with the baseline of 33.3%. Similar to imitation, it can then be concluded that the non-music condition was somewhat effective in increasing Anna's turn-taking skills. Once again, the PND for the music conditions in Phase B was 100% indicating that no overlap with the baseline occurred during this phase. This determines that the music condition was considerably more effective in increasing Anna's turn-taking skills than the non-music condition. Similar to the categories of both eye contact and imitation, the effectiveness of the music intervention was further supported in Phase C which also resulted in 100% for the PND, meaning no overlap between the baseline and second music condition was observed, thus, further supporting the effectiveness of the music condition. Furthermore, it can be determined that the music intervention was more successful in increasing Anna's turn-taking skills than the non-music condition.

Social Avoidant Behaviours

Of the four categories of social avoidant behaviours which were measured, only two of them were observed throughout the entire course of the study. The categories "pushing the toy away" and "moving away" were observed infrequently at times throughout the study.

Pushing the Toy Away. During Phase A (see Figure 4), Anna demonstrated varied instances of pushing the toys away which ranged from 0 to 8. The toys she most often pushed away were the ball and the maracas. However, once the alternating treatment phase began there were no instances of pushing the toys away during the music condition and only one instance was observed during the non-music condition which was with the maracas. During both Phase C and Phase D no instances of pushing the toys away was observed.

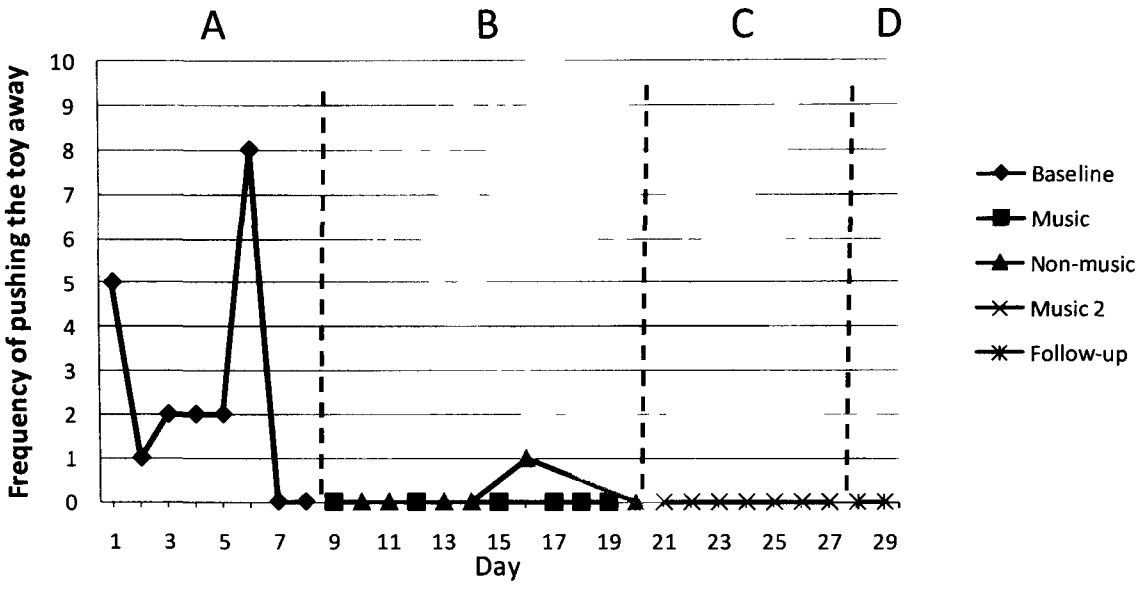

Figure 4. Frequency of pushing the toy away.

Moving Away. During the baseline (Phase A), Anna demonstrated three instances of moving away during 3 of the 8 sessions. Twice she moved away when the ball was present and once she moved away when the maracas were present. Once the alternating treatment phase began, no instances of moving away were observed during the music condition. During the non-music condition, Anna moved away during two sessions which ranged from 2-3 instances. In session 13 she moved away twice during the maracas activity and once during the stacking cups activity and in session 16 she moved away twice during the maracas activity. However, during both the second music phase (C) and the follow-up phase (D) no instances of moving away were observed.

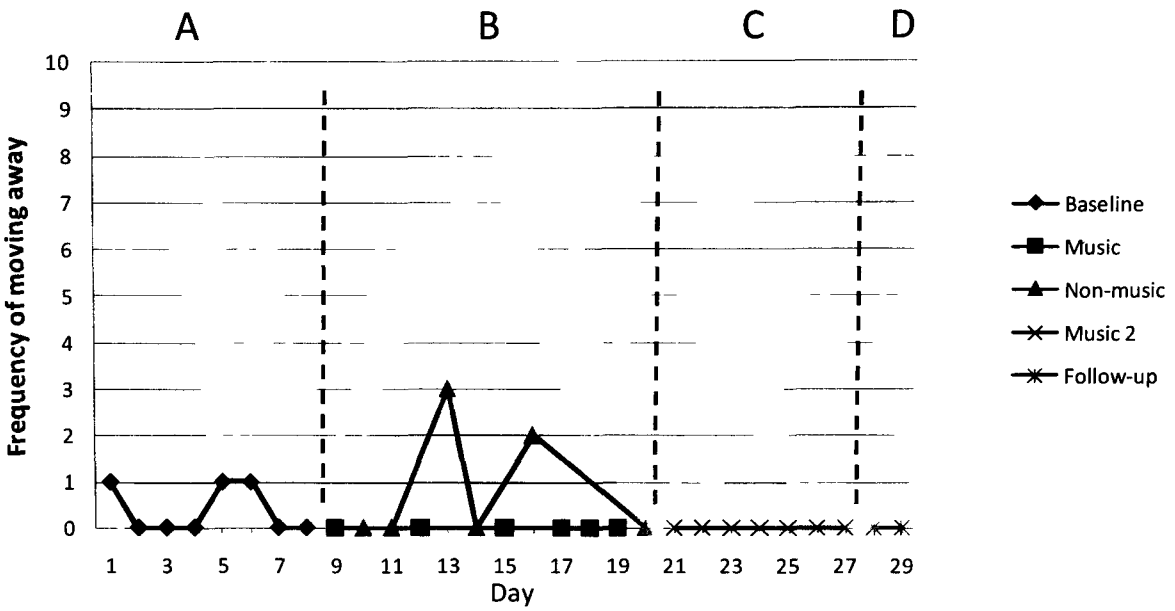

Figure 5. Frequency of moving away.

To summarize, results of this study suggest that the music condition was effective in both increasing Anna's social responsive behaviours as well as decreasing her social avoidant behaviours. Anna displayed higher numbers of all three social responsive behaviours (e.g., eye contact, imitation and turn-taking) during the music condition compared to the non-music condition. She also continued to show a higher number of all three social responsive behaviours in Phase C when the toys used in the previous non-music condition were paired with songs.

It should also be noted that although only twelve instances of social avoidance behaviours were observed, all of them occurred either during the baseline phase (Phase A) or during the non-music condition in Phase B, but no social avoidant behaviours were noted during the music condition.

Although high levels of social responsive behaviours were observed throughout the music condition, it was determined that they were not maintained during the follow-up phase (Phase D). However, in the case of turn-taking the results found in the Phase D did remain at a higher level than the results for turn-taking in the non-music condition. This overall lack of

maintenance seems to indicate that a longer intervention phase is necessary in order to sustain the desired results.

Finally, the low percentage of overlap between the baseline and music condition for eye contact and the fact that no instances of eye contact occurred during the non-music condition clearly indicates that the music intervention was more effective in increasing the frequency of eye contact. In addition, no overlap was observed between the baseline and music condition for both imitation and turn-taking skills suggesting that the music intervention was again more effective than the non-music condition for establishing imitation and turn-taking. As could be expected, it was observed that when the social responsive behaviours increased during the music intervention, the social avoidant behaviours simultaneously decreased, revealing low percentages of overlap for both categories of pushing the toy away and moving away.

Ratings of Child Affect

Three categories of child affect and behaviour were evaluated to determine any general effects that the intervention may have produced as well as to determine if possible lack of any results could be attributed to problems with behaviours or lack of engagement. Results for each category are presented in the following order: interest, happiness and general behaviour.

Interest. As seen in Figure 6, during Phase A, Anna demonstrated constant levels of interest which ranged from an average score of 2.2 to 2.7 placing her in the "neutral interest" category of child affect.

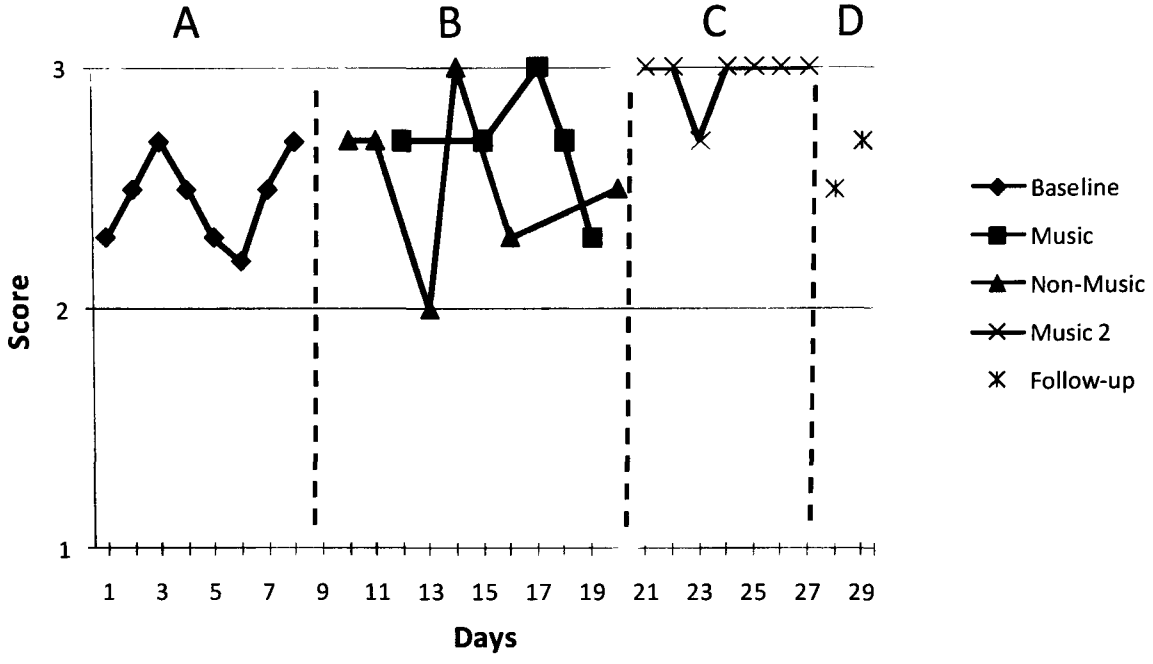

Figure 6. Child's score for interest.

Occasionally, it appeared to be obvious that Anna was disinterested in a toy and during this phase it was always when the large ball was present. Once the alternating treatment phase (Phase B) was introduced, Anna displayed slightly varied levels of interest which ranged from average scores of 2.3 to 3 for the music condition and 2 to 3 for the non-music condition. Again, any occurrences of disinterest were noted during the ball activity. During Phase C, the second music phase, Anna's level of interest appeared more stable with average scores ranging from 2.7 to 3.0 with only one occurrence of "neutral interest" during the maraca activity. Finally, during the follow-up phase Anna's level of interest appeared to decrease slightly from an average score of 2.5 to 2.7.

Happiness. During baseline (see Figure 7), Anna demonstrated mostly stable levels of happiness which ranged from an average score of 1.8 to 2.2 placing her in the "neutral happiness" category of child affect. Similar to her levels of interest, if Anna appeared "unhappy" in this phase, it was when the large ball was present. During the alternating treatment phase

(Phase B), Anna demonstrated varied levels of happiness which ranged from average scores of 2.3 to 3 in the music and 1.7 to 2.7 in the non-music conditions. It was noted that during the music condition, no occurrences of unhappiness were noted with the ball, however in the non-music condition, occasional occurrences of unhappiness were observed during the maraca activity. This being said, when the maracas were used with music in Phase C no occurrences of unhappiness were noted. In Phase C levels of happiness ranged from a score of 2.3 to 3.0 with occurrences of "neutral happiness" observed during the maraca activity and the farm animal activity. In the follow-up phase Anna's levels of happiness slightly decreased from a score of 2.7 to 2.5.

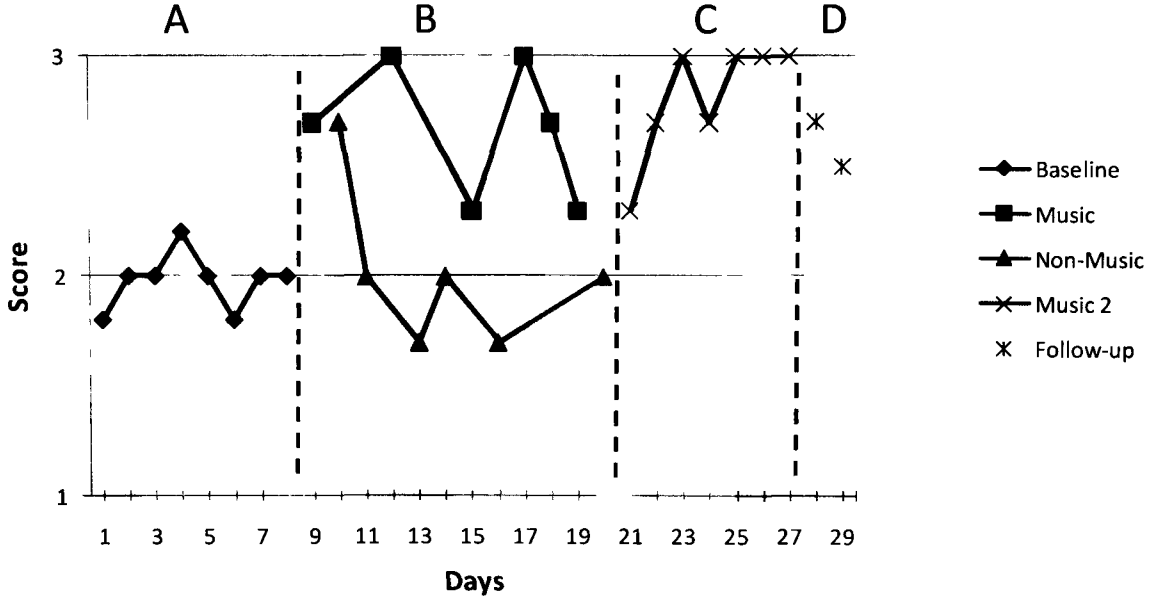

Figure 7. Child's score for happiness.

General Behaviour. As seen in Figure 8, during Phase A, Anna demonstrated mostly stable levels of general behaviour which ranged from a score of 2.0 to 2.8 placing her in the "neutral behaviour" category of general behaviour. During the alternating treatment phase (Phase B), Anna displayed stable levels of general behaviour during the music condition with an

average score of 3 and fairly stable levels of general behaviour during the non-music condition with average scores ranging from 2.7 to 3. Furthermore, during both Phase C and Phase D, Anna's level of behaviour remained constant at a score of 3 putting her in the "well-behaved" category of general behaviour.

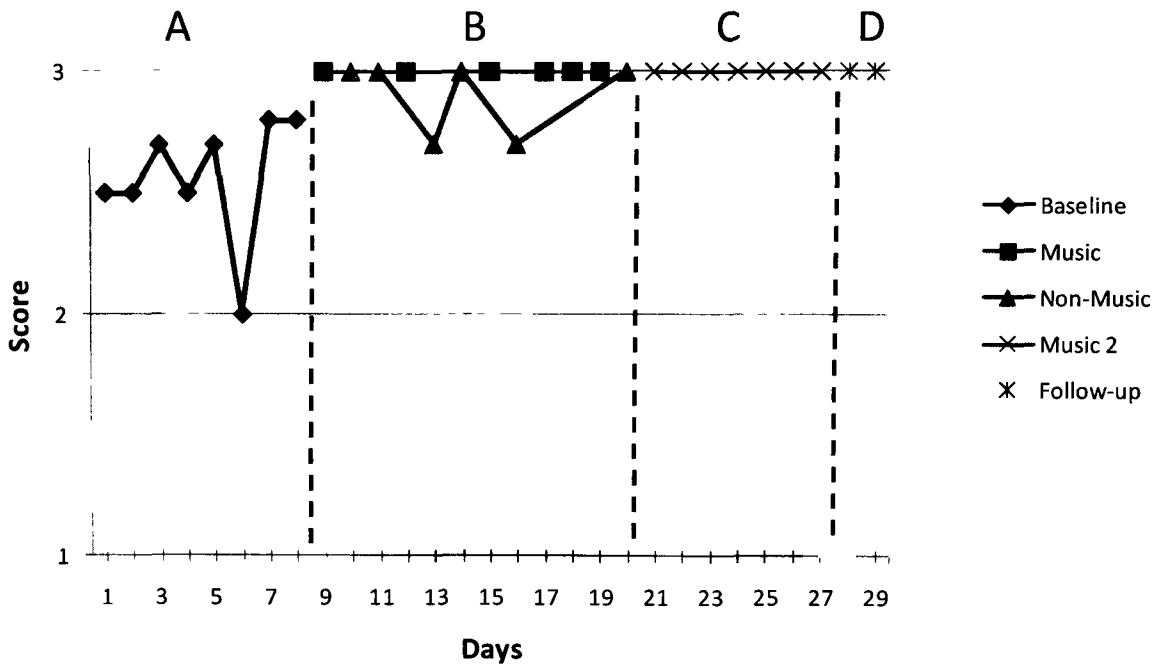

Figure 8. Child's score for general behaviour.

In summary, Anna's level of interest and general behaviour were similar during both the music and non-music conditions in Phase B with scores ranging between 2 and 3. Her scores for happiness, however, appeared to be higher during the music condition in Phase B whereas her level of happiness during the non-music condition appeared to decrease overall throughout the six sessions. It was noted that her scores in all three categories went down slightly during sessions 13 and 16 which was the non-music condition. Seeing that this decrease in scores occurred for interest, happiness and general behaviour on the same session days, it could be attributed to Anna's mood that particular day. It was noted by Anna's behaviour therapist that

Anna would sometimes have what the therapist described as an "off-day" and this was reflected in her behaviour by the decrease in her ability to tolerate less preferred activities.

CHAPTER V

DISSCUSSION

Impairment in social interaction is one of the defining characteristics of children with autism. These children often do not make eye contact, fail to engage or initiate interaction with others, and have difficulty developing relationships with their peers. Various interventions have been used to address these impairments, including the use of music therapy as described previously.

This study used a single-subject alternating treatment design (Barlow & Herson, 1984; Kennedy, 2005) to evaluate the effectiveness of a music therapy intervention on the social responsive behaviours (e.g., eye contact, imitation and turn-taking) of a 3 year old child with autism, Anna. The intervention was implemented four times a week alternating from sessions at the preschool to sessions at home and began with baseline phase (Phase A). During this phase, Anna was presented with opportunities to engage in social responsive behaviours with the therapist, although no instruction or prompting was given.

Second, the alternating phase (Phase B) was introduced in which the music and non-music conditions were randomly introduced to the child. During this phase the therapist presented Anna with opportunities to engage in socially responsive behaviours and when necessary would gesturally and/or verbally prompt her to follow through with the task. Both the music and non-music conditions were presented in a similar fashion, except with the addition of music in the music condition. Using a second music intervention in Phase C, the toys used in the previous non-music condition were paired with songs and presented to Anna along with opportunities to engage in socially responsive behaviours with prompting when needed. The purpose of this phase was to determine if Anna s behaviour would change once the toys were

used with music. In the final phase, Phase (D), two follow-up sessions were conducted in a similar fashion to Phase (A). This phase was included to determine whether or not the social responsive behaviours Anna had acquired had been maintained over time.

Results indicated that the songs used in the music condition resulted in higher frequencies of eye contact and higher percentages of both imitation and turn-taking skills when compared to the non-music condition. This finding is similar to the results of previous studies which used songs to increase social skills in children with autism (Brownell 2002; Kern & Aldridge, 2006; Pasiali, 2004; Stevens & Clark, 1969) and therefore suggests that the use of songs is an effective tool for increasing social responsive behaviours for a young child with autism. Furthermore, the songs played during the music phase were set to familiar melodies which ultimately served as incentive to motivate Anna to engage in social responsive behaviours with the music therapist. This is similar to other studies which used familiar melodies to encourage children with autism to follow-through with a task (Kern et al., 2007; Pasiali, 2004; Starr & Zenker, 1998; Stevens & Clark, 1969). As noted earlier, children with autism are not typically motivated to perform a task or engage in an activity to simply satisfy the demand of an adult (Kern et al., 2007), therefore music was used to motivate Anna to engage in tasks requiring social responsiveness. As a result, it was observed that when the toys to which Anna showed social avoidant behaviours (for example, pushing the ball away or throwing the maracas) were set to music, the social avoidant behaviours were no longer observed and Anna was engaged in the activity.

Although a limited number of social avoidant behaviours were observed with Anna throughout the course of the study, any social avoidant behaviour that did occur was observed during either the baseline or the non-music condition. This suggests that the music condition was more effective in eliciting social responsive behaviour than the non-music condition. Koegel et

al. (1987) suggest that the social behaviours of children with autism are positively influenced when the child is engaged in preferred activities during interactions with adults. Therefore the fact that no instances of social avoidant behaviours were observed during the music condition seems to suggest that Anna preferred the music condition to the non-music condition.

The computation of PND (e.g., percentage of nonoverlapping data) in the music condition revealed low percentages of overlap for both social responsive and avoidance behaviours, further verifying that the music intervention was highly effective in increasing eye contact, imitation and turn-taking skills as well as in decreasing social avoidant behaviours such as pushing the toy away and moving away. Although slight increases in frequency of eye contact and percentage of imitation and turn-taking were observed in the non-music condition when compared to the baseline phase, the music intervention was clearly superior and this was especially observed for eye contact in which no overlap occurred between to the two interventions. As expected, this increase in social responsive behaviours during the music condition was associated with a decrease in social avoidant behaviours.

It should be noted that the skills learned in the treatment condition were evidently not maintained given the low frequency of social responsive behaviours at follow-up. This could be explained by the limited number of treatment sessions that took place over the course of the study. Wimpory et al. (1995) as described previously, conducted a follow-up phase 20 months following the treatment phase which determined that the increases in social interaction observed during the intervention phase had been maintained. This being said, the intervention phase took place twice a week over a period of 16 months. This may suggest that had a longer intervention phase been implemented in the current study, the social responsive behaviours may have been maintained over time.

Finally, the Rating Scale for Child Affect and General Behaviour measured Anna's interest in the toys, her perceived level of happiness and her overall general behaviour during each session. It was found that Anna's level of interest and general behaviour were similar during both the music and non-music conditions, with the non-music condition being only slightly lower during sessions 13 and 16. Her level of happiness however, was observed to be higher during the music condition. This is thought to be a result of the natural motivating qualities of music and the fact that Anna appeared to have more fun during the music condition which she demonstrated by smiling and moving back and forth to the music.

Despite these findings, some limitations do exist. For example, despite using an established single-subject research design (Barlow & Herson, 1984; Kennedy, 2005) in which the participant served as her own control, having one participant clearly limits the ability to generalize the results to other pre-school children with autism. Additional replication studies such as this one enable the intervention to be considered evidence and the current study contributes to the already existing literature and demonstrates the potential of music therapy for increasing social responsive behaviours.

It is also not known if these results would generalize to other settings where the music therapist would not be present such as the classroom or at home. Although it should be noted that the results as described above were observed during both sessions at the early intervention program as well as during sessions in the child's home, it cannot be determined if the results would transfer outside the music therapy setting. As noted earlier, children with autism experience difficulty in generalizing what they have learned to new situations (Jordan & Powell, 1995). This therefore would assume that children with autism would need to be taught these skills in other setting in order for them to be used meaningfully.

In summary, more research is needed to clearly determine the efficacy of a music therapy intervention for increasing social responsive behaviours in pre-school children with autism. As noted in Kaplan & Steele (2005), language and social skills are the two areas that are targeted most frequently in music therapy interventions for children with autism. Although this is not surprising considering they are two of the core defining aspects of autism, it emphasizes the need for more research which further investigates the effectiveness of music therapy with children with autism. Future research should incorporate larger sample sizes or aim to replicate a similar single-subject design which would contribute to the existing literature and enable the intervention to be considered evidenced- based. Although some studies (Brownell 2002; Pasiali, 2004; Starr & Zenker, 1998; Stevens & Clark, 1969; Wimpory et al., 1995) have examined the effects of music therapy on the social responsiveness of individuals with autism, future research could investigate if music therapy is effective in increasing social skills in groups of children with autism or children with autism and their peers such as was investigated by Kern & Aldridge (2006). This would be beneficial in school settings in which children with autism are expected to interact with not only the adult teacher, but also their peers.

In addition, longer intervention phases should be implemented to determine if similar results could be maintained over time such as what was found in Wimpory et al. (1995). Finally, knowing the difficulty that children with autism experience with generalizing what they have learned to new situations, measures for generalization should be applied to verify whether or not similar results could be observed in other settings outside of music therapy.

In conclusion, the fact that music therapy appears to be motivating for a young child with autism suggests the importance of incorporating music therapy interventions into programming for pre-school children with autism. As Koegel & Koegel (2006) suggest, pivotal areas such as

motivation can be targeted, such as in this case with music, to produce change in other untargeted areas of functioning and responding, such as social responsive behaviours. Trained music therapists are able to target motivation by using music therapy techniques as both incentive and reinforcement to encourage changes in behaviour. This should be considered when determining and evaluating treatment programs for young children with autism. Koegel & Koegel (2006) further suggest that "the need for developing and implementing social interventions is essential" (p.190). Although a primary goal for school-aged children with autism who are included in regular classrooms is to target their social development, many schools do not provide adequate social programming (Koegel & Koegel, 2006). Music therapy is one intervention that could be implemented to address the social deficits of children with autism in a school setting. As exemplified by Kern et al. (2007), music could be embedded into the daily routines of school-aged children with autism to reinforce not only self-care tasks, but also social responsive behaviours such as eye contact, imitation and turn-taking skills. It could also be assumed that no problems with satiation would occur (as long as music is a preferred activity) since as stated in Rincover et al. (1977) different songs or instruments can be introduced to keep the child engaged in the activity. This suggests the importance of using music as an intervention for children with autism. The research described above has shown that music therapy increases motivation in children with autism to complete tasks even when they are considered less preferred and therefore presents opportunities for them to engage in meaningful interactions which foster success.

Appendix A

Author(s)	Purpose	N	Setting	Age/Gender	Diagnosis	Method	Outcomes/Finding	Limitations
Stevens & Clark (1969)	To examine the social effects of a music therapy intervention	5	Music therapy setting	5-7 years; all males	Autism	A pre-test/post-test design was used to determine the child's level of social and interpersonal maturity.	Music therapy techniques were significantly effective in improving some prosocial behaviours of the participants within the research setting.	-Small sample size - Possible experimenter bias -Child's growing familiarity with therapist/surroundings -Lack of measures for maintenance and generalization of skills
Wimpory, Chadwick, & Nash (1995)	To explore the effects of Musical Interaction Therapy (MIT) on social development	1	In-home	3 year old female	Autism	MIT's goal is to increase active social participation as indicated through social initiations and eye contact	MIT was shown to increase use of social acknowledgement, eye contact, and initiations of interactive involvement.	-Small sample size -Maturation -Possible influence of mother's change in behaviour -The intervention was implemented by a musician
Starr & Zenker (1998)	To demonstrate how music therapy was used to increase the social skill, sharing.	1	Music therapy setting	5 year old male	Autism	A clinical description of a 6 music therapy sessions with child with autism which aimed to increase the social skill, "sharing"	Once music that was familiar to the child was used, he was able to increase his ability to share.	-Small sample size -Lack of statistical analysis -Lack of measures for maintenance and generalization of skills -Only used one song

Duffy & Fuller (2000)	To investigate the effectiveness of music therapy in facilitating social skill development.	32	Day centre for children and adults with intellectual disabilities	5-10 years; unknown	Moderate Intellectual Disability	A comparison of a music intervention and a non-music intervention with two groups of children.	Both music and non-music interventions had significant improvements in all 5 social skills. Music was only more effective with the skill, imitation.	-Lack of measures for maintenance and generalization of skills -Used pre-recorded music, not a trained music therapist
Brownell (2002)	To use music to enhance social learning and behavioural responsiveness.	4	School setting	6-9 years old; all males	Autism	An ABAC/ACAB counterbalanced multiple-treatment design was used to investigate the difference in target behaviours.	Use of musically adapted social stories proven to be an effective and viable intervention for modifying socially appropriate behaviours.	-Small sample size -Lack of measures for maintenance an generalization of skills -Use of unfamiliar melodies
Pasiali (2004)	To promote social skills acquisition by children with autism using prescriptive therapeutic songs	3	In-home	7-9 years; 2 males and 1 female	Autism	An ABAB reversal design was used in which A was baseline and B was treatment.	All three individuals showed a decrease in problem behaviours. Only one participant showed a statistically significant difference between the baseline and the treatment conditions.	-Small sample size -Possibility of Parental bias -Lack of measure to determine generalization of skills
Kern & Aldridge (2006)	To evaluate the effects of a musical adaptation of a child care playground and an individually designed music therapy intervention to increase peer interaction.	4	Community-based child care program	3-5 years; all males	Autism	A multiple baseline design across participants was used to improve peer interactions and meaningful play on the playground.	"Music hut" alone did not improve social interaction, both teacher and peer-mediated interventions assisted in increasing peer interactions and meaningful play on the playground. In addition the attractiveness of the hut and the opportunity to participate in joint musical activities facilitated motivation in the children with autism to interact socially with their peers.	-Small sample size -Lack of measures for maintenance and generalization of skills

Appendix B

Songs and Scripts

Song: "Shake the Maraca" - to the tune of "Skip to my Lou"	Verbal prompts:	Spoken Script:
Shake, shake, shake the maraca Shake, shake, shake the maraca Shake, shake, shake the maraca Shake the maraca!	"Anna shake!" "Emily's turn" "Anna's turn" etc.	Shake the maraca! Shake, shake, shake! Shake the maraca! Shake, shake, shake!
Oh we're gonna...		We're going to...
Shake the maraca way up high! Shake the maraca way up high! Shake the maraca way high! Shake the maraca up high!	"Arms up"	Shake the maraca way up high! Shake it up high! Shake the maraca way up high! Shake it up high!
Oh we're gonna....		We're going to...
Shake the maraca way down low! Shake the maraca way down low! Shake the maraca way down low! Shake the maraca down low!	"Arms down"	Shake the maraca way down low! Shake it down low! Shake the maraca way down low! Shake it down low!
Oh we're gonna...		We're going to...
Shake, shake, shake and stop! Shake, shake, shake and stop! Shake, shake, shake and stop! Shake and now we'll stop!	"Anna shake!" OR "And stop"	Shake the maraca!....and stop! Shake the maraca!....and stop! Shake the maraca!....and stop! Shake the maraca!....and stop!

Song: "Stack the Cups": -to the tune of"Twinkle, Twinkle Little Star"	Verbal Prompts:	Spoken Script:
See the cups stacked up so tall One by one we hope they don't fall Red ones, green ones, purple ones too Stacking cups is fun to do! See the cups stacked up so tall One by one we hope they don't fall.	"Get a cup, Anna!" "Emily's turn" "Anna's turn" etc.	See the cups Let's stack them! Reds ones, green ones, purple ones Stacking cups is fun! See the cups One by one – Don't let them fall
See the cups turn into a ball Snap them together and roll them along First we do this...and then we do this... Look for any cups that we have missed See the cups turn into a ball Snap them together and roll them along	"Put them together!" "Do this!"	The cups turn into a ball Snap them together! Just like this! Look for more cups The cups turn into a ball Snap them together!

Song: "The Animal Song":
-to the tune of "Five Little Ducks"

Verbal Prompts:

Spoken Script:

Five little animals were out one day
On the farm so far away
But the one little cow who was black and white
He led the others with a moo, moo, moo
He says, "moo, moo, moo"
Moo, moo, moo
He led the others with a moo, moo, moo!

"Anna, get the cow!"
"Make him walk"
OR
"Anna's turn!"
"Emily's turn!"

Here come the animals!
They're out on the farm
See the black and white cow
He says "moo, moo, moo"
"moo, moo, moo"
"moo, moo, moo"

Repeat for the other animals as follows:

V2. Four little animals were out one day
On the farm so far away
But the one little sheep who was fuzzy and white
She led the others with a baa, baa, baa
Baa, baa, baa
Baa, baa, baa
She led the others with a moo, moo, moo!

V3. Three little animals were out one day
On the farm so far away
But the one little pig who was the colour pink
He led the others with a oink, oink, oink
Oink, oink, oink
Oink, oink, oink
He led the others with a oink, oink, oink!

V4. Two little animals were out one day
On the farm so far away
But the one little horse who was the colour brown
He led the others with a neh, neh, neh
Neh, neh, neh
Neh, neh, neh
He led the others with a neh, neh. neh

V5. One little animal was out one day
Out on the farm so far away
But the one little cat how had spots the colour brown
He let the others with a meow, meow, meow
Meow, meow, meow
Meow, meow, meow
He led the others with a meow, meow, meow!

Song: "This is How We Play the Drum": -to the tune of "London Bridge is Falling Down"	Verbal Prompts:	Spoken Script:
This is how we play the drum, Play the drum, play the drum This is how we play the drum, BOOM, BOOM, BOOM!	"Anna, play the drum" "Anna, do this!"	This is how we play the drum! This is how we play the drum! BOOM, BOOM, BOOM
Anna plays the drum like this, Drum like this, drum like this Anna plays the drum like this, BOOM, BOOM, BOOM	"Anna's turn!"	Anna plays the drum like this Anna plays the drum like this BOOM, BOOM, BOOM
Emily plays the drum like this, Drum like this, drum like this Emily plays the drum like this, BOOM, BOOM, BOOM	"Emily s turn!"	Emily plays the drum like this Emily plays the drum like this BOOM, BOOM, BOOM
This is how we play the drum, Play the drum, play the drum This is how we play the drum, BOOM, BOOM, BOOM!	"Anna play the drum" "Anna do this!"	This is how we play the drum! This is how we play the drum! BOOM, BOOM, BOOM

Song: "Pass the Ball":	Verbal Prompts:	Spoken Script:
-to the tune of "Are You Sleeping"		
Pass the ball, pass the ball Back and forth, back and forth This is how we pass the ball This is how we pass the ball Back and forth Back and forth	"Anna, pass the ball!"	Pass the ball! Pass the ball! It goes back and forth! We pass the ball like this! The ball goes back and forth!
Bounce the ball, bounce the ball Up and down, up and down This is how we bounce the ball This is how we bounce the ball Up and down Up and down	"Anna, bounce the ball!" OR "Emily's turn" "Anna's turn"	Bounce the ball! Bounce the ball! It goes up and down! We bounce the ball like this! It goes up and down!
Tap the ball, tap the ball Just like this, just like this This is how we tap the ball This is how we tap the ball Just like this Just like this	"Anna tap like this!"	Tap the ball! Tap the ball! Just like this! We tap the ball like this! Just like this!

Song: "Here Comes the Car": -to the tune of "I'm a Little Teapot"	Verbal Prompts:	Spoken Script:
Here comes the red car Down the road Four wheels are turning round and round I can drive fast or I can drive slow And when the light turns green it's time to GO!	"Get the red car" "Go fast!" OR "Go slow" "Green light! Go, go, go!" OR "Emily's turn" "Anna's turn"	Here comes the blue truck! Driving down the road! It's four wheels are turning It goes fast.....or slow A green light means – GO!
Here comes the girl and here comes the boy Running to the car, they're ready to go Jump into the front seat, just like so Buckle up your seatbelt 'cuz here we go!	"Anna, get the girl!" "Run, run, run!" "She goes in the front seat" "Go, go, go!"	Here come the girl. Here comes the boy They're running to the car. Let's go Jump into the front seat – whew! Buckle up your seatbelt – here we go!

Appendix C

CODING SHEET							
CHILD'S ID # _____				Date _____ Time _____			
OBSERVER _____				☐ Music ☐ Non-music		PHASE _____	
Social Responsive				**Social Avoidance**			
Toy	Behaviour	Frequency	Duration	Toy	Behaviour	Frequency	Duration
Drum	Eye contact			Drum	Gaze aversion		
	Initation				Pushes toy away		N/A
	Imitation		N/A		Pushes adult away		N/A
	Turn-taking		N/A		Moving away		N/A
Car	Eye contact			Car	Gaze aversion		
	Initation				Pushes toy away		N/A
	Imitation		N/A		Pushes adult away		N/A
	Turn-taking		N/A		Moving away		N/A
Ball	Eye contact			Ball	Gaze aversion		
	Initation				Pushes toy away		N/A
	Imitation		N/A		Pushes adult away		N/A
	Turn-taking		N/A		Moving away		N/A
Maracas	Eye contact			Maracas	Gaze aversion		
	Initation				Pushes toy away		N/A
	Imitation		N/A		Pushes adult away		N/A
	Turn-taking		N/A		Moving away		N/A
Stacking Cups	Eye contact			Stacking Cups	Gaze aversion		
	Initation				Pushes toy away		N/A
	Imitation		N/A		Pushes adult away		N/A
	Turn-taking		N/A		Moving away		N/A
Animals	Eye contact			Animals	Gaze aversion		
	Initation				Pushes toy away		N/A
	Imitation		N/A		Pushes adult away		N/A
	Turn-taking		N/A		Moving away		N/A

Appendix D

RATING SCALE FOR CHILD AFFECT									
CHILD'S ID#: _____				DATE: _____					
OBSERVER: _____				☐ Music ☐ Non-Music			PHASE: _____		
Toy	**INTEREST**			**HAPPINESS**			**GENERAL BEHAVIOUR**		
Scale:	Disinterest	Neutral	Interested	Unhappy	Neutral	Happy	Poor	Neural	Well-Behav
Ball									
Drum									
Animal Farm									
Maraca									

Comments: _____

Appendix E

Rating Scale for Child Affect (Interest & Happiness) and General Behaviour		
INTEREST		
Disinterested - SCORE 1	Neutral interest - SCORE 2	Interested SCORE 3
Child looks bored, non-involved, not curious or eager to continue activity. May yawn or attempt to avoid (or escape) situation. Spends much time looking around and little time attending to task. When child does respond, there may be a long response latency	Neither particularly interested nor disinterested. Child seems to passively accept situation. Does not rebel but is not obviously eager to continue	Attends readily to task – responds readily and willingly. Child is alert and involved in activity
HAPPINESS		
UnHappy - SCORE 1	Neutral SCORE 2	Happy SCORE 3
Cries, pouts, tantrums, appears to be sad, angry, or frustrated. Child seems not to be enjoying self	Does not appear to be decidedly happy or particularly unhappy. May smile or frown occasionally, but overall seems rather neutral in this situation	Smiles, laughs appropriately, seems to be enjoying self
GENERAL BEHAVIOUR		
Poorly Behaved SCORE 1	Neutral Behaviour - SCORE 2	Well Behaved - SCORE 3
Child is disruptive – may tantrum, attempt to leave chair or room, interrupt therapist's instructions and/or show aggression towards teacher, self or objects. Child is generally off-task – may fidget and squirm, show inappropriate vocal behaviour (i.e., off-task laughter and nosies) or motor behaviour unrelated to task. Shows little attention to task and may be noncompliant	Child is neither very disruptive nor exceptionally attentive. Child may fidget and appear inattentive, but is not aggressive or rebellious. Generally, complies with instructions, but may not do so readily	Child sits quietly, attends to therapist and to task. Responds to instructions; is compliant and appears to try to perform successfully. May laugh or show other emotional behaviour under appropriate circumstances

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