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**THE EFFECTS ON PHYSICAL EXERCISES TO IMPROVE SOCIAL
COMMUNICATION SKILLS OF ADOLESCENTS WITH AUTISM**

by

Christopher J. Fox

A Thesis

Submitted to the
Department of Language, Literacy, and Special Education
College of Education
In partial fulfillment of the requirement
For the degree of
Master of Arts in Special Education
at
Rowan University
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Thesis Chair: Joy Xin Ed.D

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Dedications

I dedicate my thesis to my family and friends. A special feeling of gratitude to my loving parents, Barbara and Steven Fox whose words of encouragement and motivation ring in my ears daily. To my grandparents who were biggest supporters in all I do. A very exceptional feeling of gratitude to my girlfriend Rachel Kovlak for her persistent, devoted, loving support during this extensive trial. To Andrea Tyszka for configuring this program and her guidance throughout this study. To Robert Neitzel for his insight and motivation to allow me to see the best in myself and my academics. To Anthony Nicolino for sharing his wisdom and motivation throughout this study. To Cherry Hill Health and Racquet club for providing the setting for the study. To my friends for checking in on me throughout the length of this study to show support and care. I thank you all from the bottom of my heart for all the support and love you have demonstrated through this long lasting study.

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Abstract

Christopher J. Fox
THE EFFECTS ON PHYSICAL EXERCISES TO IMPROVE SOCIAL
COMMUNICATION SKILLS OF ADOLESCENTS WITH AUTISM
2014-2015
Joy Xin, Ed.D
Master of Arts in Special Education

The purpose of this study was to examine the effects of fitness activities on communication skills of adolescents with Autism Spectrum Disorder (ASD). Over the course of 12 weeks, 3 middle school students with ASD participated in a wellness program focusing on learning social and conversational skills through practicing verbal language in a 1:1 situation, paired with peers, and whole group instruction. The initiation and maintenance of their conversation through reciprocal responses, and responses to questions and comments were evaluated. Participants gained social communication (e.g. requests, responses, and making comments), as well as conversational skills (e.g. reciprocity, listener knowledge, verbosity, topic management, discourse, and response language). The end survey also presented positive responses from parents. Having access to a fitness program seems to provide these adolescents with social experiences during their play and activities with others to create an avenue for learning social communication skills in an interesting, interactive, and healthy way.

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Chapter 1

Introduction

Statement of Problem

According to the Center for Disease Control (2014), Autism Spectrum Disorder (ASD) is considered as a developmental disability that significantly affects children's verbal and nonverbal communication and social interactions before age three. Individuals with ASD lack social communication skills which make them to be easily isolated but hard to be accepted by their peers (Muller & Schuler, 2008). These individuals often demonstrate limited abilities to a) initiate a conversation, b) request for their wants and needs c) listen and respond to questions and comments, and d) interact with others (Sansosti & Powell-Smith, 2008). These problems become serious at the secondary level, when a conversation with teachers and peers is the primary medium for social interaction and expectation of appropriate communication to gain social acceptance is raised (Hughes, 2011). These youngsters have difficulties in communication, such as, inferring information, taking another's perspective and even maintaining a conversation (Flynn, Lorna, Healy & Olive, 2011). They have limited skills to interact effectively with teachers and peers, and display difficulty in responding appropriately to social stimuli (Hendricks & Wehman, 2009).

According to the Center for Disease Control (2014), more than 3.5 million Americans have ASD. The prevalence in children in the United States was 1 in 100 in 2000, 1 in 88 in 2010, and 1 in 68 in 2014. It assumes that the number of children with ASD will continue to increase (Center for Disease Control, 2014). While the prevalence of ASD is on the incline, socialization is what makes this prevalence critical.

Socialization is a common skill, important for students to interact with their peers and adults both in school and at home; however it is very difficult for students with ASD. The major problems they face are initiating their wants and needs, developing a conversation, and maintaining such a conversation (National Institute on Deafness and Other Communication Disorders, 2012).

Conversational initiation refers to the action to start a conversation. These adolescents have difficulty with pragmatics. They tend to have monologue or tangential conversations, but lack of joint attention with other's responses. Also, sharing achievements, enjoyment, and excitement with others is difficulty for these students (Carpenter, 2013). It is found that small group situation involving a preferred interest provides an opportunity for these students to initiate their needs based on a topic of interest (Koegel & Koegel, 2013). Communication is any act by which one person gives or receives information. People are able to communicate their needs, desires, perceptions, knowledge, or effective states. Communication may be intentional or unintentional involving conventional or unconventional signals, with linguistic or nonlinguistic forms, in spoken or written modes. Students with ASD have difficulty in communication by initiating and maintaining a conversation. Conversation maintenance requires social reciprocity (Williams, Koenig, and Scahill, 2006). Reciprocity refers to responding to a positive action to keep back and forth flow of social interaction. Social reciprocity involves partners working together on a common goal of successful interaction with adjustments made by both partners until success is achieved. The skills involved in social reciprocity in young children begin with showing interest in interacting with others and exchanging smiles. This builds to being able to share conventional meanings with words

and topics in conversation. Students with ASD display an impairment in social reciprocity without taking an active role in social games, preferring solitary activities, or using a person's hand as a tool or as a mechanical object. This may lead to ignoring another person's distress or lack of interest in the focus or topic of conversation (Wiseman, 2009).

It is necessary to provide interventions to improve socialization of students with ASD (Brown, 2001 & Koegel, 2009). While effective socialization intervention programs have been described for children with ASD (Rogers, 2000; McConnell, 2002; Matson, 2007), such as peer support networks (e.g. Haring & Breen, 1992; Garrison-Harrell, 1997), circle of friends (e.g. Whitaker, 1998; Kalyva & Avram-idis, 2005; Barton, 2011), buddy systems (e.g. Laushey & Heflin, 2000), and lunch clubs (e.g. Baker, 1998; Koegel, 2012), relatively few intervention programs target high school students (Bellini, 2007; Tse, 2007). This may become a growing concern as more children with ASD reach their high school ages. Without systematic interventions, adolescents with ASD may exhibit limited or Non-existent initiations toward typically developing peers (Hughes, 2011), have difficulty maintaining engagement in interactive conversations (Humphrey & Symes, 2011), become socially isolated (Knott, 2006 & Stichter, 2007), with limited participation in social activities in school and communities (Orsmond, 2004). Furthermore, this lack of socialization has negative effects on their emotions. It is reported that adolescents with ASD present feelings of loneliness (Lasgaard, 2010; Locke, 2010) and express a desire to build friendships (Beresford, 2007).

Physical activities and exercises have been shown to be a beneficial intervention for physical and psychological illnesses and to reduce the stereotypic behaviors of

individuals with ASD (Awamleh & Woll, 2014). For example, dancing, horseback riding, yoga, basketball, baseball, and soccer, all can lead to successful experiences and potentially help those students (Delaney & Madigan, 2009). These physical intervention programs are aimed to enrich social activities, and incorporate these students' interests into exercises to motivate their participation in physical activities together with their age appropriate peers. However, it is found that students with ASD have fewer occasions to partake in physical activities and less active than their typically developing peers (Tyler, MacDonald & Menear, 2014). In the past years, some methods have been developed to improve the social skills of students with ASD (Bellini, Benner & Hopf, 2007). These include social stories, (e.g. Delano & Snell, 2006), video modeling, (e.g. Patterson & Arco, 2007) and peer interventions (e.g. Laushey & Heflin, 2000). While many of these techniques can be effective for individual students, systematic reviews of the outcomes of social skills interventions have found that they are minimally effective for students with ASD (Nikopoulos & Keenan, 2004, Shukla-Mehta, Miller, & Callahan, 2010). Many of these social skill intervention methods can also be difficult and time consuming to implement. There is an opportunity to provide physical exercises leading to positive social outcomes through interaction with peers in participation in team sports and partner activities that allow these students to learn how to recognize the social cues required for successful performance in the field or on the court (Biddle, 1998; Strauss, 2001; Pan & Frey, 2006).

According to Bhojne and Chitnis (2002), individuals with ASD have vestibular system dysfunction. This obstruction is caused by ineffective sensory processing which manifests itself in “problems in attention, behavior, learning, speech development,

movement and coordination,” (p 34). It is found that a mild exercise program (walking), or a vigorous exercise program (jogging), would change heart rate and reduce self-stimulatory behaviors. Thus, physical exercises with sufficient intensity could replace the motor component of the stereotypic behavior (Rosenthal, Malek & Mitchell, 1997). In addition, vigorous aerobic exercises have been found to control stereotypical behaviors such as repetitive sequences of fixed behaviors including movement patterns (hand-flapping, body-rocking, spinning or flipping of objects) and repetitive vocal sequences (echolalia), to help them function in social and academic settings (Elliot, 1994). In addition, participants in a peer buddy groups with one to one practice on communication resulted in high positive social interactions (Laushey & Heflin, 2000). Parental education programs can greatly improve communication (Moes, 1995). Parental education programs include teaching parents how to support their children to become more prosocial. In the training, parents were taught to assist in communication with their children interactively, as well as model appropriate play skills to initiate and maintain a play activity, and to reinforce their children’s appropriate behaviors and using the prompt hierarchy (Ingersoll & Dvortcsak, 2006) Also, communication programs designed to fit into family’s routines could teach students with ASD in a natural setting resulting in a greater gain in skills development (Schreibman, Kaneko & Koegel, 1991; Koegel, Bimbela & Schreibman, 1996). Thus, providing structured training programs, these students could learn appropriate skills to increase their social interactions with their age appropriate peers (Laushey & Heflin, 2000).

Significance of the Study

Studies have demonstrated that physical activities and exercises could provide an opportunity for students with ASD to learn skills for positive social interactions with peers (Craft, 2013), and adults (Kroeger & Schultz, 2007) and reduce stereotypical behaviors (Fava, 2011). However, reviewing research in the field of physical fitness and exercises, limited studies were conducted for adolescents with ASD. This study attempts to provide exercises for these students to enhance their physical fitness as well as learning communication skills, especially initiation and reciprocity during physical activities. The communication profile would assess their skills as they partake in a variety of exercises and partner activities. Skills of conversational initiation and maintenance, responses to questions and comments were taught during the exercises to improve their well-being and their communication skills in a natural setting.

Statement of Purposes

The purposes of this study were to: (a) examine the effects of fitness activities on communication skills of adolescents with ASD; (b) evaluate their initiation and maintenance of their conversation through reciprocal responses, and responses to questions and comments, (c) evaluate their satisfaction with the fitness activities.

Research Questions

The research questions are as follows:

1. Will students with ASD increase their initiation to a specific task during fitness activities?
2. Will students with ASD maintain a conversation by using reciprocal responses during fitness activities?

3. Will students with ASD increase their responses to questions and comments during fitness activities?
4. Will students with ASD increase their social communication outside of the study setting?

Chapter 2

Review of the Literature

According to the Center of Disease Control (2014), the number of children diagnosed with autism spectrum disorder (ASD) has been increased from 1 in 100 (2000) to 1 in 68 (2014), and this number is estimated to increase in the future. ASD is a developmental disability that impairs an individual's language development, social communication and appropriate behaviors (National Institute of on Deafness and Other Communication Disorders, 2012). Deficits in social communication, interaction, and imagination are their main characteristics (Baird, Gillian, Cass, Hilary, Slonims, & Vicky, 2003). These individuals often have limited abilities to a) initiate and maintain a conversation, b) request for information or materials, and c) interact with others (Sansosti & Powell-Smith, 2008). This chapter reviews articles regarding the communicative problems of students with ASD and the related intervention programs including social skill training, peer-mediated groups, using social stories and physical exercises, and summarizes their effects on supporting adolescents with ASD.

Communication Problems of Students with ASD

Communication of students with ASD is a major concern especially when they are in secondary school, because making a conversation with teachers and peers is the primary medium for social interaction, and expectation of appropriate communication to gain social acceptance is raised in adolescence (Hughes, 2011). Social communication can be defined as "the synergistic emergence of social interaction, social cognition,

pragmatics (verbal and nonverbal), and receptive and expressive language processing" (Adams, 2005, p. 182).

Tager-Flusberg's study (1999) examined social behavior, communicative functioning, and theory of mind in children with ASD. It is noted that an overlap of social and communicative impairments reflected underlying cognitive deficits of these children. Their ability in grammar and vocabulary development, communication in social contexts, and language development were delayed comparing to their typically developing peers. Thus, ASD is not just a deficit in cognitive domain, but the other areas such as social, language, and cognitive functioning should be considered to understand this disorder (Tager-Flusberg, 1999).

Bellini (2004) further analyzed students with ASD, especially adolescents. These adolescents are struggling in interacting with peers and adults through a variety of settings due to their anxiety. In Bellini's study (2004), the social deficits and anxiety, the prevalence and types of anxiety were analyzed. It is found that adolescents with ASD experience anxiety at an increased level than their typically developing peers. It is also found that such anxiety is related to their social skill deficits. For example, lacking of social skills may lead to their social anxiety due to their previous experience of a negative peer interaction, as well as initiation skills to start a conversation to interact with a peer. Adolescents with poor initiation skills may display an increased anxiety and have limited social exposure. Thus, it seems that there is a significant correlation between social anxiety, and initiation and social skills, as well as initiation and empathy skills. Adolescents with ASD have a high level of anxiety in social situations due to a lack of social initiation (Bellini, 2004).

Villiers, Fine, Ginsberg, Vaccarella, Szatmari's study (2006) analyzed the pragmatic impairments in conversations of individuals with ASD. In their study, 46 children and adolescents with ASD using a functional speech model were reviewed. The conversations were assessed for difficulties in social language, rise and fall of speech, word usage, using a few words to have meaning, overly formal speech, and topic perseveration. A scale was developed to evaluate the language used in conversation and to differentiate the degree of social impairments during a conversation. The children were having a semi-structured conversation with a researcher for 10 minutes. The conversations were audio-taped at the child's home and the topics of conversations ranged from school, hobbies, and family life. The recording was transcribed, coded, and analyzed. Results showed that children with ASD had difficulties in social reciprocity. It is also noted that some variable outside of IQ and language determine conversational breakdown in these children, and pragmatics were of the difficulty for the adolescents (Villers, Fine, Ginsberg, Vaccarella, Szatmari, & 2006).

Anxiety leads to social isolation and loneliness (White & Roberson-Nay, 2009). White and Roberson-Nay's study (2009) examined the relationship between anxiety, loneliness, and degree of social skill deficit in youth with ASD. Four participants were between 7 and 14 years of age who reported a high level of anxiety and loneliness. Self and parental reports were used to measure their anxiety. It is found that those that reported higher levels of anxiety also experienced more feelings of loneliness. (White, Roberson-Nay, 2009)

Taylor and Hock (2008) examined how students with ASD pursued the adult's attention. By observing their initiations to an adult with joint attention, it is found that

these students had less engagement and few attempts to initiate a request for an adult's attention. Three children participated in this study. During the baseline sessions, the participants were brought into a room with a leisure activity and visually enticing items throughout the room. The instructor waited one minute for the participant to initiate a bid (e.g., somebody made a big mess!) then instructor would respond with the proper social comment (e.g., "what a mess!") If the participant did not initiate, the instructor would not respond, but wait for the participant to sit down. To engage a participant in an activity the instructor would point to a target item and initiate a bid (e.g. "wow", "look", "that's silly"!) for 30 seconds. Each time a participants made a bid the instructor would make a proper social response. During the intervention the participants were then trained on responding to bids. The instructor initiated a bid (e.g. pointing at an item and saying, "wow!") Then, a least to most prompting system was provided. The participants were given 5 seconds to respond before a gestural prompt was used with verbal instruction. If the gestural and verbal prompts did not work, then a physical prompt was given. When the participants were attending to the item, the instructor would model a comment to imitate with a gestural prompt. Next, the participants were trained on initiating bids. The instructor would walk to the participants within a close approximately to a target item and wait for 5 seconds for the participants to initiate. If a bid was not made within 5 seconds the instructor would prompt the participants to initiate using the most to least, such as physical or gestural prompts to point to the item. When an initiation was made, the instructor would give a proper response. The study revealed that to encourage these students' initiation, the stimulus must be socially relevant, and reinforcers must be functional and social to increase initiations, such as mands for attention (Taylor & Hock,

2008). It is suggested that behavior-analytic procedures such as discriminative stimuli (presence of adult bid), social reinforcers (adult's attention), and motivating operations (visual attraction) should be used to increase responses of joint attention with adults.(Taylor & Hock, 2008).

Downs and Smith's study (2004) compared cooperation, emotional understanding, personality characteristics, and social behavior of 10 children with ASD who had an average IQ, 16 children with attention-deficit and hyperactivity disorder (ADHD) and oppositional defiant disorder (ODD) and 10 typically developing peers. Results showed that children with ASD and developmental delays demonstrated social and emotional deficits, particularly, when compared to their typical developed peers. It is demonstrated that children with ASD, exhibited social, emotional and behavioral deficits, but were not as severe as those with ODD while the emotion, social, and behavior areas were the most concern. The results also showed that both students with ODD and ASD were less cooperative than their typically developing peers (Downs & Smith, 2004).

Social reciprocity is another challenge for adolescents with ASD. White, Keonig, and Scahill (2006) reviewed the research on group-based social skills training to better assist these students. It is found that social skills impairments tend to increase as children grow up to become adolescents due to their awareness of their disability. During adolescence, these students would tend to face more isolation, peer rejection, and loneliness than their typical peers. Students with ASD have difficulties with social stimuli (Dawson, Meltzoff, Osterling, Rinaldi, & Brown, 1998), understanding facial expressions (Celani, Battacchi, & Arcidiacono, 1999), and responding to other's perspectives (Bacon, Fein, Morris, Waterhouse, & Allen, 1998). Also, lacking of initiating interactions in

social environments is observed in both children and youth with ASD (Njardvik, Matson, & Cherry, 1999). It seems that appropriate training is needed to teach these students to learn social skills including initiation, conversation maintenance, interacting with peers and adults.

Social Skills Training

Harris's study (1990) analyzed teaching social skills to adolescents with ASD. One skill was offering assistance. Three male adolescents were taught to offer assistance to someone needing assistance in completing a task. The tasks included: placing a key in a lock, buttoning, and opening a jar. Results demonstrated that the three boys were able to learn and respond to the cues of the other who needed assistance. When a peer, modeled initiating social interactions, their frequency and appropriateness of interactions increased. There is limited research beside this study on the use of interventions for adolescents with ASD.

Chin and Bernard-Opitz's study (2000) analyzed whether children with ASD could be trained to improve their conversational skills and if it led to changes in their theory of mind. Three high functioning students with ASD participated. They were taught to initiate and maintain a conversation, and change conversational topics appropriately. The student's theory of mind was tested using false belief tasks. All baseline and training sessions were conducted at each participant's home. Five conversational skills were taught to the students, including making a conversation, taking turns in a conversation, listening, maintaining a conversation topic, and changing a topic appropriately. The results showed an increase of each child's conversational skill with an increase of

answers. Although answers were only one word, participants became proficient at direct answer and questioning. After training, it is noted that each child's quality of speech improved. The participants' quality of speech developed from predominantly perseverative responses to elaborate responses. Also, each child's conversational skills suggested that they developed a theory of mind incidentally during training, and these skills could be generalized to other contexts and tasks

Ozonoff and Miller (2005) examined the effectiveness of a social skills training program for adolescents with ASD. It was found that through systematic programming of social skills training by using the theory of mind principles adolescents would increase their social skill abilities. In the study, nine adolescents participated in four and a half months of program. Five were placed into the experimental group, and the other participants were placed in the control group. During the baseline, all participants were administered a battery of theory of mind tests. The same measurements were given after the intervention. The first measure was first-order perspective taking. Participants were shown a box of M&M's and asked what it contained. After their response the box was open to reveal a pencil. The participant was asked what other children would respond. The second order was on perspective taking or predicting what another person would think. A railroad miniature was used when the participant was read a story and one of the miniature people went "missing" and the participant had to inform the instructor what the other miniature character would "think". The third measure was of attribution abilities. The participant had to listen to a story and was asked to predict what one person might think about the other. Lastly, the participants were read the prison story where a prisoner was being interrogated and the participant had to predict if the prison would tell the truth

or a lie to the captures. The training program was divided into two seven week sessions. The first session concentrated on basic interaction, conversational skills (initiate, maintain, and end), choosing topics, how to read, interpret, and express nonverbal signals and emotional expressions. The second module consisted of perspective teaching and theory of mind skills. The first was taught physically through a participant leading an instructor through a maze blindfolded. In the other sessions, the participants worked on predicting what others might think. This involved role-playing on false belief tasks. It was found that training adolescents with ASD could improve their social skills to their age-appropriate level, and successful intervention would support the theory of mind (Ozonoff & Miller, 2005).

Peer Mediated Groups

Peer mediated group is an intervention strategy in which peers assist students with ASD in a group setting. These peers are trained to work in a group to model a behavior, social skill, or academic task and to practice using the prompt hierarchy. Peer modeling seems naturalistic and helpful for social situations because both peer and partner are in a social environment to communicate. This strategy involves peers as support to communicate with the student with ASD in a group format. Such group activity may happen when the target student needs are in a regular routine, for example, once a week. In Mackay, Knott, and Dunlop's study (2007), group work was used to enrich social interaction. The focus of the activity was on social and emotional perspective taking, learning conversational skills, and building friendship. The main goal was to provide these adolescents to generalize social skills to other settings. A total of 46 adolescents participated. They were divided into six groups. Each group met for 12-16 weeks, for one

and half hours, once a week. Results displayed significant improvement in social skills of adolescents with ASD while working in a group setting.

Chun, Reavis, Mosconi, Drewry, Matthews, and Tasse's study (2007) analyzed the effectiveness of a peer mediated social skills program with video feedback, positive reinforcement, and a token system. The purpose was to increase social communication of 4 male children between the ages of 6 and 7. The training targeted 4 communication skills, including securing attention, initiating requests, providing comments and changing topics. Peer training was provided to target the skill and to trigger the children with ASD to ask questions. The results showed that peer-mediation and video feedback were successful in teaching social skills, however, perseverative behavior limited some of the success children with ASD's in learning the skills.

Tse, Strulovitch, Tagalakis, Meng, and Fombonne (2007) analyzed the effectiveness of social skills training for a group of adolescents with high functioning autism. Each group had seven or eight adolescents aged 13 to 18, led by a social worker and a psychologist. The groups met weekly for 12 weeks. Each session consisted of a check in, a review of last weeks' skill, an introduction of a new skill, role playing, a snack break, an activity, and conclusion. The social skills discussed in the meetings included awareness and expression of feelings, eye contact, recognition of non-verbal communication, politeness, introduction of oneself to others, starting a conversation, negotiating with others, responding to teasing and bullying, hygiene, dining, and dating etiquette. The results indicated that social skills in group learning could be an effective way to help adolescents with ASD to develop comfort and confidence in social aspects. Participants' self-reports perceived that their social skills improved so as their parents

reported. Meanwhile, the problematic behaviors, such as anxiety, self-isolation, stereotypical behaviors and self-injurious behaviors, were reduced though these were not targets in the group intervention.

Koenig, De Los Reyes, Cicchetti, Scahill, and Klin (2009) further examined group intervention to promote social reciprocity. Social reciprocity is considered as a skill with multiple and complex dimensions. Many variables may impact social reciprocity. Thus, training should be dynamic in nature, and related to the growth and development of the adolescent to incorporate into activities. Three students with ASD in a regular education classroom participated in this study. During the baseline these students did not make an attempt for interaction with their typically developing peers. During the intervention participants first worked with an instructor in an inclusive classroom to develop social engagement and verbal initiation skills. Once the skills were mastered the participants then proceeded to work with in class peer mediators. It was noted that the participants increased their social engagement and verbal initiation when tasks or high interest activities were used. Also, the results from this study indicate that developing curriculum with their interest may spark an increase in social engagement and verbal initiations without direct intervention on social skills. These students continued their interest to actively participate in clubs with typically developing peers. The activities used in this study were mutually reinforcing the students with ASD and their typical peers.

While social skill development should be taught and developed over time, environmental issues should also be considered. For example, the social club seems to have been a positive forum for facilitating interaction and increasing unprompted social

engagement. Further research should be focused on generalization of socialization outside the classroom and beyond the intervention.

Using Social Stories

Social stories are an intervention tool to assist individuals with ASD in understanding of a social environment in a story format. They were taught to read, or listen to a story that depicts the nuances of interpersonal communication. The purpose is to assist individuals to become appropriate with a social manner. It is found that the use of social stories is helpful to teach skills of initiating, providing social responses, and building a jointing attention (Taylor and Hock, 2008).

In Delano and Snell's study (2006) three children with ASD participated in a study to evaluate social stories impacting on their appropriate social engagement and social skills. These skills included seeking attention, providing comments, initiating requests, and making contingent responses. In the study the children read a social story, answered comprehension questions, and involved in a 10 minute play session with typically developing peers. Results showed the occurrences of the social skills during the play session increased as well as the duration of their social engagement with a peer and a teacher. However, social story interventions have a short lived history to date only four studies have been found to directly measure their effects on social skills. Although it was found that social stories may have a positive effect on the social skill learning on students with ASD. There are not many studies on social stories, and future research in a variety of environments may be needed.

Physical Exercises

Physical exercises have been provided to individuals with ASD in recent years. It was found that these activities not only help keep them fit, but also reduce inappropriate behaviors and learn social communication skills (Pan, 2009). It was also found that physical exercises lead to a decrease of stereotypical behaviors (e.g., hand flapping, rocking, etc.), and an increase of adolescent's muscular strength, gross motor skills, endurance, self-confidence, and physical appearance, so that they could become socially active (Rosenthal-Malek & Mitchell (1997). Unfortunately, as students with ASD grow up they are likely to become less physically active due to their interest in other extracurricular activities, such as video games, science (e.g., animals, dinosaurs), transportation, drawing, and comics (Hutton, 2013). It is found that 43% of these students were overweight. The rise in body mass index (BMI) is alarming because of the lack of vigorous exercise.

Physical fitness. Physical exercises promote individuals physical fitness and health (Pan & Frey, 2006). In their study, 30 adolescents aged 10-19 were divided into three groups, 9 in elementary, 9 in middle and 12 in high school. All participants wore accelerometers in a daily activity for eight hours a day for seven consecutive days based upon their level of activity then and completed an activity questionnaire. They partook in weightlifting, tae kwon do, karate, martial arts, swimming, ice and roller skating, jogging and running. The main findings were that elementary participants were more active than other groups with middle school and high school participants, regardless of the day or time.

Further, in MacDonald, Esposito, and Ulrich's study (2011) the patterns of physical activity of 72 children with ASD was analyzed. The findings indicated that physical activities decline as children grow up. The age groups demonstrated a pattern of decrease in the after school time frame were consistent with previous research that stated the need for extracurricular activities for students with ASD (Pan & Frey, 2006). The youngest group's mean time of moderate to vigorous physical activity was 17 minutes and the older group was 10, while only a small portion (1 minute) for each group was vigorous. MacDonald, Esposito, and Ulrich (2011) indicated that not only was exercise valuable for health related benefits but also decrease stereotypical behaviors of the students. Further studies need to include more vigorous activities into the physical exercise intervention and everyone will benefit from a prescription of physical activity.

In Pan's study (2011), the efficacy of a 14-week aquatic program for children with ASD and their siblings without a disability were assessed. There were 15 adolescents with ASD and 15 adolescent siblings. Their ages were from 7 to 12. There were two 12 week phases in which 14 adolescents received intervention. Then the remaining 16 adolescent participated in the following 12 weeks. The intervention consisted of four parts: a warm up, a 35 minute period for individuals or paired activity, a 15 min group game or activity, and a cool down. The results show that the participants improved their aquatic and motor skills as well as their health by building muscles and enhancing body strength and endurance. Their body fat was decreased, even their parents reported that their children displayed self-confidence, physical appearance, and appeared to be more socially active. Therefore physical exercise should be the primary way for adolescents to improve their motor skills and physical fitness.

Reducing behavior problems. Research has demonstrated that physical exercise could reduce stereotypical and maladaptive behaviors of adolescents with ASD, especially self-stimulatory behavior (Lang, Koegel, Ashbaugh, Regeister, Ence, & Smith, 2010).

Elliott, Dobbin, Rose, and Soper's study (1994) examined the effects of antecedent exercises on maladaptive and stereotypical behavior of 6 adults with ASD. The participants were observed in a controlled environment before and after the exercises and in an environment without any exercises. They were randomly placed in three groups and observed for 30 minutes on two occasions without recreational or structured activities. During the baseline, maladaptive and stereotypical behaviors were noted. During the treatment, each participant was allowed to structure his or her own activity. This was followed by one of the three activities for 20 minutes. For example, a non-exercise condition was used to control attention. The other 2 activities were general motor training and vigorous aerobic exercise. The non-exercise activity demonstrated little potential for raising heart rates. General motor training activities kept heart rates in between 90-120 beats a minute (riding an exercise bike, using a stair stepper, lifting weights on a universal gym, or treadmill walking at 2.0 miles per hour). The vigorous activity elevated heart rates above 130 bpm for 20 minutes (treadmill running at 4.0 mph). Finally, heart rates were assessed after each antecedent treatment. The participants then returned to the controlled environment and observed for 30 minutes. Each participant completed five cycles at each station. Only two participants were selected to the aerobic exercise before performing a community-integrated task. The findings showed that antecedent aerobic exercises reduced undesirable behaviors considerably.

Also, vigorous aerobic exercises equally reduced their maladaptive and stereotypical behaviors.

In Rosenthal-Malek and Mitchell's study (1997), the effect of exercise on self-stimulatory behaviors and positive responding of adolescents with ASD was examined. The results demonstrated that there was a significant decrease in self-stimulatory behavior after physical exercises. Also, the level of correct responding increased as well as task completion when aerobic exercises were taught. It appears that aerobic exercises not only decrease self-stimulatory behaviors but also increase on task academic performance and work related tasks.

Lang, Koegel, Ashbaugh, Regehr, Ence, and Smith (2010) reviewed articles on physical exercises and individuals with ASD. The total of 18 studies were analyzed, of these, 64 participants from 3 to 41 were involved. They were engaged in jogging, weight training, and bike riding to decrease stereotypical, aggressive, and off task behaviors. It was summarized that most exercises benefit adolescents with ASD to improve their health and reduce maladaptive behaviors. Physical exercises might produce positive changes in behavior beyond fitness due to the physical stimuli obtained from exercises. It is suggested that the exercises should match with their behaviors, for example, arm movements to change hand-flapping in order to target their maladaptive behavior. In addition, exercises should be provided multiple times a day for practice or embedded in a preferred activity to motivate participation and reinforce their appropriate behaviors

In Sowa and Meulenbroek's study (2011) 16 behavioral studies on 133 children and adults with ASD were reviewed. The participants were offered structured physical activities in a whole group or individualized settings. The results of the 16 studies

depicted a positive and effective gain in motor and social deficits. The individualized interventions demonstrated greater results than whole group interventions, which correlated with social skill improvement. The literature also indicates that the individualized interventions were more frequent and more intensive than whole group intervention. The 16 behavioral studies demonstrated strong benefits of physical exercises on the participants motor and social functioning.

Engaging in social interactions. Social communication is the major problem with adolescents with ASD. Although there are different ways in social skills training related to communication skills as mentioned previously, physical exercises provide an opportunity for these students to engage in activities with others.

In Pan's study (2009) the correlation between age, social engagement, and physical activity in children with ASD was examined. Twenty five children with ASD were observed. Each child was assessed by a uniaxial accelerometer and observations. Pan (2009) found a partial relation between age and social engagement and their relation to physical activity. Non-interactive engagement with adults was of correlation to the children's physical activity. Most previous research found inconsistent support in studying the decline of socialization as the children with ASD grows up. This inconsistency could be lack of adolescents in previous studies, while favorable environments and social interactions may make subsequent positive behaviors (Mundy, 2007). These interaction can lead to improve social skills (Thomas & Smith, 2004), and physical fitness (Lotan, Isakov, & Merrick, 2004), and reduction of stereotypical behavior (Prupas & Reid, 2001). Pan (2007) noted that physical activity and social engagement behaviors of children with ASD may be more positively affected by social

and environmental constraints than ASD itself. This study provided a positive initial attempt to study age, social engagement, and physical activity in children with ASD. It is found that adolescent's self-image, self-confidence, and social skills improve during physical exercise, but further studies are needed to better understand all of the influences physical activities may bring as interventions for social skills improvement.

Bahrami, Movahedi, Marandi, and Abedi's study (2012) evaluated the effects of 14 weeks of Kata techniques on stereotypical behaviors of children with ASD. Kata are choreographed patterns of movement practiced either solo or in pairs. Kata movements are commonly associated with Japanese and Okinawan martial arts such as aikido, judo, and karate. In the study, 30 participants' ages ranging from 5 to 16 were involved. They were either assigned an exercise or placed into the no exercise control group. The participants in the exercise group received Kata instruction four times per week for 14 weeks. During the baseline participants' parents, caregivers, and teachers observed participants at home, and in regular school environments in a 7 day span. Then those associated with the participant were given an assessment based on their behaviors. During the intervention, the participants were given 1 session a day, 4 days per week for 14 weeks. They were required to watch a videotape of a specific technique of an expert performing the skill prior to the skill engagement at the beginning of each training session. Then, they were taught Kata techniques individually. The training duration increased from 30 minutes to 90 minutes in week 8 with the last 6 weeks of intervention approximately 90 minutes. Multiple systematic reinforcement techniques were used such as verbal encouragement, and play-like activities. It was found that Kata techniques significantly reduced stereotypical behavior even after 30 days of no practice. It was

noted that due to the decrease in stereotypical behavior participants were more likely to initiate conversation and became more social in the school environment (Bahrami, Movahedi, Marandi, & Abedi, 2012)

Petrus, Adamson, Block, Einarson, Sharifnejad, Harris (2008) conducted a systematic review to analyze studies evaluating the effects of exercise interventions on stereotypical behaviors in students with ASD. The authors only included those studies on exercises related physical therapy interventions which were conducted from 1980 to 2007. Only seven studies meet the researcher's criteria. Four studies were using single subject design, two were group studies, and one was a case study, and the ages of participants varied. The evidence found in the research review points out that physical exercises produce a short term decrease in stereotypical behavior, and the higher the intensity the more of a decrease in these behavior problems. However, limited research has been found on physical exercises to improve social communication and social interaction of these students. It seems that more studies are needed in the area of physical exercises and adolescents with ASD, especially the impact of such exercises on these youngsters' social skills improvement.

Summary

The prevalence of autism is rising and continues to increase in the future. These students have problems in social communication, interaction, and imagination, with limited ability to initiate and maintain conversation, request for information and material, and interact with others. Intervention programs including social skills training, peer-mediated groups, social stories, and physical exercises have been defined and

demonstrated to have beneficial effects on social communication and interaction of these students to decrease maladaptive, stereotypical, and self-stimulatory behaviors. Specifically, physical exercises have demonstrated increased muscular strength, endurance, self-confidence, and physical appearance which encouraged the students to become more socially active. However, reviewing the research, limited studies have been focused on adolescents with ASD, especially providing strategies to improve their social communication skills. Recent studies on physical exercises for these adolescents may create a new avenue in social skills training, as most were found to focus on classroom based interventions. After school physical activities may be another alternative way for them, not only benefit their physical fitness but also provide an opportunity for them to communicate and interact with their age appropriate peers.

Chapter 3

Methodology

Setting

This study was conducted at a family owned fitness center located in a middle class suburban area of southern New Jersey. The center was used as a tennis only facility in 1971, then expanded to include a full size basketball and volleyball court, a group exercise studio, and a studio for Pilates and Yoga, as well as a room for physical therapy. The physical activities designed for students with ASD were provided in the Yoga studio for one hour with two sessions switched with activities, twice a week for 12 weeks.

Participants

In order to recruit participants, a letter was developed to describe the winter wellness program and sent to all fitness club members to invite the member's adolescent children with ASD to join a 12 week's fitness and socialization program.

Three adolescents ranging from age 13 to 14 were recruited and permitted by their parents. They voluntarily participated in this after school wellness program. Table 1 presents the general information of the participants.

Table 1

General Information of Participants

Student	Age	Gender	Grade Level	Diagnosis	School Placement	Special Education Services
A	13	M	7	ASD at 3	Self-Contained, private school	Speech, OT, PT twice a week
B	14	M	7	ASD at 3	Self-Contained, private school	Speech, OT, PT twice a week
C	13	M	6	ASD at 3	Self-Contained, Private school	No services received

Note: Speech: speech therapy, OT: occupational therapy, PT: physical therapy

Participant A has limited oral language with only a few words to request, and make gestures for communication. He is able to follow teacher's directions, but has difficulty in making a conversation, especially managing a topic and maintaining the conversation. He also has behavioral problems, such as eloping, squeezing, and scratching due to anxiety or lacking of interest in doing something.

Participant B is non-verbal using an iPad application named Sonoflex as a means to communicate. He is able to request his needs with gestures or use his iPad device. His problem is his ability to follow directions and avoiding non-preferred tasks. This student currently participates in a basketball program for children with special needs. His mother hopes to give her child another opportunity to increase his fitness level, improve his self-regulation and learn to follow directions.

Participant C is non-verbal, making efforts with gestures and sounds to communicate with others. He can be very aggressive quickly if he is making an attempt to initiate or seeking a peer's response. For example, if he wants to communicate with others, he would attempt to grab or physically touch peers. He is observed to avoid non-

preferred tasks, but can be quickly redirected through verbal and physical prompts. His conversational skills are limited due to his limited oral language to communicate with his peers. When given time and redirection, he is able to converse through gestures, visual cueing, and verbal noises.

Teacher

The lead instructor taught the entire program for 12 weeks. He has five years of experience in teaching physical education classes for children and adults with disabilities in a variety of settings. Two teacher assistants were involved to support students with a ratio of 2:1 during the group activities as well as individual practice when needed.

Materials

Instructional materials. A total of 12 activities including ice breaker, warm up, and group practice were provided throughout 12 weeks of the physical exercises. The instructional materials were adopted from the national program called “Get Fit”, which is a health and wellness program created by the Family Resource Network in 2008 (<http://www.getfit.org>, 2015) for people with intellectual and developmental disabilities and their caregivers. The entire program included a series of activities such as, ice breaker, warm up, group practice, and cooling down. The first activity was always an ice breaker in which all participants and teachers sit in a circle and pass a ball from the teacher to a participant by stating the name of the participant or teacher. Later in the session, a greeting was shared i.e. participant’s birthday, age. This was regarded as a conversational builder within a group setting and something that could be conversed in a paired activity. Also within the activity of the ice breaker, participants were reminded to

request for the ball to be passed e.g. “Can I have a turn?” After the ice breaker, a warm up activity was provided for body movement and to get ready for the fitness activity of the day. Then a group activity was followed when conversational skills were taught, such as initiating, requesting, and topic maintenance, modeled by the instructor. The participants were encouraged to practice following the teacher’s modeling. Subsequently, a cool down activity was provided in a similar fashion as the ice breaker.

Measurement Materials

Observation checklist 1. This checklist was developed by the teacher to record individual participant’s communication occurrences including: requests, responses, and comments (see Figure 1). It has a rating scale of 0-5 with 0 representing no occurrences, 1 for using physical prompt, 2 for partial physical, 3 for gestures or model, 4 for verbal prompt, and 5 for being independent.

Observation checklist 2. This checklist was also developed by the teachers to record conversational occurrences between two participants or participant and teacher. It includes communicative behaviors such as reciprocity, listener’s knowledge, verbosity, maintaining topic, and discourse style and language (see Figure 2). It has a rating scale of 0-3 with 0 representing never being observed, 1 occasionally, 2 moderate, but impacting the conversation, 3 evidenced across conversation, making a marked impact.

Parent survey. This parent survey was also developed by the teachers to analyze the participant’s application of socialization and conversational skills outside of the group setting to see if they were able to generalize to the home setting. The survey includes 10 questions based on the participant’s use of communicative behaviors such as reciprocity,

listener's knowledge, verbosity, maintaining topic, and discourse style and language, as well as requesting, commenting, and responding (see Figure 3).

Procedure

Instructional procedures. There were 12 sessions in the entire program. Session 1 and 2 included Ball Tag, in which a teacher and a participant use a stability ball to roll toward the other participants and teacher as they attempt to avoid being touched by the ball. If another teacher and participant were touched they would become "it." Participants were reminded to use their partner's name and discuss together to develop plans of escape and how to get other people to be "it." The next activity was the balloon relay as a group activity. The participants were required to line up in teams and race down to a cone at one end of the yoga studio and back to their team while keeping their balloon up without touching the floor. The cool down was designed in the same fashion as the ice breaker activity except that the group would say good bye as well as the other student's name. This lesson format was implemented in each session. The planned activities were altered every two sessions to give participants a variety of opportunities to complete the sessions. During the warm up activities the teacher or assistant would work independently with the one of the three participants on initiating, responding, or commenting. Modeling gestures were a successful means of teaching each participant due to their abilities. Consistent practice of language skills were practiced throughout the activity period to reinforce the language skill of the session.

Week 2's session consisted of a similar ice breaker activity as the previous week. The first warm up activity was a freeze dance where music was played and participants learned to dance and conversed with peers and teachers. When the music stopped, the

participants and coaches had to freeze their bodies, and resume dancing when the music played again. The warm up activity was followed to learn a triangle dance. This dance was designed in the fashion of the freeze dance, but the difference was when the music stopped participants had to seek pictures that the teacher announced to the class, e.g. coat. The warm up activity for the week was team rock, paper, and scissors. The class was divided into two teams. Each team huddled up and discussed if they wanted to use rock, paper, or scissors as their team's gesture. When time was up the participants would race up to the middle of the studio. The number of 1, 2, 3, was announced by the teacher and each participant displayed their sign. Then the participants ran back to the wall. The group activity for these two sessions were over, under, and around. The participants were assigned into small groups with teachers with a jump rope. They first had to jump over the rope, followed by under the rope and finally running around the rope in each turn with a faster and faster speed. The following activity was rotating stations. Participants were in the same groups to practice ball skills. The stations included: tossing a foam ball, bouncing a basketball, and kicking a soccer ball after 3 minutes at each station when the time was called. Subsequently, the cool down activity required participants gathering back in their circle rolling a ball to each other and to the teacher by saying good bye and the participant's name.

Week 3 started with the same ice breaker activity as the previous weeks, but in addition to their names, participants were required to tell their age. The first warm up activity was a shuttle relay in which participants were organized into teams with teachers. Each participant had to carry a ball and to place it in a basket at the other end of the studio. A variety of movements were practiced such as crab walking, running, hopping,

and walking. While standing in line, participants had to complete 10 jumping jacks. The second arm up was a seated rolling ball. This required participants partnering with teachers and holding their legs out straight and pushing the ball to their partner. The first group activity was cone soccer, the participants had to roll a ball between two cones, multiple cones were provided at a variety of distances based on individual skill levels. Next, participants engaged in a group of red light and green light. A participant called verbal commands of “green and red” to the class if non-verbal, colored cards could be used. Participants had to walk, run, or hop to the caller. Rotating stations was a follow up activity, in which participants had to volley a volleyball, bounce a basketball, and kick a soccer ball for three minutes. Finally, the cool down activity was the same ice breaker except that participants had to say good bye to their peers. New physical exercises were introduced each week, and a different exercise was practiced in the following week. Similar activities were arranged in the following sessions until Week 12. Table 2 presents the weekly procedures.

Table 2

Instructional Procedures

Week	Activities	Communication Examples
1	Ice Breaker: Ball pass name game Warm Up: Ball Tag Group: Balloon Relay Cool Down: Ball Pass Name Game	“Can I have a turn?” “Over here!” “What do you think if we rolled it over their?” “Great Job!” “Try this.” “Bye Chris”
2	Ice breaker: Circle warm up Warm Up: Triangle Dance Group: Team Rock Paper Scissors Group: Over, Under, Around and Through Cool Down: Circle Cool Down	“Andrea can I have the ball?” “Here’s the coat!” “What do you think of being rock?” “Can you lower the rope?” “Bye Andrea.”
3	Ice Breaker Activity: Circle Warm Up Warm Up: Shuttle Relay Group: Seated Rolling Ball Warm Up Group: Red Light, Green Light Group: Rotating Stations Cool Down: Circle Cool Down	“When can I have a turn?” “Great job balancing.” “Here you go.” “Try to stretch a little further.” “Green light!” “Try to keep it up!” “It there a harder way to keep it up?” “Bye coach”
4	Ice Breaker: Circle Warm Up Warm Up: Bean Bag Toss Warm Up: Scooter Relay Group: Simon Says Group: Soda Bottle Bowling Group: Rotating Fitness Stations Cool Down: Circle Cool Down	“Hi Leighanna!” “Chris watch this toss.” “Can you show me how to lay use my hands and feet to move?” “Strike! Good Job.” “Just a couple more.” “I liked Simon says.”
5	Ice Breaker: Circle Warm Up Warm Up: Scooter Obstacle Course Group: Soda Bottle Bowling Group: Rotating Fitness Stations Cool Down: Circle Cool Down	“Hi Crystal” “Can you I go first?” “Ok I’ll wait to he goes” “I’ll wait till he goes twice.” “This is fun.” “Here you can join in too.” “Bye Leighanna!”
6	Ice Breaker: Circle Warm Up Warm Up: Paper Snowball Fight Group: Rotating Fitness Stations Cool Down: Circle Cool Down	“Hi!” “I’m 14.” “More snowballs!” “Can you help me make more?” “I like these bands” “Can I use the stability ball next?” “Bye, this was a fun day.”
7	Ice Breaker: Circle Warm Up Warm Up: Rolling Stability Ball Exercises Group: Scooter Soccer Group: Fitness Stations Cool Down: Circle Cool Down	“Hi Andrea!” “Can I have the ball first?” “Can you touch my hands?” “Pass me the ball!” “Count 1, 2, 3.” “Good Job!” “I liked using the rope the best!”
8	Ice Breaker: Circle Warm Up Warm Up: Shark Tag Group: Rolling Stability Ball Exercises Group: Fitness Stations Cool Down: Circle Cool Down	“Hi coach Chris!” “How are you?” “Come get me!” “Lift your hands to the ceiling.” “Count to ten!” “Good Job!” “What did you like best?”
9	Ice Breaker: Circle Warm Up Warm Up: Scooter Scavenger Hunt Group: Tug of War Group: Fitness Stations Cool Down: Circle Cool Down	“Hi! Coach Sam” “1,2,3” “Pull!” “Sit down” “Bye Coach Albert.”
10	Ice Breaker: Circle Warm Up Warm Up: Scooter Volleyball Race Group: Tug of War Group: Fitness Stations Cool Down: Circle Cool Down	“Hi! Crystal.” “I’m the fastest!” “Pull!” “1,2,3” “Bye Coach Andrea”
11	Ice Breaker: Circle Warm up Warm Up: Block Baseball Group: Scooter Race with Rope Group: Fitness Stations Cool Down: Circle Cool Down	“Hi coach Albert!” “Swing!” “Pull, Pull” “Great Job!” “Bye coach Leighanna.”
12	Ice Breaker: Circle Warm Up Warm Up: Parachute Popcorn Group: Block Bowling Group: Fitness Stations Cool Down: Circle Cool Down	“Hi coach Andrea!” “Up, and Up!” “How fast can you build your pyramid?” “1 and 2 and 3.” “What was your favorite activity?”

See a Sample Lesson in Appendix A

Measurement Procedures

Observations. Each session was videotaped and saved on a DVD disc on the teacher's computer. These recorded sessions were observed using checklist 1 and 2 to mark each individual participant's communication occurrences. One teacher aide watched the recorded session with the teacher to keep accuracy of the recording.

Survey. At the end of the study parents were asked to complete all the questions in the parental survey. The copy of the survey was collected for the analysis.

Research Design

A single subject design across students with ABC phases was used in the study. During Phase A, the baseline, student A was taped for sessions 1-3, student B for sessions 2-4, then student C for sessions 3-5 and student D for sessions 4-6. Their communication occurrences were recorded using both checklists through the teacher and assistant watching the video. During Phase B the intervention, the wellness program was introduced and communication skills including initiating requests, responding to questions, and giving comments were taught in a group setting together with physical activities. Each participant was provided an opportunity to practice with teacher assistants and an activity or a game was offered to paired participants, which provided another opportunity for peer interaction. The same videoing process was used during the 12 weeks sessions, as well as communication occurrence recording. During Phase C, maintenance, after one week's break, the participants were required to join the group activities such as ice breaker circle, scooter relays and rotating stations without instruction for two weeks.

The same videoing process was applied for these sessions as well as recording participants' communication occurrences.

Data Analysis

A visual graph presented each individual student's communication occurrences in baseline, intervention, and maintenance phases. A table presented the means and standard deviations of each participant's performance in communication and interaction with adults and peers to compare the difference.

Chapter 4

Results

The current study attempted to explore physical exercises of a 12-week winter wellness program to increase social communication skills of middle school students with ASD. Each participant was observed during the baseline, intervention, and maintenance phases with two checklists to record their requests, responses to the teacher's questions and making comments. Meanwhile, their conversational skills were recorded in terms of reciprocity, taking account of a listener's knowledge, verbosity, topic management, discourse style, and response language. Table 3 presents means and standard deviations (SD) of participants' social communication skills across phases.

Table 3

Means and Standard Deviation of Social Communication Skills across Phases

	Phase A (Baseline)				Phase B (Intervention)				Phase C (Maintenance)			
	Frequency		Scores		Frequency		Scores		Frequency		Scores	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<u>Participant A:</u>												
Request	5.25	4.76	0.82	10.67	4.76	3.50	0.55	18.50	0.71	3.00	3.00	1.41
Response	7.75	5.19	2.00	2.70	14.83	5.19	3.50	0.55	22.00	1.41	3.00	1.41
Comment	5.50	3.39	2.00	1.73	9.67	3.39	3.50	0.55	14.00	1.41	3.00	1.41
<u>Participant B:</u>												
Request	2.60	0.89	1.20	0.45	4.43	1.51	2.43	0.98	6.50	1.29	2.25	0.98
Response	3.00	1.41	1.20	0.45	10.57	6.29	2.43	0.98	14.25	4.03	2.25	0.98
Comment	1.20	1.10	0.80	0.45	6.14	4.30	2.43	0.98	12.50	2.65	2.25	0.98
<u>Participant C:</u>												
Request	4.50	2.95	2.16	0.41	13.67	3.39	3.78	0.44	16.00	1.83	3.50	0.58
Response	3.50	2.43	2.16	0.41	18.89	6.64	3.78	0.44	24.00	1.83	3.50	0.58
Comment	3.33	2.70	2.16	0.41	13.44	3.40	3.78	0.44	14.75	1.71	3.50	0.58

Table 4 presents mean and standard deviation of conversational skills across phases.

Table 4

Means and Standard Deviations of Conversational skills across Phases

	Phase A (Baseline)				Phase B (Intervention)				Phase C (Maintenance)			
	Frequency		Scores		Frequency		Scores		Frequency		Scores	
	<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>
<u>Participant A:</u>												
Reciprocity	2.50	0.58	1.50	0.58	6.60	7.34	1.67	0.52	11.50	0.71	1.50	0.71
Listener knowledge	2.00	0.82	1.00	0.00	5.17	2.32	1.67	0.52	8.50	0.71	1.50	0.71
Verbosity	2.25	0.50	1.00	0.00	5.00	2.28	1.67	0.52	7.50	0.71	1.50	0.71
Topic management	2.00	0.00	1.00	0.00	4.83	2.32	1.67	0.52	8.50	0.71	1.50	0.71
Discourse	1.75	0.50	1.25	0.50	4.67	2.07	1.67	0.52	8.00	0.00	1.50	0.71
Response language	2.50	0.58	1.50	0.58	5.00	2.61	1.67	0.52	8.50	0.71	1.50	0.71
<u>Participant B:</u>												
Reciprocity	2.00	1.41	0.80	0.45	3.43	1.40	1.86	0.60	2.50	1.00	1.75	0.96
Listener knowledge	2.00	1.22	0.80	0.45	3.43	1.13	1.86	0.69	2.50	1.00	1.75	0.96
Verbosity	1.60	0.89	0.80	0.45	3.29	1.11	1.86	0.69	2.50	1.00	1.75	0.96
Topic Management	0.40	0.89	0.20	0.45	3.29	1.11	1.86	0.69	2.50	1.00	1.75	0.96
Discourse	1.80	1.30	0.80	0.45	3.43	0.98	1.86	0.69	2.50	1.00	1.75	0.96
Response language	2.00	0.00	1.00	0.00	3.43	0.98	1.86	0.69	2.50	1.00	1.75	0.96
<u>Participant C:</u>												
Reciprocity	1.50	2.35	0.50	0.84	5.78	1.56	2.38	0.58	8.25	2.22	2.25	0.50
Listener knowledge	1.83	1.17	1.17	0.41	5.33	1.73	2.38	0.58	7.75	2.36	2.25	0.50
Verbosity	1.33	1.75	0.67	0.82	5.44	1.94	2.38	0.58	7.75	2.36	2.25	0.50
Topic Management	1.67	1.21	1.67	0.41	5.22	1.92	2.38	0.58	8.50	2.65	2.25	0.50
Discourse	2.00	1.1	0.17	0.41	5.22	1.92	2.38	0.58	8.00	2.16	2.25	0.50
Response language	2.17	1.17	1.17	0.41	5.44	1.74	2.38	0.58	8.75	2.50	2.25	0.50



Figure 1. Presents Participants' Communication scores across phases

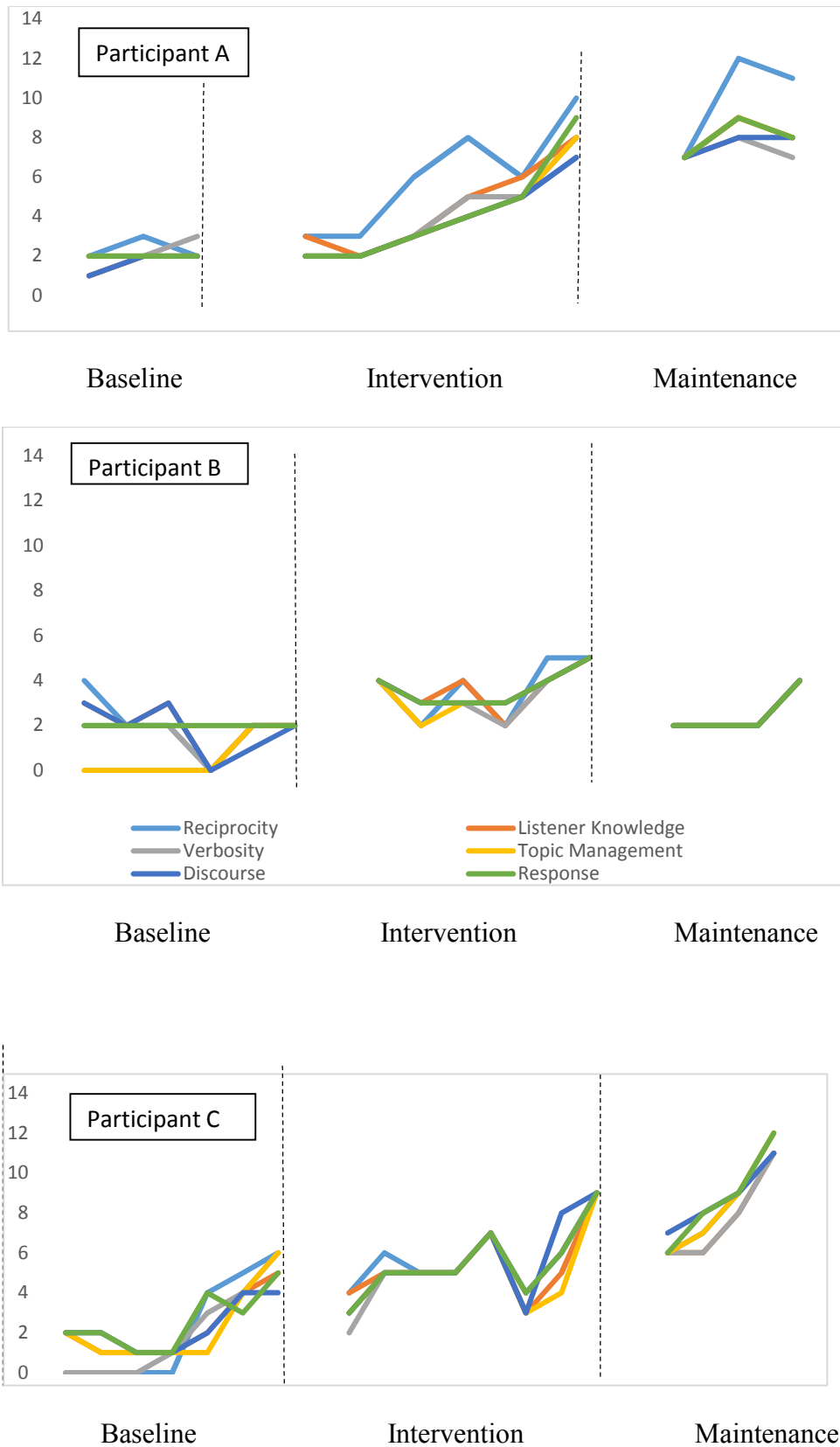


Figure 2. Participants' Mean Scores of Conversation Skills

All parents' responses to the survey were calculated and presented in Table 5.

Table 5

Parent Survey Responses

Question	Participant A	Participant B	Participant C
1. Requesting (has more attempts or makes clearer requests)	4	4	5
2. Response (has more attempts or on topic)	4	4	4
3. Commenting (has more attempts or on topic)	3	3	4
4. Turn-Taking (Shows interest in conversation or responds to questions)	3	3	4
5. Listener Knowledge (gives related knowledge during conversation)	3	3	2
6. Verbosity (takes turn to keep topic)	3	3	2
7. Topic Management (keep topic and proper language)	3	3	3
8. Discourse Style (has Less behavior issues, friendly, appropriate space)	3	3	4
9. Response Language (Understand parent or sibling's intention or appropriate linguistics)	4	3	4
10. Overall Success in communication with others at home	4	3	4

1= physical assistance, 2= partial physical prompt, 3= gestural with prompt, 4= verbal with prompt, 5= independent

Chapter 5

Discussion

The purpose of this study was to examine the effects of fitness activities on communication skills of adolescents with ASD. Over the course of 12 weeks, 3 middle school students with ASD participated in the Winter Wellness program focusing on teaching social and conversational skills through practicing verbal language in a 1:1 situation, paired with peers, and whole group instruction. Their initiation and maintenance of their conversation through reciprocal responses, and responses to questions and comments were evaluated.

Adolescents with ASD often struggle with communication skills, which can lead to problems in their daily lives such as social anxiety, loneliness and difficulty in friendship building (Bellini, 2004). Physical exercises bring these teenagers together to involve in activities and social environments that create an opportunity for these students to meet and interact during the game play.

Request

Results demonstrated that all three participants improve their communication skills. For example, the mean of Participant A's frequency of requests was 5.25 during the baseline and increased to 10.67 in the intervention and 18.50 during the maintenance. Participant B's was 2.60 during the baseline and increased to 4.43 in the intervention and continued to increase to 6.50 during the maintenance. Participant C's was 4.50 during the baseline and increased to 13.67 in the intervention and 16 during the maintenance. Meanwhile, their mean scores of requests were 1.79 in the baseline to 3.24 in the

intervention, and 2.92 during the maintenance. For example, the mean scores of participant A were 2 in the baseline to 3.50 in the intervention and 3 in the maintenance. Participant B got 1.2 in the baseline to 2.43 in the intervention and 2.25 in the maintenance. Because of the instruction and opportunity provided during the intervention, all participants increased their initial requests, starting from a simple greeting, e.g. “Hi”, to a verbal sentence, e.g. “want to play?” Obviously, the physical exercises offer these students to meet and socially interact with each other during their activities. This opportunity provides participants to communicate and initiate their request to obtain their needs.

Response to Questions

Results demonstrated that all three participants increased their responses to the instructors’ and peers’ questions. For example, the mean of Participant A’s frequency of responses was 7.75 during the baseline and increased to 14.83 in the intervention and continued to increase to 22 during the maintenance. Participant B’s was 3 during the baseline and increased to 10.57 in the intervention and 14.25 during the maintenance. Participant C’s was 3.50 during the baseline and increased to 18.89 in the intervention and continued to increase to 24 during the maintenance. Meanwhile, their mean scores of responses to questions were 1.79 in baseline to 3.24 in the intervention and 2.92 in the maintenance. For example, participant 1’s scores of responses were increased from 2 in the baseline to 3.50 in the intervention and 3 in maintenance. Participant B’s were increased from 1.2 in the baseline to 2.43 in the intervention and 2.25 in the maintenance. Participant C’s scores were increased from 2.16 in the baseline to 3.78 in the intervention and 3.50 in the maintenance. Because of the instruction and opportunity provided during

the intervention, all participants increased their responses to questions, starting from a simple response, e.g. “ok”, to a verbal sentence, e.g. “The battle ropes” to respond to the instructor’s question “What was your favorite activity to do today?” Obviously, the physical exercises offer these participants an opportunity to respond to others verbally. In the future this can lead to an increase in response to adults, i.e. teachers in school and parents at home, and enable the participants to interact with others, and build friendships with peers.

Making Comments

Results demonstrated that all three participants made more comments compared to the time when they entered the program. For example, the mean of Participant A’s frequency of making comments was 5.50 during the baseline and 9.67 in the intervention and 14 in the maintenance. Participant B’s was 1.20 during the baseline and 6.14 in the intervention and 12.50 during the maintenance. Participant C’s was 3.33 during the baseline and 13.44 in the intervention and 14.75 during the maintenance. At the same time their mean scores were increased from 1.65 in the baseline to 3.24 in the intervention to 2.92 in the maintenance. For example, participant A’s scores of making comments were 2 in the baseline to 3.50 in the intervention and 3 in the maintenance. Participant B’s were increased from 0.8 in the baseline to 2.43 in the intervention and 2.25 in the maintenance. Participant C’s were increased from 2.16 in the baseline to 3.78 in the intervention and 3.50 in the maintenance. Because of the instruction and opportunity provided during the intervention, all participants increased their verbal comments, starting from a simple comment, e.g. “like”, to a verbal sentence, e.g. “I like

it.” Physical exercises offer these adolescents an opportunity to enhance their thinking in a social environment and encourage them to share their opinions by making a comment.

Conversations

Throughout the study, participants learned to develop more conversations with peers and instructor, but their scores of the quality remained low. The first area in the conversational language was reciprocity. In the baseline, Participant A’s mean frequency of reciprocity was 2.50, 6.67 during intervention and 11.50 during the maintenance. Participant B’s baseline was 2, 3.43 during the intervention, and 2.5 during the maintenance. Participant C’s was 1.50 in the baseline increased to 5.78 during the intervention and 8.25 during the maintenance. Participant A’s mean scores in the baseline were 1.50 to 1.67 during the intervention and 1.50 during the maintenance. Participant B’s scores in the baseline was 0.80 to 1.86 during the intervention and 1.75 during the maintenance. Participant C’s scores in the baseline was 0.50, 2.38 in the intervention and 2.25 during the maintenance. Although each individual gained scores when instruction was provided, the increase was slight. It appears that conversational skills are complex and it takes a longer time to learn and practice, especially for those with ASD who have language barriers.

Listener Knowledge

This area includes giving related and appropriate information. Participant A’s mean of frequency was 2, 5.17 during the intervention and 8.50 during the maintenance. Participant B’s was 2, 3.43 during the intervention and 2.50 during the maintenance. Participant C’s was 1.83, 5.33 during the intervention and 7.75 during the maintenance.

Their mean scores were increased slightly, for example, Participant A got 1 in the baseline, 1.67 during the intervention and 1.50 during the maintenance. Participant B's was 0.80 in the baseline, 1.86 in the intervention and 1.75 in the maintenance. Participant C's was 1.17 in the baseline, 2.38 during the intervention and 2.25 in the maintenance. All participants learned how to give related and appropriate information during a conversation, however this skill needs more time to practice to demonstrate successful growth.

Verbosity

This area includes giving the speaker and listener the opportunity to equal turn taking to stay on a specific topic. Participant A's mean of frequency was 2.25, 5 during intervention, and 7.50 during the maintenance. Participant B's baseline was 1.60, 3.29 during intervention and, 2.50 during the maintenance. Participant C's baseline was 1.33, to 5.44 during intervention, and 7.75 during the maintenance. Participant A's score in the baseline was 1, 1.67 during the intervention, and 1.50 during the maintenance. Participant B's baseline was 0.80, 1.86 in the intervention, and 1.75 in the maintenance. Participant C's baseline was 0.67, 2.38 in the intervention, and 2.25 in the maintenance. All participants learned how take turns speaking and listening during a conversation, however they need more time practicing this skill to demonstrate successful growth.

Topic Management

This area evaluated how participants were able to maintain the same topic and use appropriate language during conversations. Participant A's mean of frequency was 2 during the baseline, 4.83 in the intervention, and 8.50 during the maintenance.

Participant B's baseline was 0.40, 3.29 during the intervention, and 2.50 during the maintenance. Participant C's baseline was 1.67, 5.22 during the intervention, and 8.50 during the maintenance. Participant A's score in the baseline was 1, 1.67 during the intervention, and 1.50 during the maintenance. Participant B's baseline was 0.20, 1.86 in the intervention, and 1.75 in the maintenance. Participant C's baseline was 1.67, 2.38 during the intervention, and 2.25 in the maintenance. All participants learned how to maintain a topic and use appropriate language during conversation, however they may need more time to practice this skill to make greater progress.

Discourse

This area analyzed how participant were able to leave appropriate space, have a friendly, behavior free conversation. Participant A's mean frequency during the baseline was 1.75, 4.67 in the intervention and 8 during the maintenance. Participant B's baseline was 1.80, 3.43 during the intervention, and 2.50 during the maintenance. Participant C's baseline was 2, 5.22 in the intervention and 8 during the maintenance. Participant A's baseline score was 1.25, 1.67 during the intervention and 1.50 during the maintenance. Participant B's baseline was 0.80, 1.86 in the intervention and 1.75 in the maintenance. Participant C's baseline was 1.17, 2.38 during the intervention and 2.25 in the maintenance. All participants learned how to leave appropriate amount of space, be friendly, and behavior free while conversing with another person, yet they may need a greater amount of time to practice to make advancement.

Response Language

This area analyzed the participants' use of appropriate linguistics and how they understand a partner's intention. Participant A's mean of frequency was 2.50, 5 during the intervention and 8.50 during the maintenance. . Participant B's baseline was 2, 3.43 during the intervention and 2.50 during the maintenance. . Participant C's baseline was 2.17, 5.44 during the intervention and 8.75 during the maintenance. Participant A's score in the baseline was 1.50, 1.67 during the intervention and 1.50 during the maintenance. Participant B's baseline was 1, 1.86 during the intervention, and 1.75 in the maintenance. Participant C's baseline was 1.17, 2.38 during the intervention and 2.25 in the maintenance. All participants learned how to use appropriate linguistics and understand a partner's intention, but a much larger amount of time needs to practice to further develop this skill.

The results depicted that the more exposure the participants got during the physical activities with peers an increase in the amount of communication occurred, especially in the area of responses. Taylor and Hock (2008) indicted that behavior-analytic procedures such as discriminative stimuli (presence of adult bid), social reinforcers (adult's attention), and motivating operations (visual attraction) should be used to increase responses of joint attention with adults. In their study, social reinforcers (adult attention) and discriminative stimuli (adult bid) were provided to lead to an increase in participant's communication. In this present study, social reinforcers during physical activities were constantly provided in a format of one to one assistance or paired with partners. Visual cues such as activity pictures and charts were attracting each individual's interest. Thus, their participation in developing communication skills with

the teacher and assistants during the intervention and maintenance was enhanced, and the participants demonstrate an increased amount of communication.

At the end of the study, a survey was sent to the participant's parents, and their responses were analyzed. All three participants' parents presented positive responses to the survey. For example, participant A's parents rated 4 out of 5 for their child's requests, 4 for responses, and 4 for making comments. Participant B's parents rated 4 for requests, 4 for responses, and 3 for making comments. Participant C's parents rated 5 for requests, 5 for responses, and 4 for comments. Parents also indicated that their children's level of interaction with family members increased at home.

Limitations

Despite the positive results, there are some limitations in the study. The first is the very small sample size of three participants. The second is the use of two different settings in the fitness center. The one was a karate studio that was small with mirrors surrounding the room, another was a yoga studio that was big and darker. These two locations may impact the individual's behavior, and learning experience.

Recommendations

Reviewing studies, there is limited research conducted in the area of physical exercises to promote communication of adolescents with ASD. Although the results of this study show an increased number of communicative occurrences, the participants' level of communication skills are still comparatively low. Further studies with a bigger sample size are suggested to validate the finding. To date, various studies have been conducted to explore the ways to promote communication for this group of students.

There is still a lot of exploratory research that needs to be done to provide sufficient evidence, especially to improve these students' quality of communication and level of independence.

Conclusion

This study describes a physical fitness program to support adolescents with ASD in learning social and conversational skills to improve their communication with others. Such a fitness-based program may be incorporated in both community and school settings to meet these students' needs. Having access to a fitness center or gymnasium can provide these adolescents with ASD with social experiences during their play and activities with others. This will create an avenue for these students to learn social skills in an interesting, interactive and healthy way.

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Appendix A

Lesson Plan

Week 10 – Friday

Lesson Objective: To have participants increase their social and conversational communication while exercising. Participants will work on coordination skills as well as increasing their level of fitness.

Time: The session will last for 60 minutes

Prior to the Procedures: Participants worked on building communication skills with the teacher and fellow participants. Participants work each session on increasing their fitness capacities through a variety of activities and fitness stations.

Procedure:

Ice Breaker Activity:

Circle warm up: Review of the rules a) hands to self b) if you need a break or a squeeze just ask, but no squeezing others. Review the picture schedule for the day. Work on name recognition by having them identify who they will throw the ball to ahead of time.

Warm-up Game:

- Scooter board balloon volleyball: Each athlete will have their own scooter, and will work with their coaches to volley the balloon back and forth.
- Tug of war: athletes and coaches will work together to tug the rope toward their side of the blue line.
- Modified jump rope: Using a long jump rope. Each athlete will take turns jumping over the rope. We will start with it on the ground, then held still about *an inch off the ground, then moving the rope slightly. Each athlete will get three turns.
- Rolling on the stability ball: Each athlete will have their own stability ball. They can engage in a few minutes of prone (on their stomach) rolling to self-regulate their attention/arousal level.

Group Activity:

- Rotating fitness stations, repeat circuit twice: Working in coach/athlete pairs, rotate through eight fitness stations.

- 1) Stability ball ab exercises, or prone rolling
- 2) Carpet square mountain climbers, figure 8's, circles etc.
- 3) Battle rope
- 4) Power bar – adapted squats on the ball & lunges

5) Stability ball, back exercises, or prone rolling

6) Power bar – bicep curls, triceps push downs & shoulder presses

7) Zoom ball

Cool Down/Wrap up:

End with 3 calming yoga poses & having athletes share their favorite activity. Repeat of the circle warm up saying goodbye.

Appendix B

Parent Survey

HOME COMMUNICATION SURVEY

Student Name:

Please read each item identified below, then circle the number to the right that best fits your judgment with 5 is the highest score and 1 lowest.

Survey Item	score				
	1	2	3	4	5
1. Requesting (has more attempts or makes clearer requests)	1	2	3	4	5
2. Response (has more attempts or on topic)	1	2	3	4	5
3. Commenting (has more attempts or on topic)	1	2	3	4	5
4. Turn-Taking (Shows interest in conversation or responds to questions)	1	2	3	4	5
5. Listener Knowledge (gives related knowledge during conversation)	1	2	3	4	5
6. Verbosity (takes turn to keep topic)	1	2	3	4	5
7. Topic Management (keep topic and proper language)	1	2	3	4	5
8. Discourse Style (has Less behavior issues, friendly, appropriate space)	1	2	3	4	5
9. Response Language (Understand parent or sibling's intention or appropriate linguistics)	1	2	3	4	5
10. Overall Success in communication with others at home	1	2	3	4	5

1= physical assistance, 2= partial physical prompt, 3= gestural with prompt, 4= verbal with prompt, 5= independent

Appendix C

Observation Checklists

Observation Checklist 1

Category	Rating	Frequency	Examples
Request	0 1 2 3 4 5	(tally counting)	Student initiates to greet the partner by saying "Hi! You want to play?"
Response	0 1 2 3 4 5		Student reacts verbally or gesturally to a request or comment "I want to play."
Comments	0 1 2 3 4 5		Student makes a verbal or gestural remark expressing opinion/reaction "I like this game."

Note: 0: no, 1: physical prompt, 2: partial physical, 3: gesture or model, 4: verbal, 5: independent

Observation Checklist 2 (Conversation Observation)

Category	Rating	Frequency	Examples
Reciprocity/turn-taking	0 1 2 3	(tally counting)	That was fun, do you like that?"
<ul style="list-style-type: none"> a. Responding to questions b. Listen to the speaker, show interests c. Reticence 			
Taking account of listener knowledge			"Next time we should try a different way"
<ul style="list-style-type: none"> a. Give related information b. Give appropriate amount of information 			
Verbosity:			"I like that game, do you?"
<ul style="list-style-type: none"> a. Share with the speaker b. Equally take a turn to keep the topic 			"I like it too."
Topic Management			"Do you like to jump rope?"
<ul style="list-style-type: none"> a. Keep the same b. Use appropriate language 			"Yes, I like to jump rope."
Discourse Style			
Appropriate space			
<ul style="list-style-type: none"> a. Friendly b. No behavior issues 			
Response language			"Do you want to be on my team?"
<ul style="list-style-type: none"> a. Use appropriate linguistics b. Understand partner's intention 			"Yes, I would like that."

0=never observed, 1=occasionally, 2=moderate, but impacting the conversation, 3= evidenced across conversation, making a marked impact