JOINT ATTENTION AMONG YOUNG CHILDREN WITH AUTISM AND THEIR TYPICAL PEERS

by

SARAH ZEBROWSKI

B.A., Lewis & Clark College, 2008

A thesis submitted to the

Faculty of the Graduate School of the

University of Colorado in partial fulfillment

of the requirement for the degree of

Master of Arts

Department of Speech, Language, and Hearing Sciences

2014

This thesis entitled:
Joint Attention Among Children with Autism and Their Typical Peers
written by Sarah Zebrowski
has been approved by the department of Speech, Language, and Hearing Sciences

_____
Christine Yoshinaga-Itano, Ph.D., CCC-A

_____
Amy Thrasher, MA, CCC-SLP

_____
Pui Fong Kan, Ph.D., CCC-SLP

Date_____

The final copy of this thesis has been examined by the signatories, and we find that both the content and the form meet acceptable presentation standards of scholarly work in the above mentioned discipline.

IRB protocol # 13-0202

Zebrowski, Sarah (M.A., Speech, Language, and Hearing Sciences)

Joint Attention Among Children with Autism and Their Typical Peers

Thesis directed by Professor Christie Yoshinaga-Itano

Abstract

Joint attention skills are important during development because they help children learn language and social competence. Often these skills are decreased in children with autism, depriving them of learning opportunities. The current study examined three children with autism who participated in treatment to increase their joint attention skills. Initiations of joint attention and responses to cues for joint attention were examined for each participant across two semester sessions of Story of Friendship, a social communication group at CU Boulder. Factors that influenced participants' joint attention behaviors included learning curves, prompt dependency, treatment intensity, and use of scripts and visual strategies. Factors that influenced all three participants included use of multisensory stimuli and the clinician's responsiveness. These findings are consistent with literature regarding learning, joint attention treatment, and cueing hierarchies used with children with autism. It is suggested that these influencing factors are considered in treatment plans for children with autism.

Acknowledgements

I would like to thank the members of my committee for the insight, expert opinions, and knowledge they have shared with me throughout the last three years. I would also like to thank them for their continued encouragement and positivity throughout my career as a graduate student. I have learned so much from and been inspired by each of them, and I will be forever thankful.

Contents

List of Tables

List of Figures

Introduction

Outline of the Introduction

The current study examined 3 participants in Story of Friendship, an intervention program focused on increasing the social communication skills of young children with autism spectrum disorders. The following discussion of literature includes the following: a) an overview of research addressing joint attention skills in autism and their importance to overall development, b) reviews of studies addressing joint attention interventions in different settings, and c) reviews of studies examining the use of cueing hierarchies in intervention. The introduction concludes with an explanation of the Story of Friendship intervention model and the purpose of the current study.

Autism Spectrum Disorders & Joint Attention Skills

Autism is a complex, heterogenetic disorder that affects several domains of development and functioning and presents differently in each affected individual (Waterhouse, 2013). Despite unmistakable heterogeneity, persistent deficits in social communication are required for a diagnosis of the disorder (American Psychiatric Association, 2013). In terms of problems with social communication, deficits in joint attention are a distinct hallmark of autism spectrum disorders. Mundy, Sigman, Ungerer, and Sherman (1986) defined joint attention as the ability to "coordinate attention between interactive social partners with respect to objects or events in order to share an awareness of the objects or events" (p. 657). In their research, Bono, Daly, and Sigman (2004) stated, "Joint attention essentially involves the coordinated and shared visual attention between two people on an object or event" (p. 495). Charman (2003), when discussing joint attention, distinguished declarative eye gaze from imperative eye gaze by explaining that declarative eye gaze is used to share the awareness and experience of an object or event, while imperative eye gaze serves as a function of requesting or implementing. Bono et al. (2004) explained that the declarative form of eye gaze used during joint attention is important for language development. He further distinguished two categories of declarative joint attention: responding to

joint attention and initiating joint attention. The ability to engage in joint attention, both in the form of responding and initiating, is crucial as children learn language and social skills throughout their development. Within the population of children with development disorders, children with autism are at an especially high risk for problems with joint attention. Given the importance of joint attention, it has been the subject of much research and treatment paradigms for children with autism.

In pursuit of information regarding the joint attention skills of young children with disabilities, Wong and Kasari (2012) compared a group of 27 children with autism to a group of 28 children with other developmental disabilities. Their results indicated that preschoolers with autism spent less time engaged in instances of joint attention than their peers who had other developmental delays. This lack of joint attention deprives children with autism of opportunities to learn crucial skills during development, as it affords them with fewer opportunities to gain information by actively engaging with the people and world around them.

Joint Attention Intervention for Children with Autism

The need for strong joint attention skills during development has been consistently highlighted in research focused on autism and development. Many studies have indicated that joint attention skills play an especially vital role in language development. Dawson et al. (2004) conducted a study to assess joint attention and language skills in 3 groups of children: 72 children with an autism spectrum disorder between the ages of 36 and 48 months, 34 developmentally delayed children between the ages of 36 and 48 months, and 39 typically developing children between the ages of 12 and 46 months. Children with typical development were matched for mental age with the other groups. When compared to the other groups, the group with autism displayed significantly poorer performance on measures of joint attention, social orienting, and attention to the distress of others. Additionally, the results of this study indicated that joint attention skills were

the best predictor of concurrent language ability, while social orienting and attention to distress were indirectly related to language ability (due to their relationships with joint attention).

The findings of Dawson et al. (2004) have been corroborated through a multitude of other studies. For example, Charman (2003) studied a group of 18 children at 20 months and 42 months of age. His results showed that "joint attention ability was positively associated with language gains and (lower) social and communication symptoms" (p. 315). Typically, children with autism have greater impairments in declarative eye gaze shifting than imperative eye gaze shifting. Under the framework of declarative and imperative joint attention described above, Charman's results indicated that declarative eye gaze shifts were a greater predictor of language skills and symptom severity than imperative eye gaze shifts.

Given the documented importance of joint attention in development, most specifically in language development and symptom severity, many studies have aimed to find effective interventions therapies to increase the joint attention skills of children with autism. Kasari, Paparella, Freeman, and Jahromi (2008) randomly placed 58 preschoolers with autism between the ages of 36 and 48 months into different intervention groups: joint attention focused intervention, symbolic play intervention, or no specialized intervention. Intervention occurred on a daily basis in 30-minute periods for 5-6 weeks. Independent raters collected data regarding language before treatment, directly after, 6 months after, and 12 months after the completion of treatment. Both intervention groups showed greater language outcomes than the control group. When the symbolic play intervention was compared to the joint attention intervention, the researchers found that the joint attention intervention had the greatest effect on improving the language of children who began intervention with very low language levels. The results indicated that while both symbolic play and joint attention intervention are appropriate techniques for targeting the language skills of children with autism, joint attention intervention is likely more appropriate for children with lower language skills.

Bono, Daly, and Sigman (2004) studied 29 children with autism (with an average age of 47 months) in order to investigate the relationships between joint attention, amount and intervention, and language ability. As found in other studies, their results indicated that stronger joint attention skills were positively associated with language development. Their results further specified that the child's ability to respond to bids for joint attention and their initial language skills mediated their response to intervention. Results showed that a sheer increase in amount of intervention did not result in greater language gain. Instead, the authors found that when children responded to bids for joint attention at a rate of 85% or higher, their intervention experiences were enhanced, and thus resulted in greater language gain. These findings support the need for effective joint attention intervention: in order for children to achieve maximal gains from intervention, their ability to respond to bids for joint attention should be as great as possible.

Other research has shown that after receiving intervention aimed to increase joint attention skills, children with autism showed positive changes in multiple domains, including pragmatic and language skills (Whalen, Schreibman, & Ingersoll, 2006). In this study, 10 preschoolers participated in 10 weeks of intervention that aimed to teach joint attention skills. Intervention consisted of 2 phases: response training and initiation training. During response training, children were instructed in how to respond to bids for joint attention made by an adult. Bids included placing the child's hand on an object, tapping on an object, showing an object, following a point, and following a gaze. These skills were taught in the order listed and were considered mastered when the child showed 80% success with the skill over 4 consecutive sessions. During the next phase, children were instructed on how to initiate joint attention bids through coordinated eye gaze shifts and declarative pointing. The researchers concluded that instruction of joint attention skills led to improvements in social initiations, positive affect, imitation abilities, play skills, and spontaneous speech.

While it has been documented that joint attention intervention is effective, intervention addressing these skills is not always incorporated into the treatment plans for children with autism. In their study, Wong and Kasari (2012) found that teachers rarely spent time directly addressing joint attention skills in their preschool classrooms. The authors suggest that teachers need to be educated about the importance of including this type of instruction in their preschool classrooms, particularly when children with autism are part of the class. Kaale, Smith, and Sponhein (2012) studied an intervention program that taught preschool teachers to conduct 8 weeks of joint attention intervention. Intervention was provided in addition to the regular school days for children with autism. When compared to the control group of 27 children, the 34 children in the preschool-based intervention group showed greater instances of joint attention initiation with their teachers.

Joint Attention Intervention & Use of Cueing Hierarchies

Of treatments targeting joint attention skills, some success has also been found for models that use cueing hierarchies. Kasari, Freeman, and Paparella (2006) studied a joint attention intervention that used a prompting hierarchy consisting of verbal prompts, models, and physical prompts. Intervention sessions were conducted for 5-6 weeks for 30 minutes each day. During each session, desired behaviors were primed through 5-8 minutes of discrete trial training. The authors found that children in the treatment group initiated more instances of joint attention after the completion of intervention. While there are distinct differences, this intervention model is similar to the structure in Story of Friendship (which is described in detail in the following section): during Story of Friendship sessions, the play routine is primed through the use of a video model and similar cueing hierarchies are employed.

Wong (2013) studied a therapy paradigm that used a least-to-most system of prompting to scaffold the development of joint attention skills and symbolic play in children with autism. Classroom teachers delivered intervention in a variety of contexts, which included individual

sessions, small groups sessions, or sessions involving the whole class. The hierarchy of prompts followed the following steps: general prompts, specific prompts, and physical prompts. Teachers created examples for the types of prompts they intended to use in each stage of prompting, depending on the activity at hand. Results of the study showed that children with autism made significant increases in joint attention and symbolic play skills, indicating that the use of cueing hierarchies was effective in this study.

Dykstra, Boyd, Watson, Crais, and Baranek (2011) evaluated an intervention that targeted social communication and play skills through a program entitled Advancing Social-communication And Play (ASAP). The study followed a single-case design and included 3 young children with autism. After a training period, teachers implemented the treatment program in preschool classes containing children with autism. The program utilized the following strategies: following the child's lead, natural reinforcement, incidental learning, and use of prompting hierarchies to target objectives. All 3 children studied showed increases in social communication and play skills. Many of the elements of the treatment program studied by these authors are present in the intervention model of Story of Friendship.

The above studies suggest that it can be reasonably expected that children who participate in joint attention intervention are likely to make gains in their social communication skills. Specifically, these studies indicate that joint attention intervention for children with autism can be effective in increasing joint attention skills. They also demonstrate that incorporation of cueing hierarchies can be a useful addition to joint attention intervention. However, additional research investigating how joint attention intervention and cueing hierarchies interact would expand the extant literature. The current study aims to contribute to this body of literature by examining Story of Friendship, which is an intervention for joint attention that incorporates the use of cueing hierarchies.

Story of Friendship Intervention Model

Story of Friendship is an intervention group that was designed to target the social communication skills of young children with autism. Each semester, 4 children with autism are paired with 4 peers with typical development; each pair works directly with a graduate student clinician. Social communication skills are addressed during intervention through clinician support of participation and reciprocity between the child with autism and typically developing peers. Interactions take place during a variety of contexts, including structured and non-structured activities. While some interactions occur just between a child with autism and a peer, other interactions include the whole group or different combinations of children. The intervention was based on the model delineated in *The Storybook Journey* by McCord (1995, 2011), meaning that it uses a single story as a theme during each semester program. The narrative sequence of the story provides the basis for play routines supported within intervention sessions.

Each Story of Friendship therapy session includes the following periods: Outside Play, Story Circle, Buddy Time, Free Play, and Songs and Goodbye. Buddy Time is the period of the session when intervention for joint attention skills is provided in the most structured, direct manner. Clinicians employ an individualized cueing hierarchy to prompt the child with autism to shift eye gaze toward the peer. Therefore, Buddy Time is the focus of the current study. During Buddy Time, a graduate clinician supports the interaction the child with autism and the typical peer in a semi-private area of the classroom so as to avoid distraction from other groups of children engaged in Buddy Time. Buddy Time does not typically exceed 8 or 9 minutes in length.

During Buddy Time, children engage in a pre-planned play routine based on the narrative sequence of the story read across the sessions of the program. To learn the routine, the pair of children watches a video model of the routine at the beginning of each Buddy Time. In the video model, two graduate clinicians act out a play routine that is based upon the story and involves scripted language and specific actions required for each role in the play routine. The scripted

language within a routine is typically 1-5 words in length per phrase; there is generally 1 scripted phrase per role that is repeated several times during the routine. Action roles included in play routines in the current study contained a "giver" and a "putter," meaning that one role is to give a toy and the other role is to put it somewhere.

After viewing the video model at the beginning of Buddy Time, the play routine is acted out twice as each child performs each role once. During initial sessions at the beginning of the semester, the clinician provides action cues to support the children to participate in the play routine. Once the pair reaches a level of mastery of the play routine, the clinician begins to introduce cues for joint attention in the form of eye gaze shifts to the peer.

Each graduate student clinician creates an individualized cueing hierarchy for joint attention for the child with autism. Types of cues include verbal cues, nonverbal cues, and combined cues. A cueing hierarchy might adhere to the following example sequence (listed from most to least supportive): physical + verbal cues, verbal + visual cues, visual cues, wait time, independent. The clinician can alter the level of support by adapting the type and amount of cues presented during a Buddy Time session according to assessment of the child's current level of need. During each session, the clinician documents both the type and level of cues provided, as well as the child's response to the cues. Physical and direct verbal cues are considered high level, meaning they provide a high level of support. Indirect verbal and visual cues are lower level cues than physical and direct verbal, while gestural and wait time are even lower level. As cues are faded from high level to low level, they are often combined to provide the necessary amount of support. As stated previously, cueing hierarchies are individualized, as all children have different learning styles and strengths.

Purpose of Present Study

The purpose of the present study was threefold. First, the study aimed to examine if participants in Story of Friendship increased instances of joint attention during Buddy Time over

time. Second, the study aimed to determine the efficacy of different categories and types of cues used during Buddy Time to elicit instances of joint attention for each child in the study. Third, the study aimed to help guide clinical practice through examining different methods of data collection, establishing what kinds of data are most important for clinical purposes, and determining how best to track the efficacy of cueing over time.

Research has established the importance of effective intervention models designed to target joint attention skills in children with autism. As explained above, the intervention paradigm employed in Story of Friendship aims to increase joint attention skills. Therefore, one purpose of the present study was to determine the amount of gain in instances of joint attention demonstrated by participants of Story of Friendship, as the increase in joint attention is related to increased gains in other domains of development. For most children in Story of Friendship, eye gaze shifts to a typically developing peer are specifically targeted as a focal joint attention skill. It is important to note that eye gaze shifts to a peer do not constitute instances of joint attention when made in isolation, as definitions of joint attention include eye gaze between partners and an object or event. However, it is impossible to initiate or participate in an instance of joint attention without the ability to shift one's eye gaze to partner. Therefore, for the purposes of this study, eye gaze shifts to a peer were considered instances of joint attention. In this study, gains in joint attention were measured in frequency counts of cued and non-cued eye gaze shifts to a typically developing peer across time.

As outlined in the discussion of literature above, some studies have examined the use of prompting and cueing paradigms in therapy for children with autism. The second purpose of this study was to examine the efficacy of using cueing hierarchies for the promotion of eye gaze shifts to a peer. Cues used in Story of Friendship can be broadly categorized as verbal, nonverbal, and combined. As clinicians in the current study presented all 3 types of cues, this study sought to determine if certain cues were more likely to elicit a desired response by a child. This study also

sought to identify how patterns of responses changed over time. By examining the efficacy of cue types in eliciting joint attention over time, the intervention administered in the Story of Friendship and in other joint attention therapies can more efficiently target social communication skills (including eye gaze shifts) and cue children appropriately and productively.

The last aim of the present study was to find relevant information to inform clinical practice. While this study examined cases on an individual basis, patterns and trends across participants were also investigated. The current study aimed to inform other intervention models by assessing the relationship between cueing hierarchies and the joint attention behaviors targeted in treatment.

Research Questions

1) Do the participants in Story of Friendship:
    a. Display increasing amounts of cued eye gaze shifts to a typically developing peer throughout intervention?
    b. Display increasing amounts of non-cued eye gaze shifts to a typically developing peer throughout intervention?
2) For each individual child:
    a. Is a certain type of cue more effective in eliciting cued eye gaze shifts to a typically developing peer?
    b. Does the pattern of cues responded to / not responded to change throughout the course of intervention?
3) Can the data from this study:
    a. Inform clinical data collection for future sessions of Story of Friendship?
    b. Provide information within and across participants?
    c. Contribute to the literature regarding joint attention intervention and cueing paradigms for children with autism?

Methods

Participants

Three participants took part in this study. The parents of children who had participated in Story of Friendship for both the spring and summer session of 2013 were invited to have their children participate in the study. All participants were male and had a diagnosis of an autism spectrum disorder. Data for all 3 participants were collected during the spring and summer semesters of 2013. Participants were called A100, A102, and A103 for the purposes of the study.

A100 was 3 years 10 months on his first session of spring 2013 and 4 years 2 months on his last session of summer 2013. At the end of this study, he had participated in a total of 4 semester sessions of Story of Friendship (as he had previously participated in Story of Friendship in the spring and fall of 2012). A100 had received a diagnosis of ASD at the age of 2 years 6 months, according to report provided by his parents. They further reported that he had been advanced for his age in terms of developmental milestones at 12 months, but by 15 months they began to have concerns about his speech and language. Aside from Story of Friendship, his mother reported that A100 had received or was currently receiving individual occupational and speech therapy, applied behavioral analysis treatment, brain integration therapy, and hippotherapy. She noted that his strengths included gross motor activities and his sense of humor. Some of the concerns his mother reported included his difficulties joining or initiating play with other children, taking turns, helping peers, commenting about play or conversing with peers, and maintaining appropriate eye contact.

A102 was 3 years 3 months on his first spring 2013 session and 3 years 10 months on his last summer 2013 session. At the end of the study, he had participated in 2 semester sessions of Story of Friendship (as the spring of 2013 was the first time he had attended the group). When A103 began Story of Friendship, his mother reported that his strengths included his expressive and receptive language skills. She described him as smart, kind, and curious. In terms of her concerns, she reported that social interaction with peers was a challenge for A102. Specifically, these

concerns included A102's difficulty initiating or joining play, playing cooperatively, initiating or responding to conversation bids, sharing toys, and taking turns. He had received speech-language services between the ages of 2 and 3 years, which his mother described as very successful.

A103 was the oldest participant of this study; he was 4 years 11 months on his first session of the spring semester of 2013 and 5 years 3 months on his last session of the summer of 2013. A103 had been a participant in Story of Friendship every semester since spring 2012, for a total of 5 semester sessions by the end of this study. In 2012, A103's parents reported that their concerns about his development began when he was approximately 18 months old. They stated that his strengths included his memory, positive affect, ability to use technology, and interest in interactive play. Their concerns included his dependence on routines, frustration with unfamiliar tasks, struggle with social play, difficulty with oral language, trouble following 2+ step instructions, and problems recognizing emotions in others. His parents further disclosed that A103 had been receiving speech-language therapy since 2010 and had been making improvements in overall communication skills.

Data Collection and Standardization

Sessions of Story of Friendship consisted of several phases, including Outside Play, Story Circle, Buddy Time, Free Play, and Songs and Goodbye. For the purposes of this study, data were collected during Buddy Time. The structure of Buddy Time was previously explained in the Introduction.

Videos of Buddy Time were collected during each Story of Friendship session attended by the participants of the study. Videos were originally collected for clinical purposes and were later utilized for the purposes of this study. Cameras were located near the area where Buddy Time was taking place to film the child, typically developing peer, and graduate clinician engaging in the play routine. The beginning of videos typically included time when the video model was shown, but data collection for this study began after the showing of the video model ended and the Buddy Time play

routine began. Data collection ended when the last child had taken his or her turn and the graduate clinician stated that it was time for free play. Therefore, for the purposes of this study, Buddy Time consisted of the time between the end of the video model and the last turn taken during the play routine.

The lengths of Buddy Times for individual participants varied across sessions. For some children, the difference between their longest and shortest Buddy Time sessions during a given semester was up to three minutes. For standardization, coded data were collected during time-adjusted portions of Buddy Time. Each participant's Buddy Time videos from each semester were reduced to be the same length as the shortest Buddy Time from that semester. The shortened section was then taken from the middle portion of each Buddy Time, as to encompass the most similar activities as possible across sessions. For example, if the shortest of 7 collected Buddy Times for a child during the spring was 2 minutes long, a 4-minute Buddy Time from a different session was coded between minutes 1 and 3, thus making it a section from the middle of the activity and equal to the shortest Buddy Time. Because opportunities for joint attention increase with greater time, these adjustments were made to account for variations in the amount of opportunities for a participant to shift their eye gaze during a single Buddy Time session.

Coding

The author completed the coding of Buddy Time videos by viewing them on a computer. Three behaviors were coded from each video: cues presented by the clinician, cued eye gaze shifts (C-EGSs) made by the participant to their typically developing peer, and non-cued eye gaze shifts (NC-EGSs) made by the participant to their typically developing peer. Codable items were recorded in chronological order. For each item, the time it occurred, the type of code, and the details of the event were recorded. Each Buddy Time video was viewed and coded twice. After the second set of codes was recorded, coding was compared to the first set to ensure that items were not missed. During coding, the video was paused and rewound when necessary to identify cues and type of eye

gaze shift. Frequency counts were collected for cues, C-EGS, and NC-EGS for each session attended by each child. Codes from the second viewing were compared to the first set of codes, and if there were no significant discrepancies, were used as final data. In the case of discrepancies, the video was viewed and coded a third time.

A cue was coded each time the graduate clinician presented one during a Buddy Time session. Cues included moments when the graduate clinician provided directions, prompts, or hints to the child as a bid for an eye gaze shift to the child's peer. Types of coded cues are described in Table 1 below.

Types of Cues		
Nonverbal Cues	*Point*	Clinician used index finger point to peer
	Physical Model / Cue	Clinician provided a physical gesture model, such as a wave to model for the child; or clinician moved the child's body to help them orient to their peer partner
	EGS Gesture	Clinician provided a swooping gesture with several of their fingers or whole hand between the child's eyes and their peer's eyes
	Visual Support	Clinician showed the child a drawing or photograph of their peer
	Nonverbal Combined	Clinician provided 2 or more nonverbal cues simultaneously
Verbal Cues	*Direct Verbal*	Clinician provided clear directions for shifting eye gaze to peer, such as "Look at XX," "Look at her eyes," "Let's look at our friend XX," or "Watch XX."
	Indirect Verbal	Clinician provided a verbal cue that did not directly tell the child what to do, such as "I wonder where XX is looking," "I see your friend," "Tell your friend XX," or "Friends look at each other."
Combined Cues	*Nonverbal + Verbal*	Clinician provided any combination of two or more cues from different categories simultaneously

Table 1: Descriptions of cueing types used by clinicians during Buddy Time

An instance of C-EGS was coded when the child shifted his eye gaze to his peer directly after the clinician presented a cue (within 0-5 seconds). An exception to this rule was made if the child shifted his eye gaze directly after the clinician presented a nonverbal cue but it was obvious that the child had not seen the cue. In that case, the eye gaze shift was coded under the category of NC-EGS. C-EGS categories were the same as the type of cues provided; when the child made an eye gaze shift

in response to a cue, it was categorized according to the type of cue that had been most recently presented.

An instance of NC-EGS was coded when the child shifted his eye gaze to his peer during a time when he was not cued to do so. These eye gaze shifts were coded according to the most immediate and salient action occurring at the time of the eye gaze shifts. Categories of NC-EGS are described in Table 2 below.

Types of Non-Cued Eye Gaze Shifts (NC-EGS)	
Action Cue	Clinician was providing a cue for action, such as, "Hand it to him," or, "Put it in the box"
Clinician Speech	Clinician was speaking, but was not giving a cue for action or eye gaze shift
Joint Activity	Participant, peer, and clinician were involved in an action, such as set up or clean up
Child's Turn	Child was taking action with the toys involved in the play routine and was not talking
Peer's Turn	Peer was taking action with the toys involved in the play routine and was not talking
Child Speech - Scripted	Child was reciting scripted lines from the play routine
Peer Speech - Scripted	Peer was reciting scripted lines from the play routine
Child Speech - Unscripted	Child was saying a spontaneous, unscripted utterance
Peer Speech - Unscripted	Peer was saying a spontaneous, unscripted utterance

Table 2: Codes used for non-cued eye gaze shifts made by participants during Buddy Time

Reliability Coding

The author, who was the main coder, trained an undergraduate student to be a reliability coder. Reliability coding was completed for 16% of Buddy Time videos; tapes were split evenly between the spring and summer sessions. Pearson's correlations were conducted for codes of cues presented, cued eye gaze shifts, and non-cued eye gaze shifts. Correlation values are presented in Table 3 below.

Reliability Data: Pearson's Correlations			
Session	**Cues**	**C-EGS**	**NC-EGS**
Spring	0.89	0.91	0.92
Summer	0.99	0.99	0.99

Table 3: Pearson's correlation values for codes of cues, cued eye gaze shifts, and non-cued eye gaze shifts of 6 tapes as coded by the main coder and a reliability coder.

Data Analysis

The following data were determined for each child for each semester: average cues per session, average C-EGSs per session, percentage of cues responded to with C-EGSs, average NC-EGS per session, total number of NC-EGSs during the semester, highest and lowest numbers of NC-EGS per session, and total number of eye gaze shifts during the semester. Data were also analyzed to determine the most effective type of cue for each child in a given semester. Lastly, data were analyzed to determine prevalence of each type of NC-EGS; these were ranked from most to least prevalent.

Participant 1: A100 Results

Collected Data

Data were collected for A100 across 6 sessions in the spring. The first 4 sessions for which there are data occurred over consecutive weeks. The 5th session for which there are data occurred 2 weeks after the fourth (due to spring break). A100 was absent for those sessions or the sessions were not filmed; therefore, data were unavailable.

During the summer, data were collected for a total of 7 sessions. Data are missing from the final (8th) session of the summer.

Cueing by Clinician

During the spring, A100 received an average of 4 cues per session; the greatest amount of cues in one session was 11, while the lowest was 1 for a total of 24 cues. The amount of presented cues across sessions followed a relatively flat trend, until the final session when more cues were presented than in previous sessions. Cues included verbal cues (direct verbal and indirect verbal),

nonverbal cues (pointing and EGS gesture), and combined (pointing + indirect verbal and EGS gesture + direct verbal). Nonverbal cues comprised 75.0% of cues presented throughout the spring, while combined cues comprised 16.7% and verbal cues comprised 8.3%.

A100 received 3.4 average cues per session during the summer. The greatest amount of cues presented during a summer session was 7 and the least was 0 (which occurred for two sessions). Throughout the summer, a total of 24 cues were presented, (the same amount as the spring). However, the trend of cues presented across sessions followed a more sporadic pattern than the cues presented in the spring. During the middle sessions, the trend of cueing rose and fell. There was a decreased amount of cueing in the 6th session, and the greatest amount of cueing was made during the last session for which there is data. The clinician used verbal cues (direct verbal and indirect verbal), nonverbal cues (pointing, EGS gesture, physical model, and combined nonverbal in the form of physical model + pointing), and combined cues (physical model + indirect verbal, pointing + direct verbal, and EGS gesture + indirect verbal). Nonverbal cues comprised 45.8% of cues presented during the summer, while combined cues comprised 41.6% and verbal cues comprised 12.5%.

Child's Response to Cueing

A100 displayed 2 instances of C-EGS during the spring semester; 1 instance each during the last 2 sessions in which data were collected. The first C-EGS was in response to a pointing cue, while the second was in response to an indirect verbal cue. Overall, the participant responded to 8.3% of the cues provided during the spring, which rendered an average of .17 C-EGSs per session.

The average C-EGSs per session over the summer was 2.3; 63% of presented cues were responded to with an instance of C-EGS. Nonverbal cues were responded to most consistently, with C-EGSs occurring after 72.7% of nonverbal cues. Pointing was the most successful type of nonverbal cue. Combined cues showed a 60% success rate in eliciting an instance of C-EGS. Verbal cues were 33.3% successful, but were only presented 3 times throughout the summer.

Non-Cued Eye Gaze Shifts

A100 made a total of 79 NC-EGSs during the spring, with an average of 13 per session. The trend of NC-EGSs across sessions followed a steady increase, until the last session for which data were collected, when instances of NC-EGS decreased. The fewest NC-EGSs during one session was 3 and the greatest was 23. This increase occurred between the 1st and 5th sessions for which there are data. On the last session for which data were collected, NC-EGSs decreased to 15.

During the spring, 20.3% of NC-EGSs occurred during the child's turn, 17.7% during unscripted peer speech, and 16.4% during scripted peer speech. A100 also made NC-EGSs during action cues (12.7% of total NC-EGS for the spring), the peer's turn (11.4%), joint activities (11.4%), and scripted child speech (10.1%). He did not make any NC-EGSs during unscripted child speech or clinician speech.

During the summer, A100 averaged 9 NC-EGSs per session (63 total). The trend of NC-EGS across sessions did not follow a discernable pattern; it was variable but did display a sloping trend between the third and sixth sessions. An increase of NC-EGSs was observed in the 7th session for which data were collected. The fewest NC-EGSs made in a single session was 2, while the greatest was 18.

In the summer, 46.0% of NC-EGSs occurred during scripted peer speech. The next most frequent type of NC-EGS was scripted child speech (15.9% of total NC-EGS during the summer), followed by the child's turn (10.0%) and joint activities (10.0%). A100 also made NC-EGSs during unscripted peer speech (8.0% of total NC-EGSs), the peer's turn (6.3%), and clinician speech (4.8%). No NC-EGSs were made during unscripted child speech or action cues during the summer.

Figures 1 and 2 below illustrate the trend across sessions for cues presented, C-EGS, and NC-EGS for the spring and summer. Figure 3 illustrates the spread of when A100 made NC-EGSs.

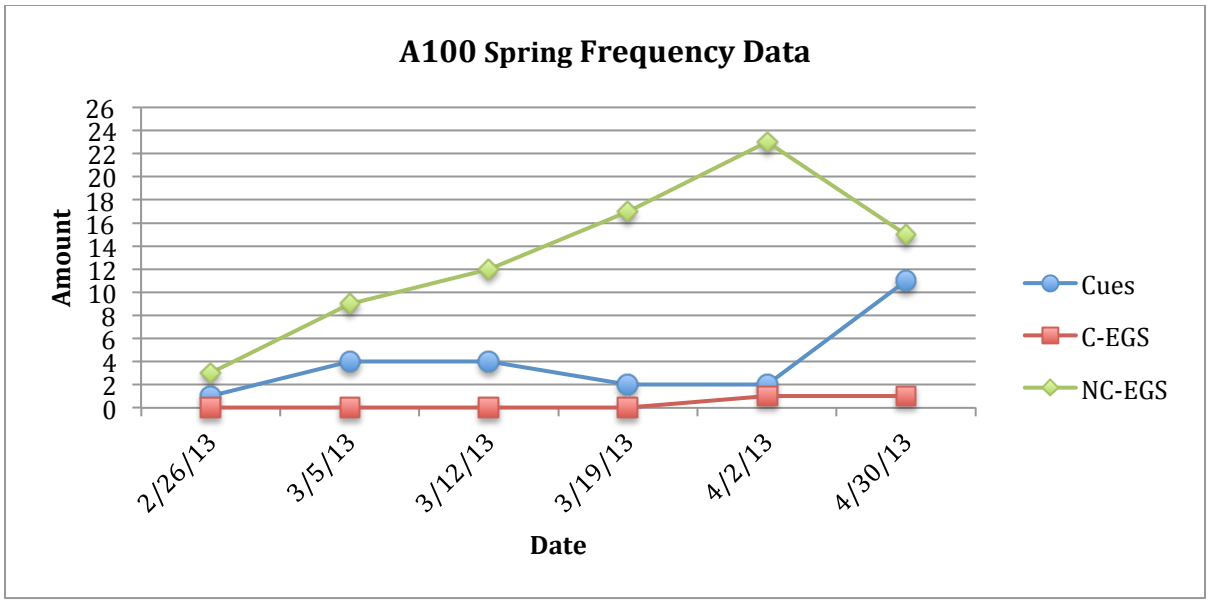

Figure 1: Frequency data for number of cues presented, C-EGS, and NC-EGS for A100 from the spring

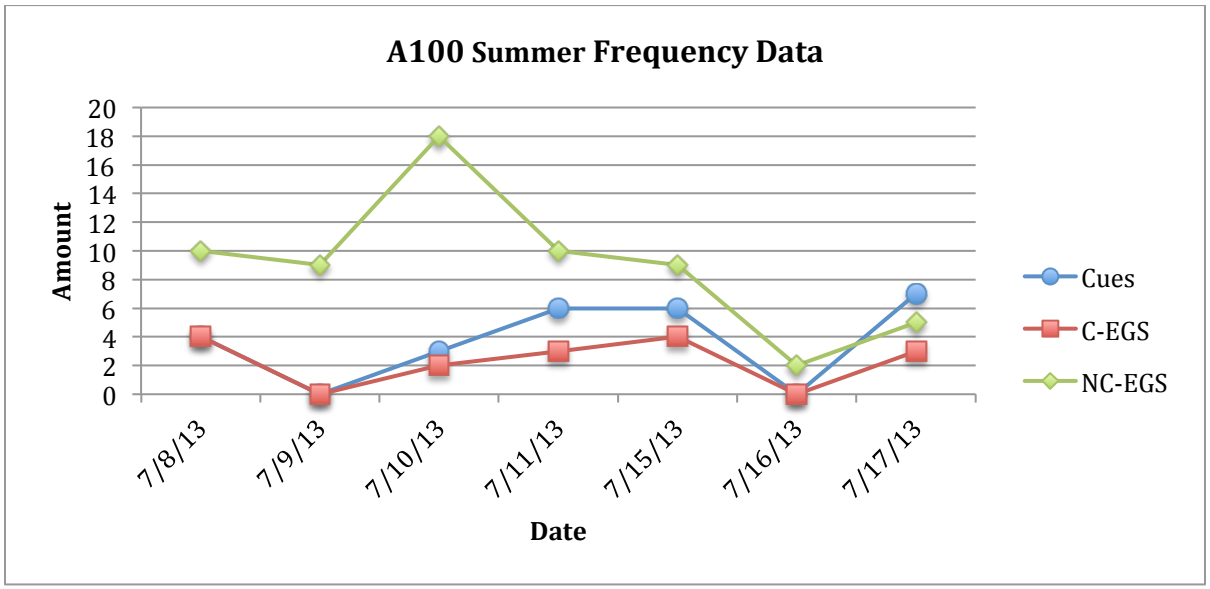

Figure 2: Frequency data for number of cues presented, C-EGS, and NC-EGS for A100 from the summer

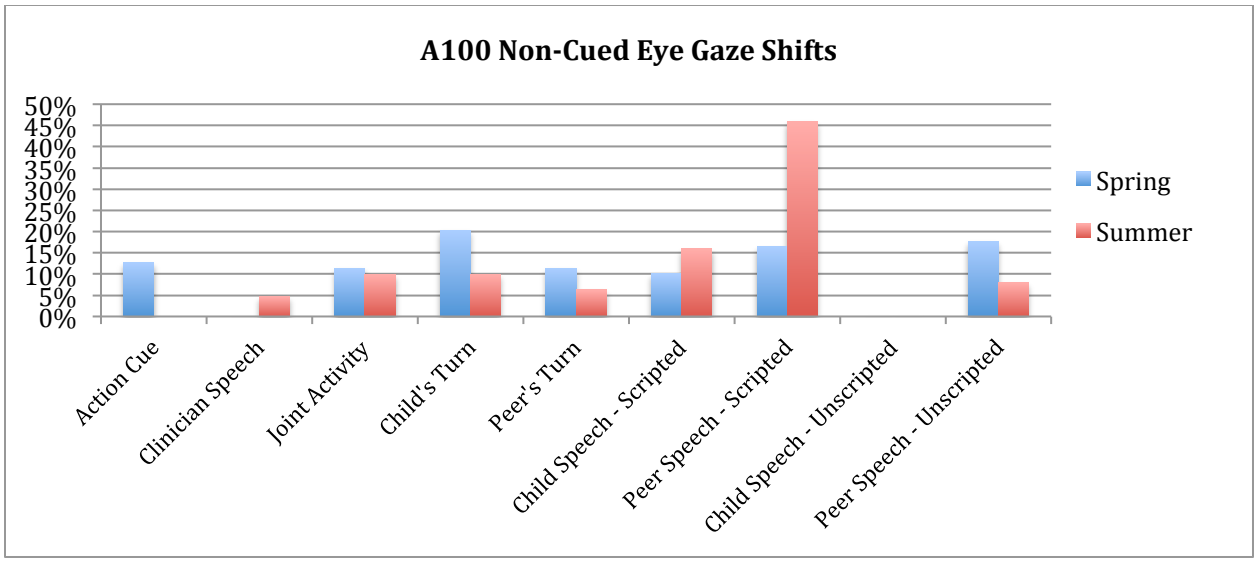

Figure 3: Types of A100's NC-EGSs during spring and summer in percentage values.

Total Eye Gaze Shifts

In the spring, A100 made a total of 81 eye gaze shifts. Of the total, 97.5% were NC-EGSs and 2.5% were C-EGSs. The EGS trend across sessions paralleled the trend of NC-EGSs; it rose steadily until it declined on the last session for which there is data.

Of the 79 total eye gaze shifts made by A100 during the summer, 79.7% were NC-EGSs and 20.3% were C-EGSs. The trend of total eye gaze shifts during the summer also followed a similar pattern to that of the NC-EGSs across sessions; it was variable.

Figures 3 and 4 illustrate the trends of total eye gaze shifts (NC-EGS and C-EGS) for spring and summer.

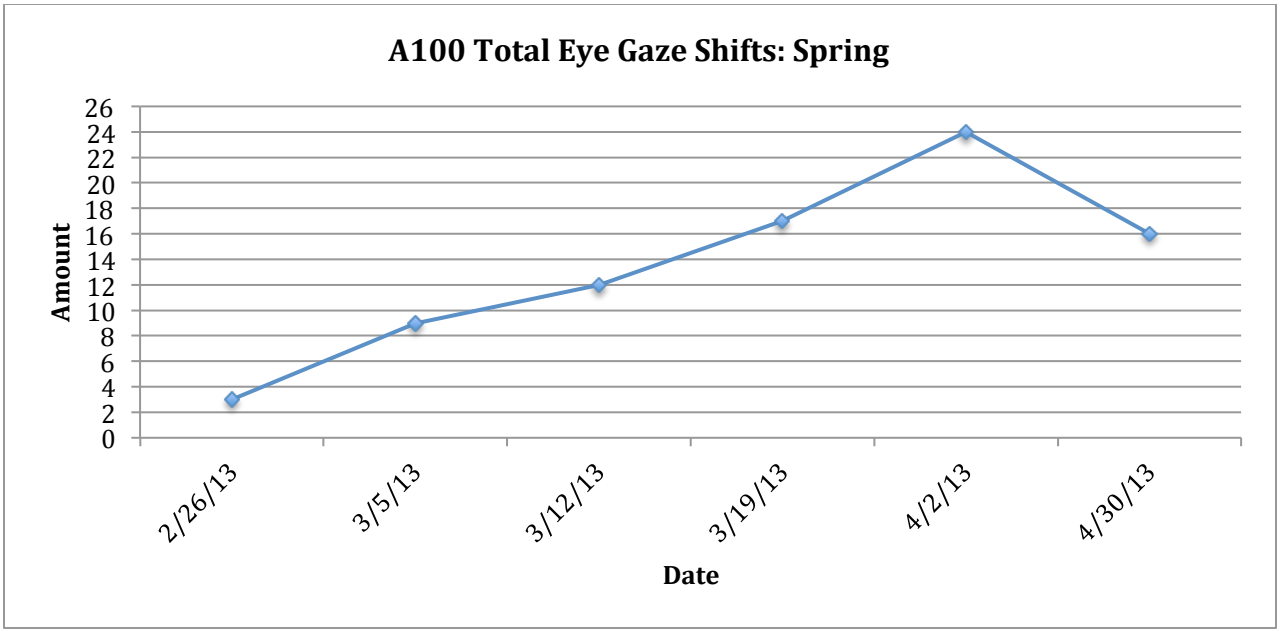

Figure 4: Total eye gaze shifts (NC-EGS and C-EGS) made by A100 in the spring

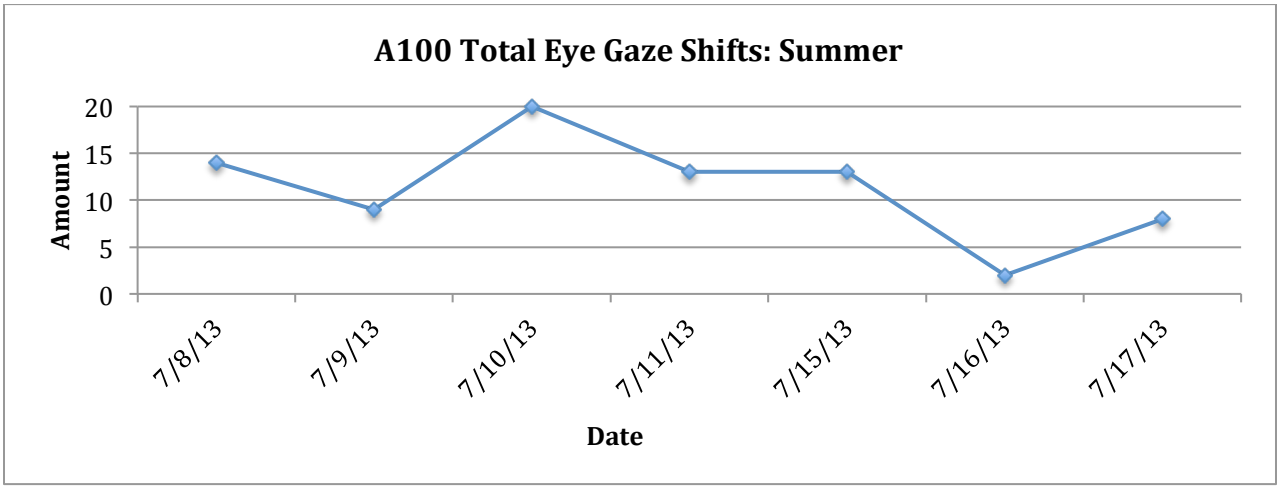

Figure 5: Total eye gaze shifts (NC-EGS and C-EGS) made by A100 in the summer.

A100 Discussion

Cues and Cued Eye Gaze Shifts

The greatest improvement observed in A100's behavior between the spring and summer sessions was his responsiveness to cueing. In the spring, A100 responded with a C-EGS to 8% of cues for eye gaze shifts to his peer. In the summer, he responded to 63% of the cues presented. These results could be indicative of a learning curve that occurred over time. In a discussion of the DIR/Floortime approach used in autism therapy, Greenspan and Wieder (2009) explained that

children are able to make progress in improving their social communication skills when they are provided with quality intervention. The only clear indicator of this progress is evidence of a learning curve, where a steeper learning curve shows better progress. He stated that the goal of treatment should be continual, steady progress seen through the learning curve. In the case of A100, his increase in C-EGS during the summer might show that while the learning curve was shallower during the spring, he was able to respond more frequently after his continued exposure to cues in the spring. For example, in the spring he responded to 7% of isolated pointing cues (without verbal input) provided by the clinician. During the summer, he responded to 86% of the same type of isolated pointing cues, which could indicate that he better understood what was being requested of him. Once he learned the significance and meaning of the cue, he was able to respond to it appropriately.

Greenspan and Wieder continued their discussion by explaining that many factors influence learning curves, and that the curve can be improved by providing the child with the right kind of support. For A100, one of these influencing factors might have been the type of cues presented by the graduate clinician. In the spring, 3/4 of cues presented to A100 were nonverbal – most of these were in the form of a point to the peer, while the rest were eye gaze shift gesture cues. In the summer, he received almost equal amounts of nonverbal cues and combined (verbal + nonverbal) cues, and both categories of cues were more successful than they had been in the spring. Of total nonverbal cues in the summer, a greater variety in types of cues was presented than in the spring. In addition to pointing and eye gaze shift gesture cues, A100 was presented with physical models during the summer.

When studying creativity in children with autism, Pares et al. (2005) found that skills increased when children were exposed to visual, aural, and tactile stimuli. Similarly, Hagiwara and Myles (1999) found success with a social story intervention that utilized multimedia format with visual, aural, and tactile information. It is possible that the increased variety of sensory information

in the types of cues presented was beneficial for A100. Given different forms of cues, he had more avenues through which to process the information being presented. Shams and Seitz (2008) explained that the human brain operates optimally in multisensory environments. They further suggest that teaching strategies that utilize a unisensory modality are unlikely to be the most beneficial route to effective learning. Given the findings of the previously mentioned authors, multisensory approaches to teaching and treatment should be considered for children with autism. These approaches are likely to foster effective learning. A multisensory approach is likely useful for many children with autism.

Another factor that could have influenced A100's rise in C-EGSs during the summer was having a different graduate clinician. In studying intervention aimed to enhance the social-emotional functioning of young children with autism, Mahoney and Perales (2003) found that a parent's ability to be responsive and interactive while teaching their child contributed to positive outcomes. While the clinicians in Story of Friendship were not the children's parents, the same principles might be applicable: a clinician who is better able to interact and be responsive to a child might be more successful in their teaching, which would then lead to greater gains in the targeted behavior of intervention.

Lastly, the difference in the structure of the intervention could have influenced A100's performance. During the spring, treatment was administered on a once weekly basis for 8 weeks; during the summer, therapy occurred for 4 days a week over the course of 2 weeks. While the focus of treatment was different from the focus of Story of Friendship, Lovaas (1987) conducted a study about intensive treatment and found that children with autism who received intensive therapy showed marked gains in many domains. When compared to a control group, these gains were even more significant. For A100, it is possible that he responded more strongly to the intensive format of therapy provided in the summer versus the one a week format of the spring program.

Non-Cued Eye Gaze Shifts

Evidence of a learning curve might also be gleaned from the data regarding A100's NC-EGSs in the spring and summer. Almost half of his NC-EGSs occurred during scripted peer speech during the summer, but only 16% of his total NC-EGSs occurred during scripted peer speech during the spring. In a study examining the efficacy of using peers with typical development as tutors for children with autism, Laushey and Heflin (2000) found that the use of peers yielded positive changes in children's appropriate social interactions. One explanation of A100's change in NC-EGSs during scripted peer speech could be the interaction of successful peer intervention with the factors affecting C-EGS listed above, such as the presence of a learning curve, amount of multisensory input, and quality of match with the clinician. In addition, A100's second most frequent NC-EGS was during scripted child speech.

A100's tendency to engage in instances of joint attention during his own scripted speech could potentially make him a good candidate for social story or script therapy. Charlop-Christy and Kelso (2003) used script therapy to successfully teach 3 school-aged boys with autism to engage in conversation by providing appropriate responses. In a similar study, Loveland and Tunali (1991) studied boys with autism by employing social scripts during a conversational interaction. While they found that a modeling was necessary for accurate use of scripts, they found that 5/12 participants improved after modeling. Given A100's strong response in the form of joint attention initiations during scripted language, it is possible that he might respond well to more directed script therapy. As the literature about autism clearly states that strong joint attention skills are the basis for learning, therapy utilizing scripted speech would be a treatment option to explore for A100.

Participant Summary

The greatest gain observed in A100's instances of joint attention occurred in his response to clinician cueing for eye gaze shifts. During the summer session, the percentage of cues he responded to increased greatly when compared to the spring. Given A100's pattern of C-EGSs and NC-EGSs during the spring and summer sessions, it is likely that he would respond well and gain a great deal from intensive therapy. Additionally, he may be a good candidate for script or Social Story therapy, as well as treatment that involved a peer with typical development. As with all children, he would also gain maximal benefits from therapy administered by a responsive, interactive clinician.

Participant 2: A102 Results

Collected Data

Data for A102 were collected during 5 sessions in the spring. Data are missing for the first session. As with all participants, there is a missing week between the 4th session for which data were collected and the 5th, as it was the week of spring break. Between the 5th and 6th sessions for which there are data, there are 3 missing weeks (one of which was a week when there wasn't a session). Information regarding whether A102 was absent for the remaining 2 sessions were not filmed was not available.

During the summer, data were collected for 6 sessions. Data from the first two sessions of the summer are missing. Information regarding the attendance of A102 for the first session was unavailable. While he was present for the second session, his peer was absent and therefore his Buddy Time data were not eligible for use in this study.

Cueing by Clinician

A total of 9 cues were presented to A102 during the spring, with an average of 1.8 cues per session. The range of cues presented during a single session ranged from 0 (which occurred over 2 days) to 4. In terms of trend, the amount of presented cues following a rising pattern until the 3rd

session and then continued in a sloping pattern during the last 2 sessions for which there are data. No cues were presented during the first or last sessions for which data were collected. Of the 9 cues, 4 were nonverbal (pointing), 3 were verbal (direct verbal and indirect verbal), and 2 were combined cues (pointing + indirect verbal and pointing + direct verbal).

The total number of cues presented to A102 during the summer increased to 21, with an average of 3.5 cues per session. Cues per session ranged from 2 (during 2 session) to 8. The most cues were presented on the first session for which there are data; after that, cues ranged between 2 and 3 per session. The majority (71.4%) of cues were nonverbal cues in the form of pointing. The remainder of cues were split between verbal cues (indirect verbal) and combined cues (pointing + indirect verbal and pointing + direct verbal).

Child's Response to Cueing

During the spring, A102 responded to 67% of cues with an instance of C-EGS. Each of the 2 combined cues was responded to with an instance of C-EGS, and ¾ of nonverbal cues were successful. Of the 3 verbal cues, 1 was successful in eliciting an instance of C-EGS. A102 had an average of 1.2 C-EGSs per session during the spring.

A102 responded to 52% of cues with a C-EGS during the summer, with an average of 1.8 C-EGSs per session. Nonverbal (pointing) cues were 60% successful, while verbal and combined cues were both 33% successful.

Non-Cued Eye Gaze Shifts

During the spring, A102 averaged 13.8 NC-EGSs per session for a total of 69. The trend of NC-EGS sloped down for the first 3 sessions and then rose for the final two sessions for which there are data. The greatest amounts of NC-EGSs were observed during the first and final sessions (17 total) while the fewest were observed during the 3rd session for which there are data (9 total).

Of the NC-EGSs made during the spring, 21.7% were made during scripted peer speech, 20.3% during unscripted peer speech, 16.0% during scripted child speech, 14.5% during clinician

speech, 11.6% during joint activities, 8.7% during the peer's turn, and 7.2% during the child's turn. A102 did not make NC-EGSs during unscripted child speech or action cues.

A total of 87 NC-EGSs were observed during the summer, for an average of 14.5 per session. The range of NC-EGSs per session spanned from 11 on the 2nd session for which there are data to 17 on the 4th session. Beginning at the 2nd session, the trend of NC-EGS followed a rising then falling pattern.

As seen during the spring, the most prevalent type of NC-EGS was scripted peer speech during the summer (25% of total NC-EGSs). During the summer, other NC-EGSs were made (in order of frequency) during joint activities (18.4% of total NC-EGSs), the child's turn (16.1%), scripted child speech (12.6%), unscripted peer speech (10.3%), the peer's turn (9.2%), clinician speech (6.9%), and action cues (1.1%). No NC-EGSs were observed during unscripted child speech.

Figures 6 and 7 below illustrate the trend across sessions for cues presented, C-EGS, and NC-EGS for the spring and summer. Figure 8 shows the percentages of when A102 made a NC-EGS during the spring and summer.

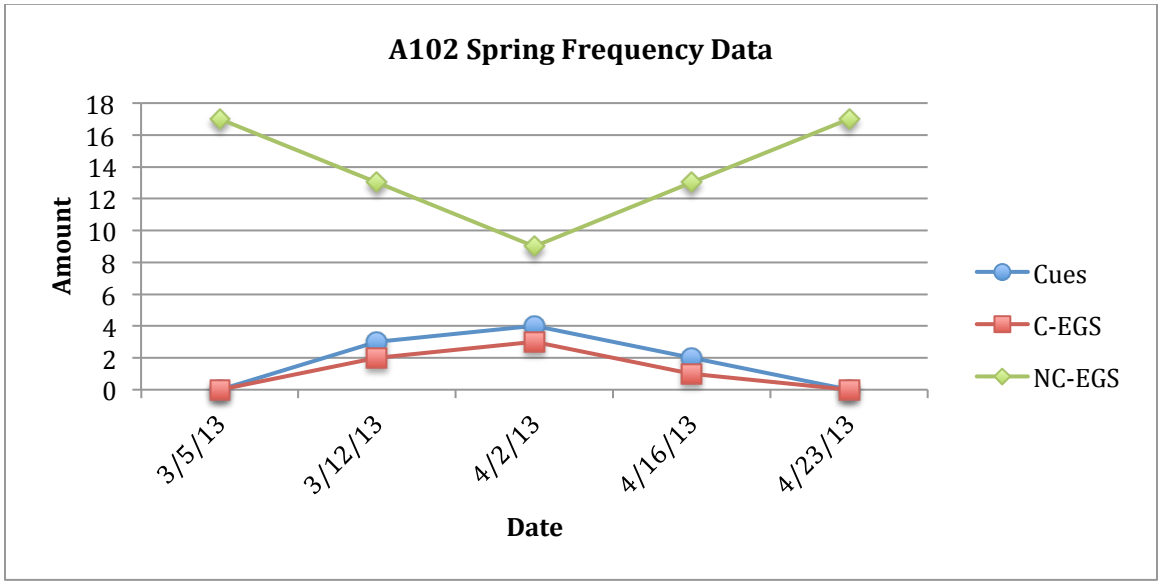

Figure 6: Frequency data for cues, C-EGS, and NC-EGS for A102 from the spring

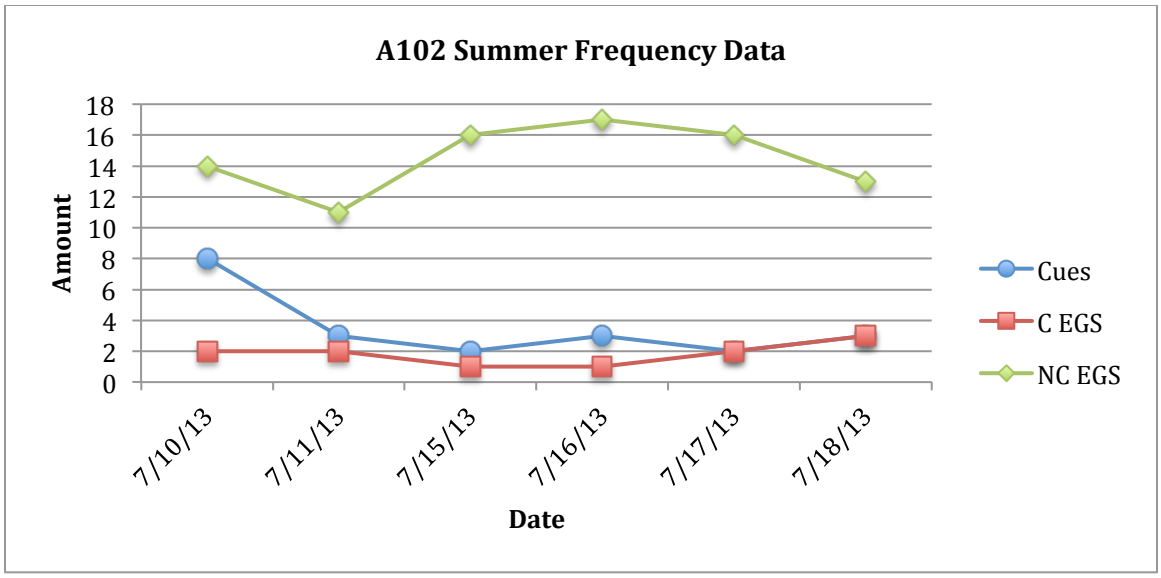

Figure 7: Frequency data for number of cues presented, C-EGS, and NC-EGS for A102 from the summer

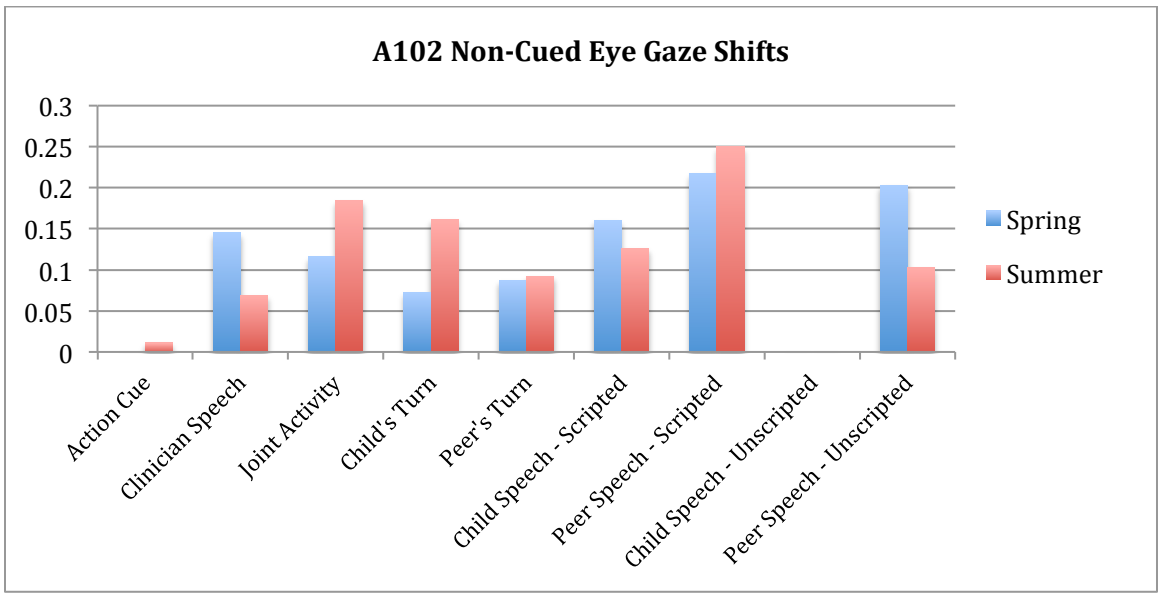

Figure 8: Types of A102's NC-EGSs during spring and summer in percentage values.

Total Eye Gaze Shifts

A102 made a total of 75 eye gaze shifts during the spring, with 92.0% classified as NC-EGSs and 8.0% C-EGS. Given the high percentage of NC-EGS, the frequency trend across sessions was a shallower version of the trend for NC-EGS.

During the summer, 98 eye gaze shifts were observed. Of this total, 88.8% were NC-EGSs and 11.2% were the result of cueing by the clinician. The trend of total eye gaze shifts across sessions for which there are data was relatively flat.

Figures 9 and 10 illustrate the trends of total eye gaze shifts (NC-EGS and C-EGS) for spring and summer.

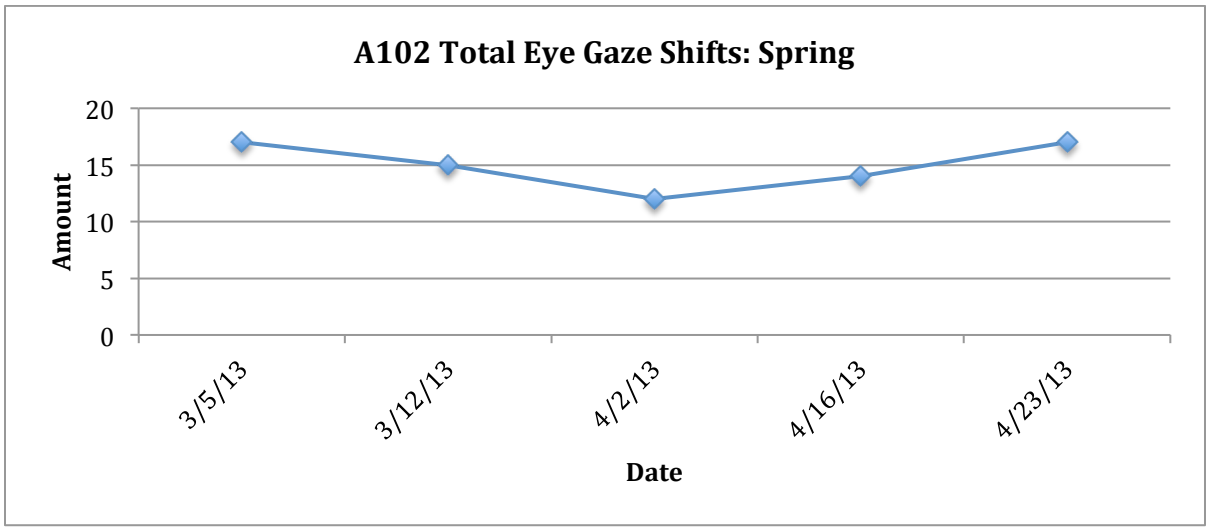

Figure 9: Total eye gaze shifts (NC-EGS and C-EGS) made by A102 in the spring

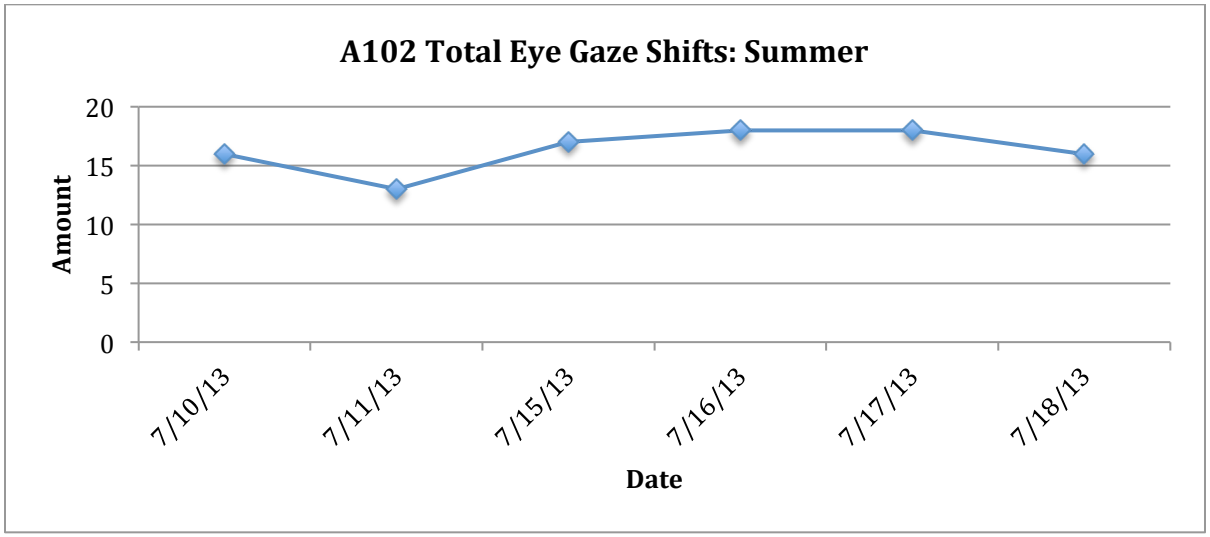

Figure 10: Total eye gaze shifts (NC-EGS and C-EGS) made by A102 in the summer

A102 Discussion

Cues and Cued Eye Gaze Shifts

A102 showed an increase in C-EGSs in the summer session when compared to the spring session. This change was observed both in the average C-EGSs per session as well as in the fewest number of C-EGSs across sessions. While in the spring there were some sessions when A102 made no C-EGSs, he always made at least 1 per summer session. During the summer, A102 received almost double the daily average of cues he received during the spring. It is possible that the sheer increase in amount of cues presented had a positive effect of A102's joint attention, as it prompted him to shift his eye gaze to his peer more often. In other words, given greater opportunities, his performance increased. Other influencing factors include those discussed in the section addressing cues and C-EGSs for A100, such as a learning curve, intensity of treatment, and an effective client-clinician relationship.

Across semesters, a pattern was apparent in A102's responsiveness to cueing. During both the spring and the summer, he responded most frequently and consistently to nonverbal cues (in the form of pointing) or combined verbal and nonverbal cues. In sessions when nonverbal pointing cues were provided, A102 always responded to at least one of the cues. In their paper, Tissot and Evans (2003) stated that much of the instruction provided to children with autism is dependent on auditory information. They explained that many children with autism do not "benefit from copious oral instruction" (p. 425). It is possible that A102 fits this learning profile, as his rate of responsiveness for auditory cues was much lower. According to the authors, there are 3 important points to remember about visual teaching strategies: they do not exclude vocal exchange, they should be used as temporary support for communication and be used less often as the child improves his skills, and the goal of their use should be to enhance the meaning of communication for the child. The Story of Friendship therapy paradigm adheres to these key points when

nonverbal cues are employed during Buddy Time, which might have influenced the effectiveness of the cues presented to A102.

As nonverbal cues were the most successful type of cue for A102 during both semester sessions, it is possible that he would be a good candidate for other interventions with a focus on visual strategies. Tissot and Evans categorized these interventions into movement-based systems and materials-based systems. Movement-based intervention systems mainly rely on sign language and/or gesture, while materials-based intervention systems use external tools. While A102 only received movement-based cues during the spring and summer, the cueing hierarchy within Story of Friendship may include both movement cues and as well as cues with tools (such as photographs, pictures, or written names). If A102 were to continue with Story of Friendship in the future, the research of Tissot and Evans would support an attempt at using both modalities of nonverbal cueing. Given A102's strong response to pointing cues, it is possible that he would also respond well to other interventions utilizing movement-based teaching strategies.

Non-Cued Eye Gaze Shifts

Between the spring and summer sessions, A102's average NC-EGSs per session increased. Along with this change, he also increased his lowest number of NC-EGS in a single session from the spring to the summer. This change might be indicative of the learning curve that was reviewed in the discussion of A100's results. It could also be the result of more intensive treatment or a better client-clinician match, as discussed previously.

During the spring and summer sessions, A102 made the most NC-EGSs during scripted peer speech. While initially this might seem contradictory to the discussion of his responsiveness to visual strategies discussed above, researchers have found success in combining script therapy with nonverbal cues. In studying the acquisition of verbal communication skills, Ganz, Kaylor, Bourgeois, & Hadden (2008) found that the combined use of social scripts and visual cues had a positive effect on increasing scripted statements in children with autism. In a different study, Ganz and Flores

(2008) found that use of visual strategies with groups of preschool children with autism resulted in improvements in their use of scripted phrases. If A102 were able to build upon his strengths in responding to visual strategies, he might then be better able participate in treatment utilizing both visual strategies and scripts. Given that A102 also made NC-EGSs during his own scripted speech, it is likely that the routine of the play schema was salient for him and, therefore, he was able and encouraged to shift his eye gaze during these moments. The use of these types of treatment paradigms would likely be beneficial for him in terms of increasing his verbal output (if that were an intervention goal for him). Given that optimal learning takes place when joint attention is at the maximum, therapy involving both scripts and visual strategies might be a beneficial option for A102, regardless of the specific target behavior or skill.

Participant Summary

Given A102's responsiveness cues, it is possible that he is stronger as a visual learner than as an auditory learner. Additionally, his ability to engage in instances of joint attention during scripts indicated that script therapy could be utilized to help teach A102 a variety of skills. Research indicates that scripts can be successfully combined with nonverbal cues, which might be an especially applicable strategy for teaching A102.

Participant 3: A103 Results

Collected Data

Data were collected for 7 sessions for A103 during the spring. Data were not available for the final session of the spring semester, as A103's peer was absent that day. A103 attended all sessions of Story of Friendship during the spring.

During the summer, data were collected for 6 of the 8 sessions. Data are missing from the 2nd session (as the videotape was missing), as well as the last session (when the participant's peer was absent). Again, A103 attended all sessions.

Cueing by Clinician

During the spring, A103's clinician presented him with a total of 17 cues, for an average of 2.4 cues per session. The amount of cues per session ranged from 1 (which occurred during 2 sessions) to 5. The trend of cues presented followed two shallow but distinct rising and falling patterns over the course of the semester. Nine cues (53.0% of total) were nonverbal, 5 cues (29.4%) were verbal, and 3 cues (17.5%) were combined. Nonverbal cues consisted of eye gaze shift gestures, pointing, and physical cues; verbal cues consisted of direct verbal and indirect verbal; and combined cues consisted of pointing + indirect verbal, eye gaze shift gesture + indirect verbal, and pointing + direct verbal.

The amount of cueing during the summer increased drastically to a total of 67 (which rendered an average of 11.1 cues per session). The greatest amount of cues per session was 15 and the least amount was 7. The trend of amount of cues presented rose and fell throughout the semester, with another rise for the last session. The vast majority of cues were nonverbal (47.8% of total cues) and combined (43.3% of total cues); verbal cues comprised 9% of the total cues presented. The only type of purely nonverbal cue was pointing. Verbal cues consisted of both direct and indirect verbal, and combined cues included pointing + indirect verbal, pointing + direct verbal, pointing + visual support + indirect verbal, and visual support + indirect verbal.

Child's Response to Cueing

During the spring, A103 averaged 1.6 C-EGSs per session (11 total) and responded to 65% of cues with an instance of eye gaze shift. All 3 types of cues were roughly equal in their success rates: 66.7% of nonverbal cues were successful, 60% of verbal cues were successful, and 67% of combined cues were successful (however, only 3 combined cues were presented). The trend of C-EGS closely followed that of cues presented.

A103 responded to 43% of cues during the summer, for an average of 4.8 C-EGS per session. The most successful type of cue was combined (55% responded to with C-EGS), followed by nonverbal (31.3% response rate) and verbal (50% response rate).

Non-Cued Eye Gaze Shifts

A total of 90 NC-EGSs were made by A103 during the spring, with an average of 12.9 per session. The overall trend of NC-EGSs showed a shallowly rising pattern. The range of NC-EGS observed in a session was from 10 during the 1st session to 16 during the final session.

Of the total number of NC-EGSs made during the spring, 31.1% were during scripted peer speech, 16.7% were during the child's turn, and 12.2% were during scripted child speech. The rest of the NC-EGS were made during action cues (10% of total), unscripted peer speech (8.9%), joint activities (7.8%), clinician speech (6.7%), the peer's turn (5.6%), and unscripted child speech (1.1%; 1 instance total).

In the summer, 43% of cues were responded to with an instance of C-EGS (46 total), for an average of 7.7 C-EGS per session. The overall trend of NC-EGSs sloped until the 4th session for which there are data; it then rose and fell again over the last 2 sessions.

The most prevalent type of NC-EGS during the summer was scripted child speech (39.1% of total), followed by joint activities (15.2%), child's turn (13%), peer's turn (10.9%), scripted peer speech (10.9%), action cues (6.5%), and unscripted child speech (4.3%). A103 did not make any NC-EGS during unscripted peer speech or clinician speech during the summer.

Figures 9 and 10 below illustrate the trend across sessions for cues presented, C-EGS, and NC-EGS for the spring and summer. Figure 13 shows the percentages of types of NC-EGSs made by A103 in the spring and summer.

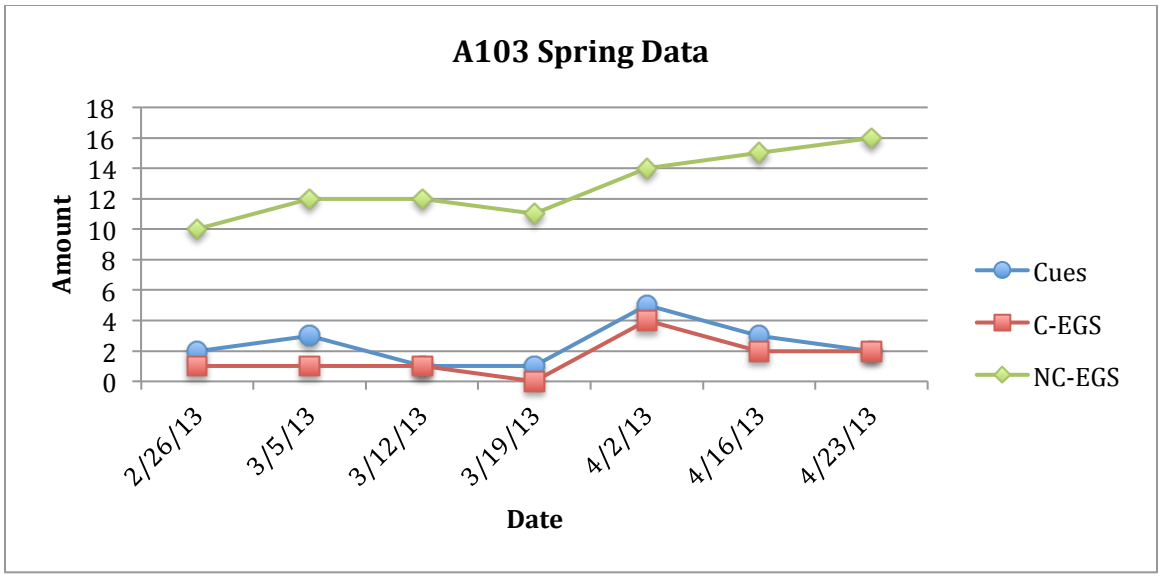

Figure 11: Frequency data for number of cues presented, C-EGS, and NC-EGS for A103 from the spring

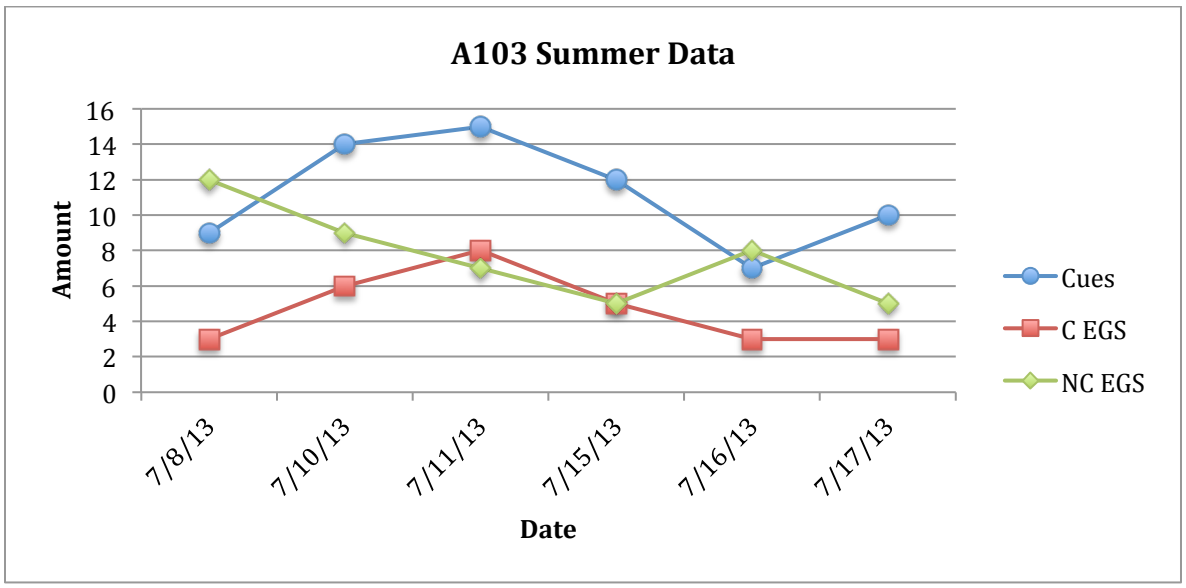

Figure 12: Frequency data for number of cues presented, C-EGS, and NC-EGS for A103 from the summer.

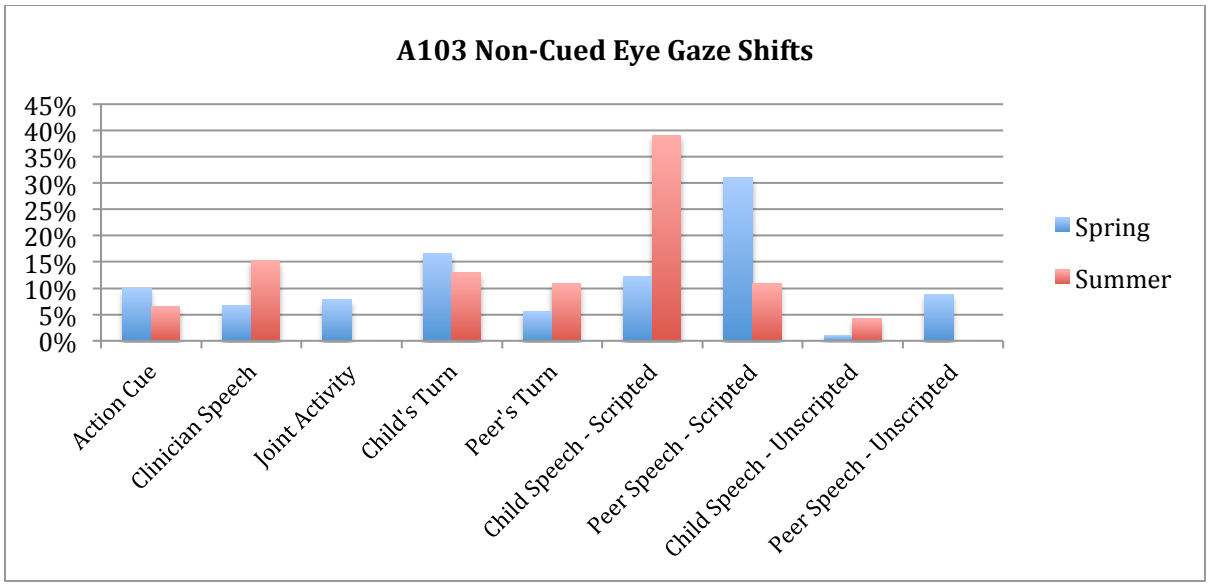

Figure 13: Types of A103's NC-EGSs during spring and summer in percentage values.

Total Eye Gaze Shifts

One hundred and one eye gaze shifts by A103 were observed during the spring. With some minor variation, the overall trend of total eye gaze shifts rose across sessions. Of the total eye gaze shifts, 89.1% were NC-EGSs and 10.9% were C-EGS.

Seventy-five total eye gaze shifts during the summer initially followed a flat trend across sessions; a gradually declining trend was observed after the first 3 sessions. In the summer, 61.3% of the eye gaze shifts were NC-EGSs and 36.7% were C-EGSs.

Figures 11 and 12 illustrate the trends of total eye gaze shifts (NC-EGS and C-EGS) for spring and summer.

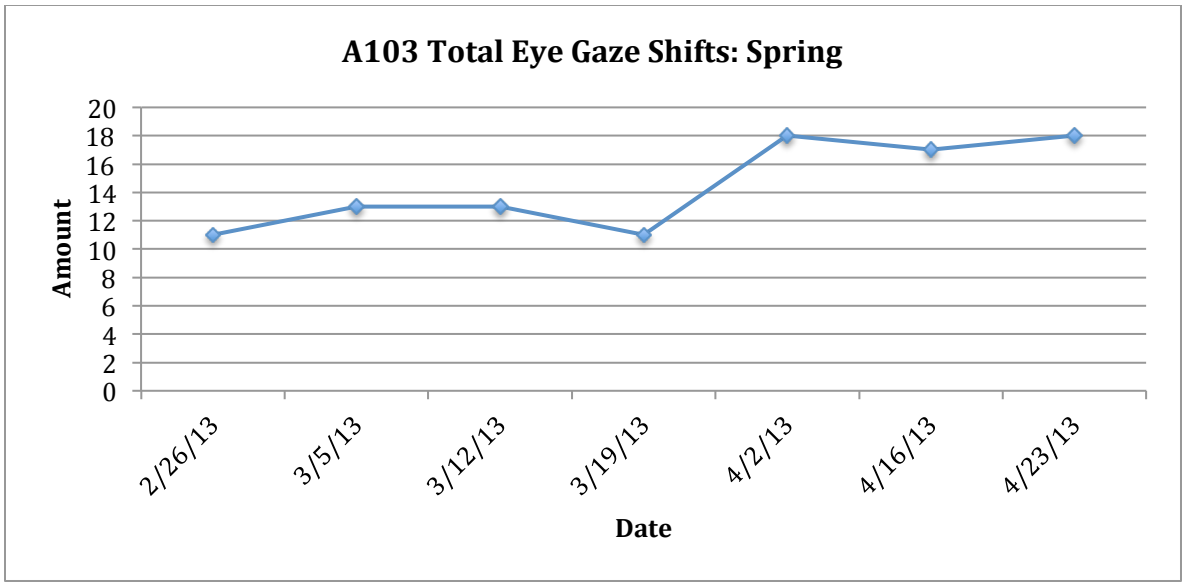

Figure 14: Total eye gaze shifts (NC-EGS and C-EGS) made by A103 in the spring

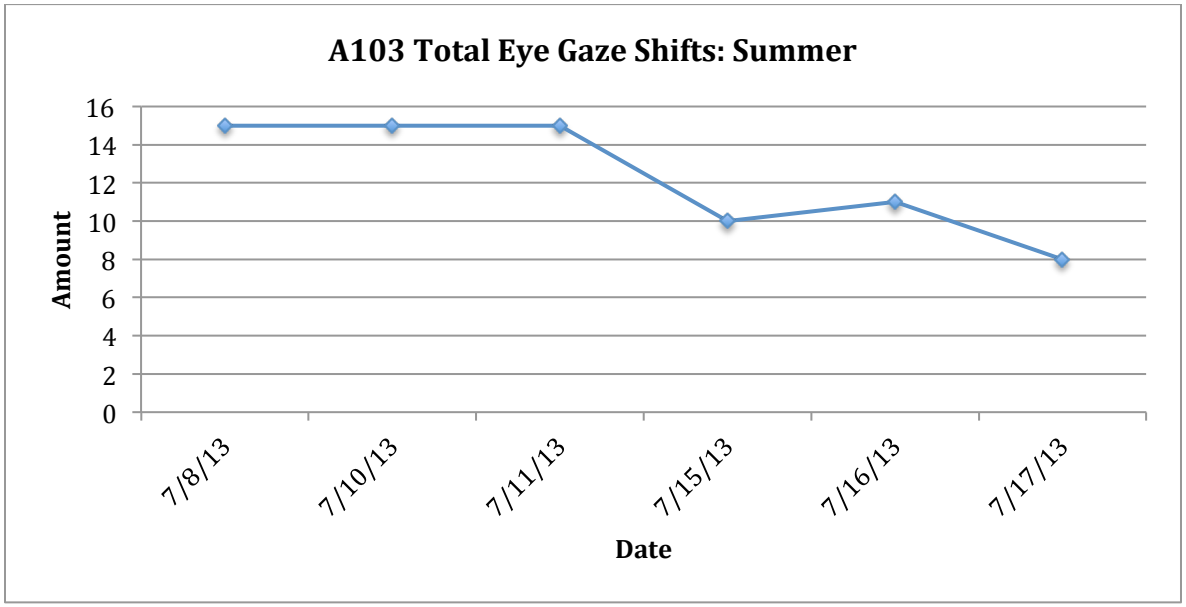

Figure 15: Total eye gaze shifts (NC-EGS and C-EGS) made by A103 in the summer

A103 Discussion

Cues and Cued Eye Gaze Shifts

A103's average C-EGSs per session increased in the summer when compared to the spring. His average amount of C-EGSs per session in the summer was 3 times that of the spring. As A103 received almost 4 times the amount of cues during the summer that he did in the spring, this

increased average likely reflects the greater opportunities presented (as discussed in A102's case). For A103, this change does not seem to reflect a learning curve, as he responded to a lower percentage of cues during the summer than the spring.

When compared to the spring, a noteworthy shift in A103's responsiveness to cues was seen in how often he responded to nonverbal and combined cues in the summer. While he responded to the majority of nonverbal cues during the spring, he responded to less than a third of nonverbal cues in the summer. However, during the summer he was presented with over 3 times the amount of nonverbal cues than he was in the spring. For A103, nonverbal cues might have lost their salience or meaning. During the summer, a single type of nonverbal cue was used (a point to the peer). As he became perhaps overly exposed to this pointing cue, he might have ceased giving it much attention. This theory is supported by the data regarding his response to combined cues. While his rate of response to combined cues also decreased, it was not nearly as drastic as a change in his response to pointing cues. Given that most combined cues in the summer included pointing, it is plausible that A103 was responding to the other aspects of the combined cue, and not the point.

A103 was presented with 5 types of combined cues during the summer. While he responded to over half of these cues, some were more effective than others. For example, he responded to more than half of pointing + direct verbal cues. Of particular importance, he responded to all of the cues consisting of indirect verbal + drawing and cues consisting of pointing + indirect verbal + photo. In their discussion of learning, Shams and Seitz (2008) stated, "The human brain has evolved to develop, learn and operate optimally in multisensory environments" (p. 411). They further explained that multisensory environments and training that includes multisensory input are more conducive to learning, as they better approximate natural settings. They contrasted multisensory stimulus with unisensory stimulus and state that the latter might not be optimal for learning. Under this classification system, combined cues used for A103 would be multisensory, while an isolated pointing cue would be unisensory. This theory of learning is likely applicable to A103, as evidenced

by his increased ability to respond to cues containing multisensory input and his diminished response to unisensory nonverbal cueing. Information such as this could be highly relevant in planning further treatment and educational approaches for this child.

Non-Cued Eye Gaze Shifts

A103's average NC-EGSs per session were greater during the spring than during the summer. One potential explanation for this trend could be his compatibility with his peer. Overall, research supports the use of peers in intervention for children with autism. However, there is a paucity of research addressing what specific qualities of a peer are most beneficial during treatment. Research from as early as the 1980s showed that the use of peer models is successful in promoting the target behavior of children with autism (Egel, Richman, & Koegel, 1981). More recently, DiSalvo and Oswald (2002) endeavored to delineate qualities of peers that would result in the greatest success. They explained that socially competent peers can be incorporated into therapy as models for socially appropriate behavior. They further stated that the presence of a peer can serve as a reinforcement of targeted behaviors. In order to use peers most effectively, the authors suggested that participation of peers must be effortful. Peers must also appropriately adjust their expectations regarding the behavior of their classmates with autism. Given this insight, it is possible that A103's peer during the spring was better suited to be a peer model than his peer during the summer. Alternatively, it is possible that A103 was more interested in his peer during the spring, and therefore was more attentive to him. His peer during the spring was a boy, while his peer during the summer was a girl. In a study examining the efficacy of using same sex peer models, Roeyers (1996) found that use of peers rendered improvements in the social behaviors of children with a pervasive development disorder. However, these results were not compared to outcomes of pairs of different sexes. Having a peer of the same sex might have been more salient to A103, but current research does not completely support this idea.

Another possible explanation for A103's behavior is that he was beginning to show signs of prompt dependency during the summer. Hume, Lofton, and Lantz (2009) stated, "Independent performance may prove difficult for individuals with autism spectrum disorders (ASD) due to the core deficits of the disability, as well as executive function deficits that impact initiation and generalization" (p. 1329). As A103 began to receive more cueing to shift his eye gaze during the summer, it is possible that he was less inclined to independently shift his eye gaze. Instead, he might have been waiting until he was told to do so. It is also possible that the play routine in the summer was more cognitively demanding for A103. The authors stated that this type of change in demands could have an effect on performance. If that was the case, A103's resources for initiating and responding to bids for joint attention might have been diminished. The authors also explained that motivation could be an influencing factor on the initiation behaviors of individuals with autism. In the case of A103, his motivation to shift his eye gaze independently could have been less, as he was almost consistently being cued to do so. The authors also stated, "Prompt dependence impedes potential success in the independent performance of the skill during maintenance and generalization activities, may reduce the student's level of participation, and can increase overall passivity and learned helplessness" (p. 1332). This information is relevant to this case, and the level of cueing should be strongly and carefully considered as A103 continues treatment.

Participant Summary

While drastic improvements were not observed in A103's eye gaze shifts between the spring and summer, the data from these semester sessions could be very useful in informing future treatment. For A103, a clinician should carefully consider the type and frequency of cues presented. It is likely that multisensory cues are superior in eliciting a desired behavior than cues using only one modality for this child. A suitable peer would likely influence A103's response to intervention as well. Lastly, it is important to note that while A103 did not make improvements in terms of frequency of eye gaze shifts between semesters, his overall behaviors were similar. These results

could indicate that some skills were maintained and carried over from the previous semester session.

Conclusion

Comparison Across Participants

Data for each participant in this study were analyzed on a case-by-case basis through the use of a common methodology. However, the participants in this study showed noteworthy similarities and differences when compared to one another. When comparing these cases, several points cannot be ignored. The first is that each child was paired with a different peer, and peers changed from semester to semester. The child's relationship with his peer could have influenced his eye gaze shifts each semester. The second point is that each child had a different clinician each semester, which also could have influenced his behavior. Lastly, each child received cueing that was tailored to him by his clinician; cueing hierarchies were different for the participants each semester. For these reasons, comparison across cases is complex because treatment cannot be considered entirely equal for all three children. However, some trends were discernable across participants despite the varied circumstances of treatment.

Differences Across Participants

The differences between the participants in this study were many. Some examples include the types of cues they responded to and did not respond to, instances that caused them to make an eye gaze shift when not cued, how their responsiveness to cueing changed over time, and the minimum and maximum number of eye gaze shifts they made during a single session. An overlaying difference that could be considered the most important was the difference in their total number of eye gaze shifts. This number is the result of many factors, and it could be indicative of their overall responsiveness to treatment.

Each participant in the study exhibited different patterns of total eye gaze shifts throughout the semester sessions. While A100 steadily increased in total eye gaze shifts for the majority of the

spring, his total eye gaze shifts during the summer followed an unpredictable pattern by increasing or decreasing almost daily. A102, on the other hand, showed less variability during the 2 semester sessions. During the spring, his total eye gaze shifts shallowly diminished and then increased back to the initial amount. His total eye gaze shifts during the summer also followed a shallow decrease and increase, and he also ended with the same total as he began with in the summer. A103's pattern of total eye gaze shifts increased during the spring and decreased during the summer.

When considering the data regarding total eye gaze shifts in isolation, the cases are more dissimilar than similar. No two participants made eye gaze shifts in very similar ways during any semester. Further, participants did not show the same trends when their individual data were compared between spring and summer. These data emphasize the importance of tailoring treatment to individual's strengths and needs by providing appropriate scaffolding and opportunities supported by data about the child. As all children with autism show different strengths and challenges, it is not surprising that these cases were very different when the amounts of eye gaze shifts were compared.

Similarities Across Participants

One similarity observed across participants was the overall responsiveness to cueing. With A100's spring data as an exception, the participants' trends of responsiveness to cueing closely mapped to the trend of number of cues presented. In other words, participants showed greater C-EGSs on days with more cueing and fewer C-EGSs on days with less cueing. Further, with the exception of A103's summer data, the amounts of C-EGSs across semester sessions were not drastically different from the number of cues presented. Overall, these data suggest that cueing was effective for the participants in the study in terms of eliciting eye gaze shifts. While it is important to consider the possibility of cue dependence, the strategy of cueing could be considered a useful tool in a treatment paradigm for teaching children skills in joint attention.

Another similarity was observed across participants in terms of eye gaze shifts that were not cued. With the exception of 2 days during the summer for A103, all participants displayed greater NC-EGSs than C-EGSs during every session of both spring and summer. These data are important for a couple of reasons. First, they are helpful in informing how clinical data is collected. If clinicians are attentive to both the cued and non-cued eye gaze shifts a child is making, they might notice trends not observable by recording C-EGSs alone. These data can be very important for progress tracking. Second, the increased amounts of NC-EGS might speak to the effects of treatment that go beyond isolated responses to cueing for eye gaze shifts. It is possible that the structure of Story of Friendship, including aspects of the Storybook Journey, video modeling, typical peers, and Buddy Time, are fostering an environment where children are inherently cued to shift their eye gaze to their peer. Overall, the collection of NC-EGS data can help inform clinicians about the effectiveness of treatment, as well as provide information about the possible generalization of skills. The observation of greater NC-EGSs than C-EGSs during Story of Friendship treatment sessions is a promising one, as the ultimate goal of joint attention intervention is to provide a child with skills they are able to use on their own without cueing provided by a clinician.

Lastly, a trend was observed in terms of the types of NC-EGSs that were most frequent across participants. Overall, NC-EGSs made during scripted peer speech were the most common across participants. While this was not the case for each child each semester, when assessed as a whole there is a shallow trend that indicates this type of NC-EGSs was most prevalent. These data further support the idea that use of script therapy might be useful for these participants in that use of scripts seem to promote instances of joint attention.

Influential Factors of Treatment

As discussed in previous sections, there are many factors that might have influenced the joint attention behaviors of the children in this study. Some of these factors included qualities of the child's peer, the presence of a learning curve, the possibility of prompt dependence, the intensity of

the treatment, efficacy of scripts, and the implementation of visual strategies. Of all of the possibly influential factors examined in this study, two appeared to be relevant for all three of the participants: the clinician's responsiveness to the child and the use of multisensory stimuli during treatment.

Gerald Mahoney has focused on the importance of relationships and responsiveness throughout his career in research. While his studies have been directed at examining the responsiveness of parents while interacting with their children, many of his findings are applicable to the service providers who work closely with children who have developmental needs. In 2003, Mahoney and Perales presented a relationship-focused intervention in which parents were trained to use responsive interactive strategies, such as engaging in child-led activities. The authors found that parents who were trained in a responsive teaching system were better able to interact with their children with autism in a responsive manner. As a result of increased parental responsiveness, children showed improvements in social interaction and emotional functioning. Through the use of these strategies, parents were able to respond appropriately to the individualized needs of their child in the domains of cognition, communication, social-emotional functioning, and motivation.

While clinicians in Story of Friendship are not the children's parents, the same concept of responsiveness is relevant. In reviewing the data collected for this study, some clinicians continued to use cues that were not resulting in eye gaze shifts from the child. In these cases, it might have been more appropriate and responsive to cease using a particular cue and replace it with a more effective cue. For clinicians, responsiveness includes being keenly aware of how the client is reacting to a given stimuli and adjusting the treatment plan accordingly. In Story of Friendship, each clinician is able to individualize the cueing hierarchy to effectively interact with their client. This flexibility and individualization are essential elements of the treatment model that lend themselves perfectly to clinician responsiveness. By being aware of and responsive to their client's

behavior, clinicians can provide cues in the most effective ways possible to facilitate gains in joint attention for their clients with autism.

While reactions varied among the three participants in the study, the use of multisensory stimuli and teaching seemed to have an effect on all three participants. A100 and A103 showed increased responsiveness when they were presented with multisensory (combined) cues instead of unisensory cues, and A102 showed strong responses both to scripts and to visual information. Research conducted by Pares et al. (2005) and Hagiwara and Myles (1999) showed that using multisensory input yielded positive results for children with autism. These finding were relevant in the current study, as each participant in the current study showed increased instances of joint attention when they were presented with cues or information in a multisensory format. The flexibility and individualization of the cueing hierarchies in Story of Friendship allow for a vast range of multisensory cues to be used. Clinicians can also create multisensory environments during Buddy Time or other parts of treatment through their use of scripts, spontaneous speech, gestures, and visual information such as pictures or written language. In addition, clinicians can incorporate physical, tactile, and attentional cues throughout treatment sessions. In considering future sessions of Story of Friendship, clinicians might consider the significant impact of multisensory cueing on their clients. The use of multisensory cueing can also aid in clinician responsiveness, as clinicians can monitor which types of cues seem effective and ineffective.

In summary, participants in the current study were likely influenced by several factors during the moments they engaged in instances of joint attention. Of these factors, clinician responsiveness and multisensory input appeared relevant for all three participants. In future sessions of Story of Friendship, and in other treatments aimed at improving the joint attention skills of children with autism, treatment efficacy might be optimized if clinicians considered their level of responsiveness and their use of multisensory information. Being responsive to individual needs and

providing information that can be accessed through multiple sensory channels is likely to foster an environment in which children with autism are able to improve their joint attention skills.

Bibliography

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). Arlington, VA: American Psychiatric Publishing.

Bono, M. A., Daley, T., & Sigman, M. (2004) Relations among joint attention, amount of intervention, and language gain in autism. *Journal of Autism and Developmental Disorders, 34,* 495-505.

Charlop-Christy, M. H., & Kelso, S. E. (2003). Teaching Children with Autism Conversational Speech Using a Cue Card/Written Script Program. *Education and Treatment of Children*, *26*(2), 108-27.

Charman, T. (2003). Why is joint attention a pivotal skill in autism? *Philosophical Transactions of the Royal Society,* 358*,* 315-324.

Dawson, G., Toth, K., Abbott, R., Osterling, J., Munson, J., Estes, A., Liaw, J. (2004). Early social attention impairments I autism: Social orienting, joint attention, and attention to distress. *Developmental Psychology,* 40:2, 271-283.

DiSalvo, C. A., & Oswald, D. P. (2002). Peer-mediated interventions to increase the social interaction of children with autism consideration of peer expectancies. *Focus on autism and other developmental disabilities*, *17*(4), 198-207.

Dykstra, J. R., Boyd, B. A., Watson, L. R., Crais, E. R., & Baranek, G. T. (2011). The impact of the Advancing Social-communication And Play (ASAP) intervention on preschoolers with autism spectrum disorder. *Autism*, 1362361311408933.

Egel, A. L., Richman, G. S., & Koegel, R. L. (1981). Normal peer models and autistic children's learning. *Journal of Applied Behavior Analysis*, *14*(1), 3-12.

Ganz, J. B., & Flores, M. M. (2008). Effects of the use of visual strategies in play groups for children with autism spectrum disorders and their peers. *Journal of Autism and Developmental Disorders*, *38*(5), 926-940.

Ganz, J. B., Kaylor, M., Bourgeois, B., & Hadden, K. (2008). The impact of social scripts and visual cues on verbal communication in three children with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities*, *23*(2), 79-94.

Greenspan, S. I., & Wieder, S. (2009). *Engaging autism: Using the floortime approach to help children relate, communicate, and think*. Da Capo Press.

Hagiwara, T., & Myles, B. S. (1999). A multimedia social story intervention teaching skills to children with autism. *Focus on Autism and other developmental disabilities*, *14*(2), 82-95.

Hume, K., Loftin, R., & Lantz, J. (2009). Increasing independence in autism spectrum disorders: A review of three focused interventions. *Journal of autism and developmental disorders*, *39*(9), 1329-1338.

Kaale, A., Smith, L., Sponhein, E. (2012). A randomized controlled trial of preschool-based joint attention intervention for children with autism. *Journal of Child Psychology and Psychiatry,* 53:1, 97-105.

Kasari, C., Freeman, S., & Paparella, T. (2006). Joint attention and symbolic play in young children with autism: a randomized controlled intervention study. *Journal of Child Psychology and Psychiatry, 47,* 611-620.

Kasari, C., Paparella, T., Freeman, S., & Jahromi, L. B. (2008). Language outcome in autism: randomized comparison of joint attention and play interventions. *Journal of consulting and clinical psychology*, *76*(1), 125.

Laushey, K. M., & Heflin, L. J. (2000). Enhancing social skills of kindergarten children with autism through the training of multiple peers as tutors. *Journal of autism and developmental disorders*, *30*(3), 183-193.

Lovaas, O. I. (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal of consulting and clinical psychology*, *55*(1), 3.

Loveland, K. A., & Tunali, B. (1991). Social scripts for conversational interactions in autism and Down syndrome. *Journal of Autism and Developmental Disorders*, *21*(2), 177-186Mahoney,

G., & Perales, F. (2003). Using relationship-focused intervention to enhance the social—emotional functioning of young children with autism spectrum disorders. *Topics in Early Childhood Special Education*, *23*(2), 74-86.

McCord, S. (1995). *The Storybook Journey: Pathways to Literacy through Story and Play*. Simon & Schuster, 200 Old Tappan Rd., Old Tappan, NJ 07675

Mundy, P., Sigman, M., Ungerer, J., & Sherman, T. (1986). Defining the social deficits of autism: The contribution of non-verbal communication measures. *Journal of child psychology and psychiatry*, *27*(5), 657-669.

Parés, N., Carreras, A., Durany, J., Ferrer, J., Freixa, P., Gómez, D., Kruglanski, O., Pares, R., Ribas, J. I., Soler, M., & Sanjurjo, À. (2005, June). Promotion of creative activity in children with severe autism through visuals in an interactive multisensory environment. In *Proceedings of the 2005 conference on Interaction design and children* (pp. 110-116). ACM

Roeyers, H. (1996). The influence of nonhandicapped peers on the social interactions of children with a pervasive developmental disorder. *Journal of autism and developmental disorders*, *26*(3), 303-320.

Shams, L., & Seitz, A. R. (2008). Benefits of multisensory learning. *Trends in cognitive sciences*, *12*(11), 411-417.

Tissot, C., & Evans, R. (2003). Visual teaching strategies for children with autism. *Early Child Development and Care*, *173*(4), 425-433.

Waterhouse, L. (2013). *Rethinking autism: variation and complexity*. Academic Press.

Whalen, C., Schreibam, L., & Ingersoll, B. (2006). The collateral effects of joint attention training on social initiations, positive affect, imitation, and spontaneous speech for young children with autism. *Journal of Autism and Developmental Disorders, 36,* 655-664.

Wong, C. (2013). A play and joint attention intervention for teachers of young children with autism: a randomized controlled pilot study. *Autism,* 17(3), 340-357.

Wong, C., & Kasari, C. (2012). Play and joint attention of children with autism in the preschool special education classroom. *Journal of Autism and Developmental Disorders, 42,* 2152-2161.