

VIDEO CALLING WITH NONVERBAL CHILDREN  
WITH AUTISM

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DISSERTATION

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR THE DEGREE OF DOCTOR OF EDUCATION IN  
THE SCHOOL OF EDUCATION  
UNIVERSITY OF BRIDGEPORT  
CONNECTICUT

June 2014

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## Abstract

Twenty five percent of individuals diagnosed with autism are nonverbal and need to learn to communicate using alternative means (National Research Council, 2001) in order to build functional spontaneous communication. Joint attention behaviors are critical for communication development (Mundy & Newell, 2007). This study introduces a video calling intervention to target the joint attention behaviors, eye gaze, verbalization and gestures. The purpose of this study was to discover what relationship exists between video calling and joint attention in nonverbal children with autism and to explore the perspectives of parents and their communication interaction with the child. This case study of two children is a quantitative ABA withdrawal design and a qualitative narrative design. The ABA design uses seven-inch Prestige 7 Connect tablets and Skype, video calling software program to communicate during game, reading and discussion activities. Observing and recording procedures were used to collect the data and visual analysis was conducted using graphs, tables. The narrative design used parent interviews and questionnaires to build themes. The findings indicate that video calling had a positive impact on eye gaze and verbalization behaviors during discussion and game activities. From the narrative analysis emerged a theme of engagement and focus. The conclusions indicate that video calling has impact on some joint attention behaviors and increases engagement in nonverbal children with autism. Implications for this study include using video calling in the classroom for peer interactions and skill building. Further study is needed to increase the generalizability of these findings.

Keywords: joint attention, video calling, nonverbal, autism, engagement

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## CHAPTER I: INTRODUCTION

Autism affects the ability of individuals to communicate. Approximately forty percent of individuals with autism have difficulty developing functional communication skills to meet their daily needs (Cafiero & Meyer, 2008). Communication is a process by which individuals not only use speech but also interpret gestures, body language, tone of voice, and includes verbally expressing feelings, thoughts and needs. About twenty five percent of individuals diagnosed with autism are nonverbal and need to learn to communicate using other alternative means (National Research Council, 2001).

The purpose of this study was to discover if a relationship exists between video calling and joint attention in nonverbal children with autism and to explore the perspectives of the parents and their communication interactions with their child. The intervention included the use of an augmentative and alternative communication device with video calling software. Augmentative and alternative communication (AAC) that is commonly used in schools is any tool, strategy or technology that compensates for, enhances, or otherwise helps develop communication skills (Cafiero & Meyer, 2008). The devices selected for this research study were seven-inch tablets from Visual Land, the Prestige 7 Connect chosen for their low cost, ability for wireless Internet connection, and Skype software interface. This researcher looked at the joint attention behaviors of eye gaze, verbalization, and gestures while communicating using Skype. Joint attention behaviors fall into two categories: Responding to others or spontaneously initiating a behavior (Mundy & Newell, 2007). Responding to others means to follow another's gaze, gestures or behaviors when sharing a common interest. Joint attention in initiating a behavior involves initiating the behavior, gaze or gesture (Mundy & Newell, 2007).

This researcher explored eye gaze, verbalization, and gestures as responding behaviors and initiating behaviors. In addition to learning if a relationship existed between video calling and joint attention behaviors this researcher explored if the video calling intervention impacted the perspectives of the communication interaction between the parent and the child. Joint attention is vital for social development (Mundy & Newell, 2007) and lack of adequate joint attention behaviors can interfere with caregiver relationship building and communication (Sanefuji & Ohgami, 2011). This researcher explored the caregiver experience to determine if and how their perspectives of communicating with their child changed during or after using video calling.

Autism spectrum disorder encompasses a wide range of behaviors. Individuals with autism are commonly characterized by exhibiting atypical language and social development, repetitive behaviors, problem behaviors, sensory disorders and differences in intellectual functioning (Turnbull, Turnbull, Wehmeyer & Shogren, 2013). For the purposes of this study, autism spectrum disorder as described in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) will be used (American Psychiatric Association, 2013). The DSM-5 diagnostically defines social communication as a deficit in social-emotional reciprocity including a lack of back and forth conversation, shared interests, and failure to initiate or respond to social interactions. The participants selected for this study exhibited these communication deficits as well as exhibiting an intellectual development disorder. Intellectual development disorder is characterized as a chronic impairment of mental abilities that impact functioning in three areas; conceptual skills, social skills and self-management skills as well as an IQ score of 70 or below (DSM-5) (American Psychiatric Association, 2013).

This study examined if a relationship (Creswell, 2009) between video calling and joint attention in non-verbal children with autism could be discerned. The study also examined the participants' perspectives about (Creswell, 2009) communicating with their child.

The participants were purposefully selected and consisted of two children and two parents who lived in an urban setting. The children were observed at an elementary school and the parents were interviewed in their homes. The two families were selected based on fitting the criteria that answers the research questions (Lapan, Quartaroli & Riemer, 2012).

Quantitative and qualitative data was collected concurrently during the intervention process (Teddlie & Tashakkori, 2009), during a seven-month period beginning in November 2013 and continuing through April 2014. The quantitative data for the ABA design (Creswell, 2012; Gast, 2010) consisted of observing and recording the participant's joint attention target behaviors after administering the intervention and conducting a parent survey. Data was collected using a direct observational recording system while the participants engaged in multiple activities. Inter observer agreement was determined by examining recordings of the children and resulted in agreement in the 80% range. Qualitative data was collected from the parent participants in the form of questionnaires, parents' notes and interviews (Creswell, 2012). This data was used to seek personal experience stories that (Creswell, 2012) explored the perspective of the parents while using the video calling communication intervention.

Analysis of the observations and surveys were used to evaluate the outcomes of the intervention. An independent visual analysis of the observations was conducted to

determine the impact of the intervention on the joint attention target behaviors (Gast, 2010; Muijs, 2011). Results of the observation were displayed in simple line graphs with each participant displayed separately and the survey results were presented in a bar graph. The analysis of the qualitative data followed an inductive design (Creswell, 2009) that moved from specific details to themes that represented the participants' meaning. The qualitative results were presented in the form of tables and narrative reports. These narrative reports were analyzed individually for responses and themes that illuminate the interactive relationship between the parent and the child before and after the introduction of the intervention.

Validity and credibility measures were used throughout this study including inter observer agreement, analysis of level of change and percentage of non-overlapping data. The ABA withdrawal design selected for this study allows for functional analysis of the impact of the intervention on the target behaviors (Gast, 2010) as well as return to baseline data that increases the credibility of the findings. Interobserver agreement was obtained during the qualitative portion of the data collection and percentage of non-overlapping data (PND) was used during the analysis for functional assessment of impact on the target behaviors. Qualitative techniques used to improve the credibility of the findings included disclosing researcher bias, using rich narratives, data triangulation, and a secondary reader independently coding the material for analysis.

## **Problem**

Communicating needs, thoughts and feelings verbally can be especially difficult for persons with autism (National Research Council, 2001). Nonverbal children with

autism need to learn to communicate using alternative methods when verbal expression is difficult. The National Research Council (2001) states in "Educating Children with Autism" that functional spontaneous communication is a critical skill that needs to be part of interventions for students with autism in our schools. Individuals with autism often have impaired joint attention skills (Charman, 2003). Children with autism often learn language primarily based on imitative learning (acquiring a new action by watching another) or associative learning (learning a new behavior by making a connection between two events) (Ingersoll, 2008, Luyster, 2009). Enhancing joint attention and spontaneity in everyday communication has been highlighted as one of the most important goals of an intervention for students with autism (Mundy & Newell, 2007). Developing the communication skills of these individuals is imperative if they are to become participating members of the community.

Augmentative and alternative communication (AAC) is defined as any tool, strategy or technology that compensates for, enhances, or otherwise helps develop communication skills (Cafiero & Meyer, 2008). There are currently many options available for enhancing communication including sign language, visual picture programs, and speech generating devices. These tools can be used in a stationary setting, such as a book or board, movable device, or technological device. In a meta-analysis conducted by Nunes (2008), not only does the use of these tools increase communication, but they also establish joint attention and understanding of shared content, critical for continued growth in communication development. Joint attention is the foundation for learning more complex communication skills such as word learning. This researcher explored joint attention behaviors using tablets and video calling as an intervention.

## **Purpose**

The purpose of this study was to discover what relationship exists between video calling and joint attention in nonverbal children with autism and to explore the perspectives of parents and their communication interaction with the child with and without video calling.

This researcher wanted to know if and how using a video calling communication device impacted joint attention between the child and partner. Based on the research by Nunes (2008) devices such as picture exchange communication system (PECS) significantly increase spontaneous communication (Nunes, 2008) whereas a child "exchanges" a picture for a desired object (Bondy & Frost, 1994). Using the picture exchange communication system (PECS) can be an effective strategy for facilitating verbal imitation as well as increasing the frequency of communication initiations and responses (Bondy & Frost, 1994; Nunes, 2008). Included in the phases of learning functional communication is the child initiating the interaction with another person. By using the video calling intervention, this researcher joined the communicating partner through the tablet and provided opportunities for initiating the interaction. This intervention is an expansion of PECS in that it used a visual picture of the communicating partner within an object, the tablet, to facilitate responses and initiations in the child.

Jacobs (2010) calls for our education system to modernize. iPads and touch screen tablets have become increasingly popular in the school community for students with disabilities. Using a touch screen tablet incorporates sensory integration and "high interest" for the child (Brandon, 2011) making it an effective tool to use with students

with autism. This researcher chose video calling on a tablet device as the intervention as a way to integrate using tablets in the classroom beyond playing games and using mobile applications. Jacobs (2010) charges educators to not just modernize our education system by just changing the tools we use but to use these tools in new ways for student learning and growth.

The results of this study are intended for the adults that work and care for children with autism including teachers, parents and other educational professionals.

### **Definition of Terms**

**Associative learning** - Learning behaviors need to be taught to children with autism because of the significant delays in these areas. Associative learning happens when a child learns a new behavior by establishing a connection between two events (San Ramon, 2010).

**Atypical language development** - Language development in students with autism can range from very prolific to no verbal communication at all. Approximately one quarter of students with autism is nonverbal (National Research Council, 2001). Nonverbal students often use gestures, babbling and utterances in place of words for communication.

**Atypical social development** - Students with autism most often have delays in social interactions and social skills. This may include inability to spontaneously share in activities, enjoyment and interests with others. They may have difficulty comprehending others feelings, difficulty reading physical cues, and nonverbal signals.

**Augmentative and alternative communication (AAC)** - Communication methods used to supplement or replace speech. Commonly used by those with intellectual disabilities,



including children with autism. Examples include sign language, pictures, communication boards and speech generating devices.

**Autism (Autism Spectrum Disorder)** - Autism spectrum disorder encompasses a wide range of individuals that fall into two main categories, social communication disorder and autism spectrum disorder. This study looks at children with autism spectrum disorder, to be referred to hereafter as autism. Autism is characterized by deficits in social communication, social interactions and repetitive patterns of behavior or interests with or without intellectual impairment. Children in this study fall into the severity level of three, requiring very substantial support with severe functional deficits in verbal and social communication (Diagnostic and Statistical Manual, DSM-5)(American Psychiatric Association, 2013).

**Comprehensive Test of Nonverbal Intelligence (CTONI-2)** - A nonverbal test to measure reasoning and problem solving in children and adults. It uses pictures of familiar objects and geometric shapes to measure general intelligence (Hammil, Pearson & Weiderholt, 2009)

**Educational Professionals** - Professionals in the school environment that work with children with autism. These individuals can be speech and language therapists, paraprofessionals, general education classroom teachers and special education teachers.

**Eye gaze** - Occurs when child makes eye contact with a partner. This can be looking at the eyes or face.

**Gestures** - Occurs with a purposeful change in body movements such as a nod of the head, smiling, grimacing, looking away, pointing, touching, hugging, kissing, jumping, kicking, clapping, shaking hands, moving away or coming closer.

**Imitative learning** - Imitative learning occurs when an individual acquires a new action by watching another. Imitative learning can include symbolic and non-symbolic body movement; symbolic and functional object use, vocalizations and facial expressions. Imitative learning is critical for the development of social communication behaviors that include language, play and joint attention (Ingersoll, 2008).

**Intellectual disability** - This development disorder is characterized as a chronic impairment of mental abilities that impact adaptive functioning in three areas; conceptual skills, social skills and self-management skills as well as an IQ score of 70 or below (DSM-5)(American Psychiatric Association, 2013). Students with autism may have a range of intellectual abilities. Approximately 75 percent of children with autism have an intellectual disability (Turnbull et al., 2013).

**Joint attention** - Joint attention behaviors can fall into two categories: responding to others or spontaneously initiating a behavior (Mundy & Newell, 2007). Responding to others means to follow another's gaze, gestures or behaviors when sharing a common interest. Joint attention in initiating a behavior involves initiating the behavior, gaze or gesture (Mundy & Newell, 2007).

**Nonverbal** - Nonverbal communication is communicating with out verbal utterances or sounds. Speech may be limited to utterances or other one - word vocalizations (Gordon, 2011). There is no shared dialogue with other persons.

**Picture Exchange Communication System (PECS)** - Developed by Lori Frost and Andy Brody in 1984. It is a form of augmentative and alternative communication commonly used as a communication aid for children with autism. Using pictures to

represent words, it teaches functional communication skills in a spontaneous format (Bondy & Frost, 1994)

**Verbalization** - Occurs with a purposeful change in saying words, making utterances, screaming, singing, laughing, or crying.

**Video calling** - Video calling is a term used for the simultaneous use of video and audio for communication between two people. Devices such as tablets, web cams, computers and phones have the capability to conduct video calling. Common software used for video calling is Skype, Face time, Video chat and Face flow. These devices and software allow two people to talk and see each other at the same time. For the purposes of this study Skype software will be used on devices for communication.

**Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV)** - A cognitive ability assessment of verbal comprehension, perceptual reasoning, working memory and processing speed. Full Scale IQ is a combination score of all four areas.

## CHAPTER II: LITERATURE REVIEW

Social-cognitive models of joint attention suggest that social cognition is necessary for the developmental function of joint attention (Tomasello & Carpenter, 2005). This theory proposes that typically developing infants monitor their own goal-related intentional activities as well as those of others (Mundy & Newell, 2007). Early development of social cognition allows nine month old infants to integrate these two activities.

Joint attention is critical to social competence (Mundy & Newell, 2007) thus is worthy of studying in children with autism exhibiting social delays. Joint attention skills begin developing around the age of six months in children (Mundy and Newell, 2007) and are comprised of two main skills, responses to joint attention (RJA) and initiating joint attention (IJA). RJA is the first to develop beginning in the first few months of life when an infant begins to orientate towards a meaningful stimuli (Mundy and Newell, 2007). Aspects of representational development, imitation and eye gaze begin to develop. This early stage of RJA can be described as the behavior following the eye gaze (Mundy and Newell, 2007). Infant receptive eye gaze begins with the child's understanding that his gaze can move to a preferred stimuli and later attend to a preferred stimuli. This attending leads to goal-directed behavior, therefore, that goal-related behavior in others is a product of their self-control to attend (Mundy and Newell, 2007).

Initiating joint attention (IJA) impairments are more profound in children with autism than response joint attention impairments (Mundy and Newell, 2007). Although these two systems are interacting, they are also distinct from each other. IJA demands

greater connectivity and Mundy and Newell (2007) suggest this connection relationship as a primary link to cognitive impairments in children with autism.

In intentional communication a child's behavior becomes more goal directed, conventional and purposeful. Bruinsma, Koegel and Keogel (2004) outline three characteristics of intentional communication. Emerging joint attention begins with eye gaze alternating between an object and communicating partner that develops into the child's persistent gesturing or vocalizing until their goal/demand is met and finally the vocalizations take on close resemblance to speech patterns and sounds. Studies conducted by Bates (1979) suggest that intentional communication is complex requiring social interaction, persistence and environmental feedback. In a typical child IJA will develop and evolve into an interaction between the child and partner with attention being split and alternating between the partner and the object of interest.

Another study conducted by Bakeman and Adamson (1984) found that coordinated joint engagement was not fully observable for a ten minute time period of play until the child reached the ages of eighteen months. Bakeman and Adamson (1984) also attest that a key component of joint attention is the division and alternating attention between the communicating partner and an object. This alternation involves one of the most reported deficits of children with autism, eye contact. Children with autism display diminished frequency of eye contact and other joint attention behaviors such as giving, showing, point to objects, and following others' pointing. In a study of typical children and children with autism by Mundy, Sigman, Ungerer and Sherman (1986) the results showed that children with autism were most atypical in the category of joint attention behaviors. Another study found that children with autism were significantly more likely

to be object centered than person centered (Philips, Gomez, Baron-Cohen, Laa, & Riviere, 1995). Bruinsma, Koegel and Koegel (2004) state that the emergence of joint attention behaviors is a precursor to the acquisition of early language skills.

The final stage of developing joint attention is accompanied by intentional communication that is a closer approximation to the actual word of the object. Communication between the child and a communicating partner eventually becomes divided between the child, communicating partner and an object (Bruinsma et al., 2004). Greenspan and Weider (2003) refer to this divided communication as the circle of communication. It consists of exchanges between the child and the caregiver. Each exchange of eye gazes, gestures and vocalizations between the child, caregiver and eventually an object completes a circle of communication. It begins before spoken words are used to communicate. Through imitation the child learns to use gestures and vocalizations to control his needs and desires. Eventually through associative learning the child will later develop verbalization for the circle of communication.

### **Alternative and Augmentative Communication**

Based on the findings of children with autism and the acquisition of joint attention skills, gestures are more prevalent among children with autism as well as relating and interacting with objects rather than people. In a study conducted by Charman, Swettenham, Baren-Cohen, Cox, Baird, Drew (1997) of eye contact in typical children and children with autism, physical social play was found to be an area of higher eye contact and social engagement in children with autism. Another look at intervention practices concerning joint attention and children with autism found some of the

interventions focused on the development of non-verbal-social communicative skills. One case study suggested that promoting nonverbal communication does enhance language use in children with autism (Charman, 2003). In a visual graphic system such as Picture Exchange Communication System (PECS), the individual uses symbols and photographs to communicate (Bondy & Frost, 2001). PECS involves the child exchanging a picture to communicate needs or wants. Nunes (2008) states that using visual systems allow the child to focus more on the environmental cues and therefore is more able to check back and forth between the picture cue and other aspects of the interaction such as the communicating partner and other environmental cues. Nunes (2008) discusses how augmentative and alternative communication systems (AAC) facilitate the establishment of joint attention as well as shared understanding of an object. This type of intervention would support the notion that children with autism have an easier time relating to objects rather than communication partners, garnering it an easier mode of communicating for children.

Gordon, Wade, Pasco, Howlin and Charman (2011) conducted a study to determine if using a visual picture system would increase spontaneous communication in children with autism. The results showed that there was a significant change in spontaneous communication following the intervention. However, the change was incurred in requesting objects, not for social routines or purposes.

### **Imitation Learning**

Several studies looked at teaching imitative skills and imitation of the child's behaviors in order to learn more about imitation as an intervention. Sanefuju and

Ohgami (2011) conducted a study on gaze behaviors with young children with autism. The study measured gaze imitations between the infant and mother/caregiver. Their findings showed that gaze interactions with others allowed them to acquire joint attention skills that built on their understanding of relationships between others and objects. Another study of imitation showed that children with autism displayed more joint attention skills after repeated imitation sessions where the adult continuously imitated the behaviors of the child (Field, Nadel & Ezell, 2011). The authors conclude that children show more eye gaze behaviors when adults imitate the behaviors of the child. The study also found that children also showed preference for interacting with adults that are more playful and imitative.

Early intervention has been conducted for children with autism in discrete trail training environments (Ingersoll, 2008). Discrete trail is an applied behavior analysis technique to bring about positive change in behavior (Greenspan & Wieder, 2006). When using this instructional approach desirable behaviors are rewarded and undesirable behaviors are ignored. In a highly structured environment the child is taught through positive reinforcement to imitate adult behaviors and is adult directed rather than child directed. While this type of imitative learning may benefit learning of skills, it is often hard to generalize the behaviors to other natural settings and is taught in isolation rather than in the context of social interaction (Ingersoll, 2008). Ingersoll (2008) contends that this type of imitative learning does not benefit social communication development. A more social intervention would be reciprocal imitative training (Ingersoll, 2008) that takes place in a more natural setting. It begins with the adult's contingent imitation in a



play setting. The goal is to teach imitation skills with social interaction, move to spontaneous imitation and then have the imitation be generalized.

### **Associative Learning**

Associative learning is a commonly used strategy for teaching children with autism (San Ramon, 2010). San Ramon (2010) describes learning differences between typical children and children with autism. Typical children learn by observation of others and their actions. Observational learning relies heavily on paying close attention to others in the environment. Children with autism are lacking the joint attention necessary for observational learning and often require associative learning. When using associative learning positive reinforcers such as food, praise, tokens or favorite toys may be used. Learning is shaped through association with the reinforcer. Bhat, Galloway, and Landa, (2010) used associative learning in a study conducted in infants at risk for autism. They compared social and non-social visual attention patterns with associative learning. A triadic interaction with the caregiver, infant and an object was introduced. The results showed that the infants learned the association between the object and their behavioral actions. They increased their behavioral actions but their initiation of joint attention with the caregiver was not increased when the caregiver was quiet and passive.

### **Use of Theory**

Theories associated with this intervention include (a) joint attention, (b) eye gaze, and object centered behaviors. The theory associated with joint attention is defined by Bakeman and Adamson (1984) as the division and alternating attention between the

communicating partner and an object. This alternation involves one of the most reported deficits of children with autism. The theory associated with eye gaze is defined by Mundy and Newell (2007) as responses to joint attention or initiations for joint attention. As eye gaze develops the child understands that his gaze can move to a preferred stimuli and later attend to a preferred stimuli. This attending eventually leads to goal-directed behavior where the child uses eye gaze to obtain an object of his desire. The theory of object centered behaviors as defined by Philips, Gomez, Baron-Cohen, Laa, & Riviere, (1995) states that children with autism are object centered rather than person centered. These theories were used in this study to predict if they held true with the two students, their parents and the teacher-researcher in this study.

As this study includes single subject research methodology (Gast, 2010), the paradigm associated with the quantitative component was post positivism. Considering the discussed theories, this researcher used an object for communicating with a child to find if there was a change in joint attention behaviors, particularly, eye gaze. This was conducted through implementation of an ABA design of data collection (Gast, 2010). Joint attention behaviors were observed and measured during the course of this study.

The qualitative research component was from a constructivist methodological viewpoint that looks to explore the perspectives of the participants. It sought to probe the parent views and opinions concerning the usefulness and applicability of the intervention (Crewsell, 2009). Interviews and field notes were used to understand the perceptions of the parents concerning the usefulness and applicability of the tablet for increasing communication skills. An inductive process used the parents' interview responses to develop themes to analyze and discuss.

As this study was being conducted by the teacher-researcher, it is important to highlight the worldview of the researcher, potential biases and ways in which the bias is addressed from a methodological stance to make transparent to the reader the credibility of this study. This researcher was also the teacher of the children and had a prior relationship with the parents. This topic was chosen for study because this teacher-researcher was interested in helping children with autism. These two particular students with autism have been in the teacher-researcher's classroom for at least one year or more. It is fair to say that this teacher-researcher hoped this study would have a significant impact on their joint attention skills and communication in general. In light of this viewpoint, this teacher-researcher has taken some measures in order to reduce this bias that may be evident in this study. The ABA design of case study (Gast, 2010) allows for more credible data to be collected as it includes a return to baseline showing growth or lack of growth after the intervention. The analysis of the data included percentage of non-overlapping data in order to find those data points that were 75% and higher, an acceptable range in the field of single subject study. During the quantitative data collection all of the observed sessions were recorded and another educational professional was utilized to conduct multiple observations on the recorded sessions. This provided the results with an inter observer agreement over 80%, an acceptable range in the field of single subject study. In order to reduce bias in the qualitative portion of the study a secondary reader was utilized to help develop the themes used for analysis. Data triangulation (Maxwell, 2013) through the interviews, notes and questionnaires provided this researcher with multiple data sources for analyzing the data and forming themes for

discussion. It is through these measures that this teacher-researcher hopes to reduce researcher bias and increase the credibility of the results.

### CHAPTER III: METHODS

This study was a case study of two nonverbal children with autism. Quantitative and qualitative data were concurrently collected during this study. The quantitative portion of this study examined individual target joint attention behaviors using the ABA withdrawal design as outlined by Gast (2010). This design permitted the researcher to make an analysis of the target behaviors using a baseline and intervention conditions (Gast, 2010). When implementing the ABA withdrawal design three target behaviors eye gaze, verbalization, and gestures were measured as a baseline (A). The intervention, video calling, was then administered (B). Finally, the intervention was withdrawn (A). This design allowed the researcher to assess change in target behaviors as well as any maturational threats to internal validity (Gast, 2010; Tawney & Gast, 1984).

This researcher began by defining the target behaviors and collecting data for at least four sessions to obtain a stable baseline. Gast (2010) recommends using at least three data points when displaying results. After a baseline condition was obtained over a period of six weeks. The intervention was introduced and data was continually collected over a minimum of four sessions for a period of four weeks. The final step in the ABA design process was to withdraw the intervention for a two-week period of time and then repeat the intervention for a period of two weeks to establish a return to a baseline condition. All activity sessions lasted between 1:19 minutes and 8:04 minutes.

Inter observer agreement was also established for greater reliability of the behaviors being recorded. Gast (2010) describes inter observer agreement as another observer conducting event recording to compare instances of recorded behaviors with

that of the researcher. An educational professional was trained using the operational definitions and digital recordings. After the secondary observer viewed 20% of the recorded observations, a calculation was used to report the percentage of inter observer agreement between the researcher and secondary observer. This percentage ranged from 84% to 89%. Inter observer agreement is discussed in greater detail in the quantitative data collection portion of this chapter.

Additional quantitative data was collected in the form of a parent survey. This survey was conducted at the beginning and end of the study to collect specific information on the communication between the parent and the child. The survey (see Appendix A) was a pre-existing instrument that combined closed questions using a rating scale (Muijs, 2011). Each parent filled out a survey at her home prior to the interview and again at the end of the study.

This study also contained a qualitative component with multiple sources of data that included semi structured interview questions (see appendix B), open ended questionnaires (see Appendix C), and notes that focused on the participants meaning through an inductive process of data analysis (Creswell, 2009; Maxwell, 2013). This interpretive inquiry (Creswell, 2009) followed a narrative design that involved an exploration into the participants' experiences. By creating a close bond with the participants and collecting stories and individual experiences, this researcher was able to inductively develop themes using the participants' interpretation of their communication with their children (Creswell, 2009; Lapan, Quartaroli & Riemer, 2012).

## **Research Methods - Quantitative**

### **Sampling design and site selection.**

This case study used convenience sampling and the participants were selected based on fitting the criteria that answers the research questions rather than focusing on generalization and randomization (Lapan, Quartaroli & Riemer, 2012; Maxwell, 2013). The participants included two nonverbal children with autism and two parent participants of the children. This researcher had an established relationship with the participants and was better able to collect data that answered the research questions (Creswell 2009).

This study took place in two locations, an elementary school and the parents' homes. The school community consisted of twelve elementary schools, four middle schools and three high schools. The elementary school the child participants attend had approximately five hundred students in attendance. The researcher-teacher's classroom they attended was a third, fourth and fifth grade district wide program located in this elementary school. It was a self-contained classroom with ten students and one teacher and four teacher assistants. The classroom consisted of students with developmental and intellectual disabilities. The children received approximately eighty percent of their instruction in this classroom and twenty percent of their instruction with non-disabled peers. Instruction in this classroom was in the areas of academics, speech and language development, social/emotional development and occupational and physical therapies. Functional and adaptive skills were taught through out all disciplines. The majority of the quantitative target behavior observational data was collected at the school site except for the parent survey. The other site used in this study was the children's homes in the

same urban city. The majority of the qualitative interview and questionnaire data was collected at the home sites.

Prior to the beginning of any data collection informed consent was obtained from the participants, school and district. Given that the participants of this study were of minor age and vulnerable with disabilities, obtaining Institutional Review Board approval was necessary. The Institutional Review Board at University of Bridgeport approved this research proposal and this researcher completed the National Institutes of Health Office of Extramural Research's training course in Protecting Human Research Participants. Consent was also obtained from the school district superintendent, school principal and the parents of the children participating in the study (Appendix D). Ethical practices such as full explanation of the intervention and the risks and benefits were used in informing the participants (Gast, 2010). Confidentiality of the participants was extremely important to this researcher. The names of the participants were changed in order to protect the participants. The child participant names were changed to Karl and Barbara, and the parent participants were referred to as Karl's mother and Barbara's mother throughout the study.

This study began in August 2013 with obtaining consent from the IRB and gatekeepers of the school district and participants. Data collection began in November 2013 and continued through April 2014.

### **The child participants.**

Karl was eleven-year-old nonverbal child with autism in an elementary school self-contained classroom for 3rd, 4th, and 5th grade students. He has been in this



classroom with the teacher-researcher for 2 1/2 school years. The program had 10 students with developmental delays and intellectual disabilities and had a teacher to student ratio of 1:2 for the current 2014 school year. Karl's reading level is at a third grade level for decoding and a first grade level for comprehension. He easily reads new words in instructional level text and spells with accuracy at a fourth grade level although he needs supports for developing sentences. His comprehension skills include retelling parts of stories and answering who, what and where questions. In the Comprehensive Test of Nonverbal Intelligence Karl's full scale was 81, in the below average range. Karl's full scale IQ is 51 (WISC-IV), a level in the extremely low range and is functioning at the severity level of 3 for the DSM-5 diagnostic criteria for Autism Spectrum Disorder (American Psychiatric Association, 2013) requiring very substantial support. This definition includes severe deficits in verbal and nonverbal social communication skills and very limited initiation of social interactions. Karl did not use an augmentative and alternative communication device for communication during the study although he has used the Picture Exchange Communication System (PECS), an alternative communication intervention and other visual systems in the past. The PECS system uses pictures for communication rather than verbalization, reducing the dependency on verbal prompts for communication (Bondy & Frost, 2001). Karl no longer uses an AAC device and has acquired limited speech over the years and can make his needs known through words and gestures. During the course of the school day Karl used few words with his peers or teachers. Most of his communication was in response to a request from a teacher. When he did respond it is usually with one word. With redirection and visual cues Karl would produce a longer phrase or sentence. On occasion

he would initiate a verbal one -word request for an object of his desire, mostly food items, or tools needed for work tasks. Karl has learned through modeling and imitation to greet his teachers each morning and to make routine responses during the school day. Throughout the day Karl engaged in self-talk, mostly in a quiet voice that was not audible more than 1 foot away from him. Prior to the study Karl used an iPad at home for several years, mostly for games and Internet sites. He has used Skype, a video calling application, to communicate with family on rare occasions.

Barbara is a nine-year-old nonverbal child with autism in an elementary school self-contained classroom for 3rd, 4th, and 5th grade students. She has been in this classroom with the teacher-researcher for 1 1/2 school years. The program had 10 students with developmental delays and intellectual disabilities and had a teacher/teacher assistant student ratio of 1:2 for the current school year. Barbara's reading level is at a beginning second grade level for decoding and a first grade level for comprehension. She uses decoding, picture and contextual strategies to read new words in instructional level text and spells with accuracy at a first grade level although she needs supports for developing and writing sentences. Her comprehension skills include retelling parts of stories and answering who, what and where questions using visual cues. In the Comprehensive Test of Nonverbal Intelligence Barbara's full scale was 96, in the average range. Barbara's Full Scale IQ is 54 (WISC-IV), a level in the extremely low range and is functioning at the severity level of 3 for the DSM-5 diagnostic criteria for Autism Spectrum Disorder (American Psychiatric Association, 2013) requiring very substantial support. This definition includes severe deficits in verbal and nonverbal social communication skills and very limited initiation of social interactions. Barbara had an

iPad that she had access to at school and at home. The iPad had Prolequo2Go, speech-generating software that Barbara had used prior to this study but did not use it at school or at home during the time of the research study. Barbara preferred to use verbalization or a combination of gestures and sign language rather than the iPad or speech generating software. During the day she mostly verbalized with gestures such as "bathroom" and pointing, "sharpen please" and holding the pencil or "help please" and standing close holding her zipper. Barbara's speech was forced and her words did not contain all of the sounds in the words so it was often difficult to understand her request. She often got irritated when she had to repeat her request several times. Barbara has used Skype about once a month with family and used Face Time more often with her father.

#### **Data collection, child participants.**

The quantitative measure of joint attention included eye gaze, verbalization, and gestures during interactions between the child participants and this researcher. Instruments were used to tally, count, and record observations of the target behaviors. The following technology were used to facilitate collection of the quantitative data; digital recording equipment, tablets and laptops, and speech/video software. All sessions were digitally recorded using a Canon PowerShot Digital Elph camera with a tabletop tripod to record the sessions without the intervention. The sessions were recorded to allow focused interaction between the teacher-researcher and child. Recording the data of the target behaviors occurred during the viewing of the recorded observation not during the session. Recording the session also allowed multiple observers to collect data for obtaining inter observer agreement. Each session was then transferred to an Apple

MacBook Pro laptop for later observation. During the intervention stage of the study the child participants used Visual Land Prestige 7 Connect tablets and the researcher used a MacBook Pro laptop computer. Both of these devices had wireless Internet capacity, necessary for using the Skype software interface. The researcher and children used either a personal headphone set or an auxiliary speaker attached to the tablet or laptop computer. Barbara preferred to use a personal headphone and Karl preferred to use an auxiliary speaker. The researcher used an auxiliary speaker during the study. Microphones were embedded in both devices and were sufficient for use during the study. Ecamm, a call recorder program for recording Skype video calls was used to record the sessions with the intervention.

Skype was chosen because of its availability to be used on numerous devices including the Visual Land tablets and Apple computer. It also had the capacity to work with ecamm, a call recording program that was used during the intervention.

Direct observational recording (Gast, 2010) was used to tally specific number of behaviors that occurred during an activity session (see Appendix E). A summary sheet (Appendix F) was used to create line graphs to determine if the intervention increased incidents of eye gaze, verbalizations, and gestures as a result of video calling.

#### **Data collection, parent participants.**

Parents filled out a survey about communication behaviors with their child at the beginning of the research, prior to the interviews and again at the end of the study (Appendix A). The responses were rated on a scale of 1 to 6 (1 = never, 2 = very rarely, 3 = rarely, 4 = occasionally, 5 = very frequently, 6 = always) by the mothers to rate how

often the behaviors occur when communicating with her child. The behaviors survey included eye gaze, verbalization and gestures.

**Target behaviors defined.**

This researcher used the following operational definitions of the target behaviors in this study.

Eye gaze	Child makes shared eye contact with another person. Child looks at the other's face or eyes. Each eye gaze was recorded when eye gaze was connected and then withdrawn. Multiple eye gazes were recorded when the gaze was withdrawn and connected in quick succession.
Gestures	Purposeful change in body movements such as nod of head, smiling, grimacing, looking away, pointing, touching, hugging, kissing, jumping, kicking, clapping, moving away or closer. Each gesture was recorded when action of gesture was complete.
Verbalization	Purposeful utterance of words or sounds such as recognizable words, utterances, heavy breathing, sighing, screaming, singing, laughing, or crying. Each verbalization was recorded when vocalization began. A new vocalization was recorded if 5 seconds of no

vocalization occurred. A verbal response was recorded even if it was an incorrect response.

**Response** Any eye gaze, gesture or verbalization that occurred in response to or after the researcher's words or actions.

**Interaction** Any eye gaze, gesture or verbalization that the child begins in an effort to engage with the researcher.

**Joint attention activities defined.**

Three activity sessions were used throughout the research study. The three activities were playing games, reading word cards and a discussion. These activities are described as follows.

The game activity consisted of playing one of two games; Dominoes and compare with number cards. When playing Dominoes the players took turns turning over a domino tile and matching it to a number that was already played. If a match was not made, the player missed a turn. The game is played until all the tiles are used. Compare is a card game played with a deck of cards, numbers one through ten. Each player is dealt an equal number of cards. Both players show the top card in their pile. The player with the higher number keeps the cards. The game is played until all cards are gone. These games were chosen for their interactive reciprocal turn taking but did not necessarily require vocalization. For each game session the child was called to the table and they chose a game to play with the researcher. These sessions took place in close

proximity to the researcher, approximately three feet apart during both the baseline and intervention sessions. The game would begin with the researcher prompting turn taking for the first two turns and then did not prompt for the remainder of the game. The session ended when the game was completed.

The reading card activity consisted of reading word cards or number cards. The word and number cards consisted of mastered words and numbers for each child. There were approximately 20 cards used in each session. The child picked a card and read it to the researcher or the researcher would hold up a card and the child read the card. During the baseline sessions the activity was conducted in close proximity, 3 feet apart at the same table. During the video calling intervention sessions the activity took place approximately fifteen feet apart with the child and researcher facing away from each other in the same room.

The discussion activity consisted talking with the child. The researcher used a list of pre-determined questions to ask each child (Appendix G). The questions were mostly literal questions asking about the activities the child had taken part in or routine questions such as "What is the weather today". During the baseline activity sessions the researcher and child were approximately three feet apart sitting at a table. During the video calling intervention activity sessions the child and researcher were approximately fifteen feet apart facing away from each other but in the same room. The child and researcher could not see each other without using the intervention.

### **Multiple observers.**

During the data collection stage of the study this researcher used multiple observers in order to present a more reliable measurement of each of the target behaviors. Gast (2010) describes reliability of measurement in terms of accuracy. If multiple observers obtain 80 percent or higher accuracy in tallying observable behaviors it is considered to be reliable data. In this study data collection of the observable behaviors consisted of counting observable behaviors that were digitally recorded; therefore, there was little question of the agreement between the two observers occurring by chance. An educational professional was selected that was familiar with children with autism in order to understand the target behaviors studied in this research. This educational professional was a special education teacher that had experience in observing students as well as collecting data on student behaviors. The training session consisted of instruction on identifying the target behaviors and their operational definitions. This researcher and the educational professional watched a number of digitally recorded observations together. The target behaviors were discussed as they appeared in the recording. After this researcher was confident that the educational professional was able to identify each of the defined target behaviors, the educational professional observed multiple sessions using the even recording protocol. The purpose for using an inter observer in this study was to increase confidence in the findings (Gast, 2010). This researcher and the educational professional viewed the same digitally recorded sessions separately and recorded the target behaviors using the event recording protocol. Sessions used for the reliability observer were randomly selected. Inter observer agreement was collected for 20% of each of the target behaviors for the two participants. The target behaviors were totaled



for each observer and agreement was obtained by using the following calculation (Gast, 2010). Using the frequencies tallied for each observer during the same observation session, the smaller frequency number is divided by the larger frequency number and the new number is multiplied by 100 yielding a total percent agreement. For example: observing eye gaze during a session, observer A marked 18 tally's, observer B marked 20 tally's. Eighteen is divided by 20 resulting in .9 multiplied by 100 yielding 90% agreement. The following agreements for reliability were obtained from primary and a reliability observer observing the same digitally recorded session and are a combined average of the agreement obtained; eye gaze, 84%, verbalization, 87%, and gestures, 89%. This researcher did not use a more rigorous measure of inter observer agreement of Cohen's Kappa (Wood, 2007) as the sample size was very small involving only two participants.

### **Procedures.**

Prior to beginning the ABA withdrawal model (Gast, 2010) this researcher conducted lessons with the participants in order to acclimate them to the tools and activities used in this research. Each of the activities, games, reading cards and discussion were performed three times prior to collecting data in order to familiarize the child with the procedures. The digital camera was used at least two times prior to the activity sessions and data collection in order to desensitize the participants to its use. The digital camera was placed by the observer and recorded the behaviors of the participant during the session. Introduction to the tablet was conducted after the baseline data was collected. Explicit instruction was provided for using the tablet and speaker during the

intervention. Two sessions were conducted with the child before data collection began, one session using the game activity and one using the reading card activity. The tablet was set up before the participant arrived and the participant was brought to the table with the Skype software loaded. The researcher called the participant via Skype and the participant responded by touching the green phone, thus activating the screen. For the activities that were in close proximity the child used an exterior speaker attached to the tablet. The activities that were conducted fifteen feet apart used headphones in place of the speakers.

The activities took place in the child's classroom during the school day. The classroom was set up with tables for small group instruction. The activities took place at one of these tables with the researcher. Instruction was often going on in other parts of the classroom or at other small group tables. The child was called to the table by the teacher/researcher and the activity began.

Following the model for ABA withdrawal design (Gast, 2010) this researcher began the first sessions of games with each participant. Using the digital camera to record the behaviors the games session was repeated four times to establish a baseline. The duration of the game activity sessions ranged from 4:24 minutes to 6:57 minutes. Four sessions were repeated for each of the word card and discussion activities. The duration of the reading/work activity observations ranged from 2:24 minutes to 5:17 minutes and the duration of the discussion activity observations ranged from 1:19 minutes to 2:01 minutes. The data collection occurred over a period of six weeks for a total of twenty four sessions of approximately 82 minutes observed by the researcher. The secondary observer observed four sessions for approximately 16 minutes.

The intervention was then introduced and two practice sessions were conducted using the tools. After the researcher felt comfortable that the child was able to properly use the tools, the game activity sessions began. Each session was recorded digitally using Ecamm to observe at a later time for target behaviors. Four sessions of each of the games, reading card and discussion activities were recorded. The duration of the game activity sessions ranged from 4:02 minutes to 8:04 minutes. Four sessions were repeated for each of the word card and discussion activities. The duration of the reading/work activity observations ranged from 3:28 minutes to 5:35 minutes and the duration of the discussion activity observations ranged from 1:50 minutes to 3:27 minutes. The data collection occurred over a period of four weeks for a total of twenty four sessions of approximately 102 minutes observed by the researcher. The secondary observer observed five sessions for approximately 20 minutes.

The withdrawal portion of the design was conducted three weeks after the intervention portion was completed. Each activity was repeated four times and was digitally recorded for later observation. The duration of the game activity sessions ranged from 3:25 minutes to 6:18 minutes. The duration of the reading/work activity observations ranged from 1:39 minutes to 3:45 minutes and the duration of the discussion activity observations ranged from 1:13 minutes to 2:01 minutes. The data collection occurred over a period of two weeks for a total of twenty four sessions of approximately 72 minutes observed by the researcher. The secondary observer observed four sessions for approximately 14 minutes.

A direct observational data recording system was used in this research study (Gast, 2010). The behaviors were observed and quantified as they occurred. Event

recording was used to measure the frequency of the target behaviors eye gaze, verbalization and gestures used by the child during the activity sessions (Appendix E). Event recording is a process of placing a mark on a recording sheet each time the target behavior is observed (Gast, 2010). Each of these behaviors was determined to either be a response to a verbal stimuli or an initiation by the child during the activity. The researcher viewed each digitally recorded session two times. The first viewing was to observe behaviors without recording. The second viewing the researcher used an event recording sheet to record the target behaviors as they occurred. As the target behaviors were observed as defined by the operational definitions, tally marks were systematically recorded using an event recording sheet (Appendix E). The start and stop times were recorded for each session. A final summary recording protocol was used to compute the standard measure of rate for each target behaviors to use for graphing the data for analysis (Appendix F). The standard measure of rate was computed by taking the number of target behavior counts and dividing it by the number of minutes of the session observed (Gast, 2010). The results were recorded to the hundredths position and were not rounded.

#### **Data analysis, child participants.**

This researcher conducted independent analysis of the target behaviors and the video calling intervention as well as the relationship of the three different activities used in the study. The quantitative data of this research study was presented in the form of simple line graphs constructed in Microsoft Excel. Gast (2010) suggests using graphs that display data points and paths with clear separate conditions, baseline, intervention

and return to baseline. In order to avoid confusion each graph shows one target behavior as either a response or initiation. Each graph displayed four data points and the path of the target behaviors or type of interaction in each experimental condition. Each behavior was computed into a standard measure of rate and recorded on the summary sheet (Gast, 2010). The ABA withdrawal research design by Gast (2010) called for a three-step process that included baseline data, intervention data and baseline data after the intervention. Each of these graphs includes these three conditions as well as the path of each behavior. The data is organized and presented for each participant separately.

Tables were also used for further analysis of the conditions to determine if the intervention influenced the target behavior. Visual analysis of the target behaviors included determining the median of each behavior, the condition level for each behavior, calculating the relative level of change and determining the percentage of non-overlapping data (PND) (Gast, 2010). The median of each target behavior was calculated by placing the calculated standard measures of rate in order. Given an even number of measures, this researcher took the two middle measures, added them together and divided by two to find the median. The median is considered a more accurate number than the mean as measures that are extreme are not factored into the median (Gast, 2010).

The relative level of change provided the researcher with an indication of the direction and gross measure of the change of behavior (Gast, 2010). This was calculated by identifying median data points in the two conditions and by subtracting the smaller number from the larger number. Positive or negative change was determined by the direction of number relationships.

Percentage of non-overlapping data (PND) refers to the percentage of non-overlapping data for each behavior (Gast, 2010). To calculate the PND this researcher followed Gast's (2010) steps; (a) find the range of data values in the first condition, (b) count the number of data points in the second condition, (c) count the number of data points of the second condition that fall outside the range of values in the first condition, (d) divide the number of data points that fall outside the range of the first condition by the total number of data points in the second condition and (e) multiply by 100. Calculating the PND for the baseline and intervention conditions gave the researcher the percentage of the impact the intervention has on the behavior being measured. The larger the PND, the more likely the intervention has impact on the target behavior.

#### **Data analysis, parent participants.**

Analysis of the parent survey was conducted to see if their perspectives of communication with their child changed during the course of the study. A bar graph (Gast, 2010) was used to show the pre and post data responses. The results of the survey were considered with the results of the interviews and researchers notes to analyze parent's perceptions and develop themes.

#### **Validity and credibility.**

Gast (2010) discusses validity when analyzing behaviors in single subject research. The type of design can have a significant influence on the validity and credibility of a study. Gast reports that an ABA design is more desirable than an AB design in that it not only determines the effect of the intervention but also considers a

withdrawal of the intervention to observe change in behaviors again. A demonstration of behaviors returning to beginning baseline levels when the intervention is withdrawn bring greater strength to the study. This researcher chose the ABA design for just this reason. It is also important to minimize internal threats to validity such as "history" effects on the behavior (Creswell, 2009). History refers to the participant learning the behavior during the period of intervention and continuing it after withdrawal of the intervention (Creswell, 2009). When this occurs it is difficult to say if the intervention had true impact on the behaviors of the participant. According to Gast (2010) if after withdrawal of the intervention the trend direction approaches a similar one as in the initial baseline the argument is strengthened that the intervention had an impact on the behavior. The participants were orientated to the devices and activities prior to beginning the study. The return to baseline is critical in determining change in behavior. This type of internal validity threat can be minimized by using the same treatment with multiple participants. This researcher used two participants during the study in order to observe the intervention in more than one child.

This researcher also used interobserver agreement to establish greater reliability of the behaviors being observed. Interobserver scores for each of the three target behaviors were above 80%, an acceptable level in research. This high level of agreement is also attributed to operational definitions of the target behaviors. It is important that the behaviors used during observation are defined in detail for accurate recording. Recording of the observations also provided repeated viewings if there were questions about recording behaviors during observations.

Tawney and Gast (1984) discuss internal and external validity when conducting research in an educational environment. Internal validity refers to determining if the intervention is truly the factor responsible for the change in behavior. Analyzing the data by level of change and percentage of non-overlapping data helped this researcher review the data in a more valid manner. When first inspecting the line graphs, change appeared likely. However, this researcher wanted to bring greater validity to the study by using Gast's (2010) visual inspection techniques. When these techniques were applied to the data a more accurate picture was represented between the baseline and intervention conditions. This allows those that read this study to judge for themselves whether the intervention used has merit for replication or implementation.

A final note concerning external validity threats to this study include generalization. Due to the small participant size of two, this study is not generalizable to other populations, children or groups of children (Creswell, 2009). In order for the results to be generalized this researcher would have to conduct additional experiments with groups of children with different characteristics than those selected for this study. The purpose of this study was to confirm if video calling had an impact on joint attention behaviors of eye gaze, verbalizations and gestures. The findings of this study are representative of these participants and cannot be applied to other children.

## **Research Methods - Qualitative**

### **Researchers role.**

This researcher's educational background includes certification in the state of Connecticut for elementary and special education teaching. This researcher has been a



teacher for seventeen years, five of which were in special education. Knowledge of the participants' disability was constructed through experience with teaching students with autism and through study of best teaching practices. Through these educational experiences and review of the literature this researcher is knowledgeable on the topic of language development in non-verbal children with autism. This researcher has also been the teacher in the classroom with the child participants for the past two years. The qualitative interviews of this research focused on the parents of the child participants. This researcher has had a collaborative relationship with the parents for at least two years while their children were in the researcher's classroom. This researcher has conducted a different action research pilot study with one of the students and parent prior to this research and has a relationship with the parent that fosters trust, hope and understanding.

This researcher disclosed these relationships in order for the audience to be aware that these relationships may bring some bias to the interpretation and analysis of the narrative portion of this research. This researcher describes the relationship between the parents and researcher as trusting, understanding, and very positive. The parents often shared with the teacher/researcher that they were very happy with the program their child participates in and the progress their children were making. The teacher/researcher also had a mutually respectful opinion of the parents and their role in raising a child with autism. The parents volunteered to participate in this research with their child with hope that it may lead to a more communicative relationship with their child.

### **The parent participants.**

Karl's family consists of an older brother in high school, a mother and a father. Karl's mother is the main caregiver of the family and participates in all educational decisions and activities involving Karl and his brother. Karl's father lives outside of his child's home and participates in leisure activities on the weekends with Karl and his brother. Karl's extended family is very involved with him, visiting often and helping in a caregiver role. Karl's mother regularly volunteers to help in the classrooms of her sons and has a positive outlook for Karl's educational experiences in the public school. She has a thorough understanding of autism and how her child is affected by this disability. She has implemented numerous interventions in her home to help her child succeed as well as provided outside services for him. She has been an advocate for her child since he was diagnosed with autism at the age of two.

Barbara's family consists of an older brother in middle school and a mother and father. Both parents work full time and a nanny supports the family with childcare during times they are working. Barbara's mother works in a neighboring town during the week and Barbara's father works from home and travels a significant amount of time. Barbara's mother takes on the main caregiver role with support from the father when he is home. Barbara's extended family is very involved with her life and visit often for special occasions as well as sharing vacation times. Both parents take an active role in Barbara's education attending conferences and meetings with Barbara's school team. Barbara's family enrolls in many activities outside of the home on the weekends. Barbara's parents have been advocates for her since she was diagnosed with autism. She has been

receiving educational support since the age of three and the parents have solicited outside support and evaluations to better help them meet Barbara's specialized needs.

### **Data collection and recording procedures.**

Data collection occurred during a six-month period beginning in November 2013 and continuing through April 2014. The qualitative data was collected at the parents' homes in the form of open ended questionnaires and interviews. An interview was conducted prior to the beginning of the quantitative component and an interview with questionnaire was conducted at the close of the research. During the study the parents participated in using the intervention device at home and kept notes while using the device with their child. In order to provide consistency through out this study prior to any data collection the target behaviors studied in this research and their operational definitions were shared and discussed with the parents. The parents understood the definitions of each of the target behaviors and could provide specific examples of each.

Interviews were used during the research to collect personal experiences about communication between the child and parent. Both interviews were conducted one to one with the researcher asking questions and recording the parent responses (Creswell, 2012). This researcher developed an interview protocol for conducting the interviews (Appendix B). The interview questions were semi-structured and designed to elicit rich narratives for analyzing. Probes (Creswell, 2012) were used to gain additional information on a particular response. The initial interview was conducted in the parents' homes and the final interview was conducted via Skype with the researcher and parent in

their respective homes. All interviews were digitally recorded for later transcription and analysis.

A post intervention questionnaire for the parents was developed and administered at the end of the research to gather more information about communicating with their child (Appendix C). The questionnaire was filled out at home and returned with the child to the teacher/researcher.

Notes were also collected from the parents during the research. These notes pertained to the use of video calling with their child in their home. Each parent had a set of tablets with the Skype video calling software to use with their child. Training took place in the parent's homes to learn how to use the devices and become familiar with the target behaviors of joint attention. A description of the target behavior definitions as well as instructions for using the tablet and video calling was left with each parent. Parents used data collection sheets to record their experiences with their child using video calling. These notes were shared with the researcher in the data collection and analysis process.

### **Data analysis.**

Analysis of the qualitative data involved truthfully representing the data and making meaning of the data (Creswell, 2009). This inductive process began with specifics details with a move to a more general understanding of the participants meaning as it was portrayed through the data. This researcher used Creswell's (2009) inquiry design that includes (a) organizing and preparing the data, (b) reading all the data, (c) coding the emergent ideas, (d) generating descriptions as themes, (e) presenting the data in narrative form and (f) interpreting the data.

This researcher organized each of the data components; interviews, questionnaires and notes. Each parents' data was viewed separately for interpretation during this process. This researcher transcribed the interviews from each parent. This researcher then read through all of the data (Creswell, 2009) to begin the process of analyzing.

The coding process began with the transcribed interviews. This researcher made notations as she read and began to form some general codes from the text. A secondary reader was also used during the analysis process of generating codes and themes (Maxwell, 2013). This educational professional was an assistant superintendent and also a doctoral student at the same institution as the researcher. The same instructor trained her in coding narrative interviews and theme generation. After being given an overview of the study and research questions, the secondary reader was given the transcribed interview and asked to code it. The following table illustrates the codes generated by each reader and the themes used in the analysis.

Table 1

*Interview Codes*

Researcher codes	Final themes	Secondary reader codes
surprise	surprise/joy	relationships
joy		communication
frustration	frustration/anxiety	relationships
anxiety		communication

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routines		transition
change	hope/benefit	growth
engaged		inquiry
connected	engaged/focused	

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The codes were then analyzed for similarities and possible groupings as well as relationships. In order to organize and generate themes from the codes, the researcher looked at the parents quotes that were associated with the codes. When analyzing and comparing the parents quotes to the researcher and secondary readers' codes, many similarities. The secondary reader grouped the themes by topics and the primary reader grouped the themes by substantive categories (Maxwell, 2013). This researcher was able to use the supporting narrative from both readers' codes to find similarities that supported the primary theme generation process. For example the following quote was selected by both readers. "If I don't understand what she is saying she gets really frustrated and starts to cry, it breaks my heart". This quote was labeled as frustrated by the researcher and as relationship by the secondary reader. The codes and themes used in this process were those that emerged from the data, not predetermined codes (Creswell, 2009).

The final step of analysis and interpretation of the qualitative data was to present the narrative data in a table format that is easily understood by the reader. Discussion on the meaning of this data follows in the results chapter.

### **Validity and credibility.**

Credibility in qualitative research is established during the process of data collection. It focuses on the relationship between the researcher and the participants and the processes the researcher takes to construct knowledge from the data. Creswell (2009) defines validity in qualitative research as checks for accuracy of the findings by using certain procedures and reliability in qualitative research as the researchers conducts the study. This researcher used multiple means of validity and credibility including researcher bias, rich descriptions, data triangulation, and a secondary reader (Creswell, 2009; Maxwell, 2013; Patton, 1999).

One important process for researchers to go through is researcher bias. As a researcher/teacher working in an elementary school in which the research is being conducted, this researcher had to be very careful of her role in the study. Maxwell (2013) does not say that we can't do research in our own environment, rather he states that by bringing this to light, the reader of the findings will be better able to understand the study. Understanding the power positions that may be evident when interviewing and working with my participants is very important. During the study this teacher-researcher became more aware of that relationship with the participants' mothers. The parents had positive experiences involving their children had a high level of trust with the researcher. It was also important to note that this teacher-researcher had been working with these participants for a number of years in the classroom. This researcher's experience as a teacher of students with autism brought knowledge about language and communication development to the study that was necessary in order to conduct this study.

This researcher intended to bring greater credibility to the study through the use of rich narratives (Creswell, 2009, Maxwell 2013). Narrative experiences helped to define the adults' perceptions of change in communication. This researcher/teacher used actual quotes from the narrative to support the analysis and discussion of the themes. The initial and final interviews were transcribed verbatim rather than taking notes. These practices make this data and study much more credible.

This researcher used data triangulation in this study. Denzin (2012) discusses data triangulation as encompassing the use of multiple sources for validity and clarification in presenting information in a study. This study collected narrative through interview transcriptions, questionnaires and participant notes in order to bring greater understanding and validity to the study (Flick, Garms, Hermmann, Kuck, & Rohnsen, 2012). This researcher used Denzin's (2012) premise that mixing, collecting and analyzing data to understand a research problem is a very true and good use of triangulation. This process was used in analysis of the qualitative data.

This researcher used a secondary reader to code the initial interview transcripts to increase credibility of the theme generation. The secondary reader was an educational professional who was trained to code at the same institution by the same instructor as the researcher. The transcribed interview was given to the secondary reader for coding. The secondary reader's themes were compared and analyzed with this researcher's themes to look for similarities and differences. The narrative that supported the themes was compared to the narrative and themes of the primary reader. By analyzing the narrative between both readers this researcher generated the four themes used in this study.



Another important part of conducting a reliable study is being knowledgeable in the area of research. Patton (1999) discusses the credibility of the researcher. This researcher had multiple graduate level research classes on how to conduct interviews and how to code data as well as how to distinguish between qualitative and quantitative research. These experiences and knowledge, along with support from colleagues and dissertation committee members helped to develop the credibility of this study.

## CHAPTER IV: RESULTS

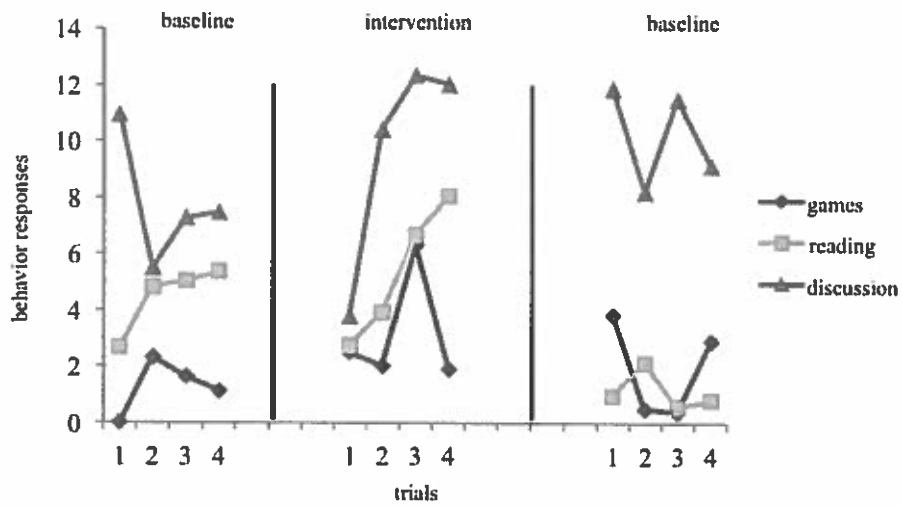
This chapter presents the results of the quantitative and qualitative data analysis for this study. The quantitative results are presented in the form of line and bar graphs that illustrate the findings from the event recording protocols (Gast, 2010) and parent surveys. The data collected was entered into Microsoft Excel worksheets and the graphs were designed using the chart function of Microsoft Excel. The behavior graphs each illustrated four data points and the path of behavior. Data for each participant was presented in two ways: by behavior and by response or initiation. The parent survey used in this study was presented in the form of a graph (Gast, 2010). The parent survey data is presented as pre and post responses to show change in perception that may or may not have occurred during the study.

The qualitative results were presented in code summary tables and in narration. The interview results were presented in the form of tables and narrative as this researcher coded the data and then generated themes as they emerge (Creswell, 2009). The questionnaire and parent notes were used as supporting data for the themes generated by the researcher.

### **Results - Quantitative**

The following data results were compiled from the summary sheets of the event recording protocols used during the observations. Each of these graphs shows a baseline condition, an intervention condition and a return to a baseline condition by withdrawing the intervention. Four trials, or data points are displayed for each condition. The

responses and interactions are represented in a standard measure of rate (Gast, 2010). The standard measure of rate is calculated by taking the number of behavior counts and dividing it by the duration of the observation in minutes. The behavior responses are represented by number of occurrences of the behavior in a minute. Each graph shows the three conditions of treatment including a baseline condition, an intervention condition and a final baseline condition.



*Figure 1* Eye gaze response behaviors for participant Karl. Responses are displayed as number of occurrences per minute under each condition.

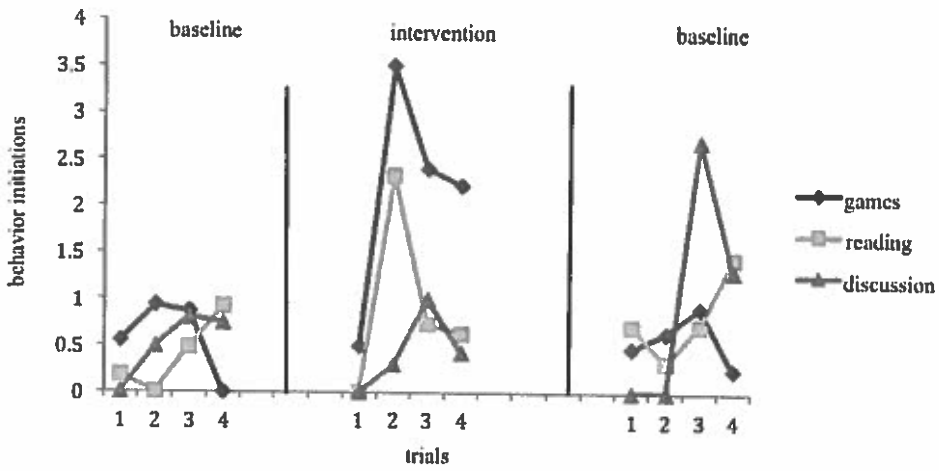


Figure 2 Eye gaze initiation behaviors for participant Karl. Initiations are displayed as number of occurrences per minute for each condition.

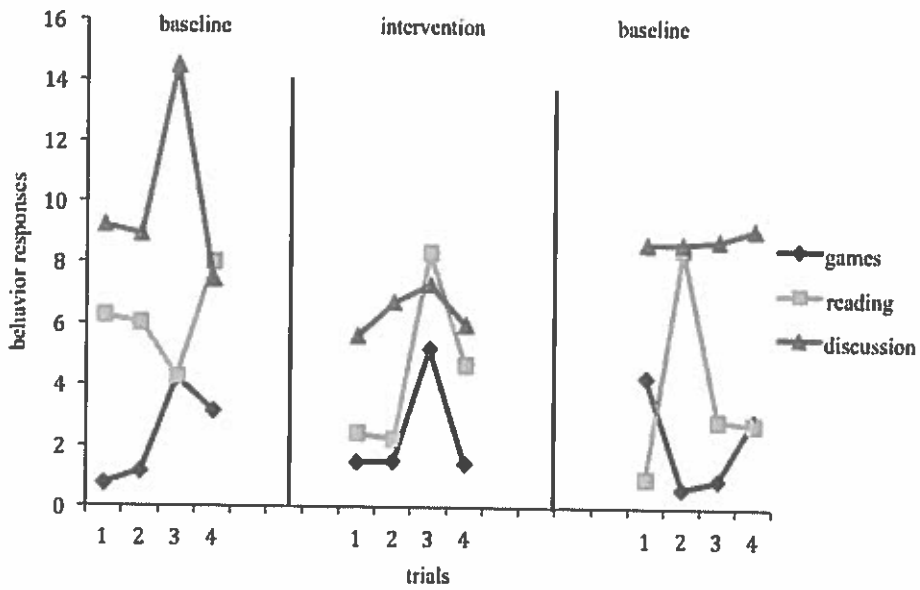


Figure 3 Verbal response behaviors are illustrated for participant Karl. Responses are displayed as number of occurrences per minute for each condition.

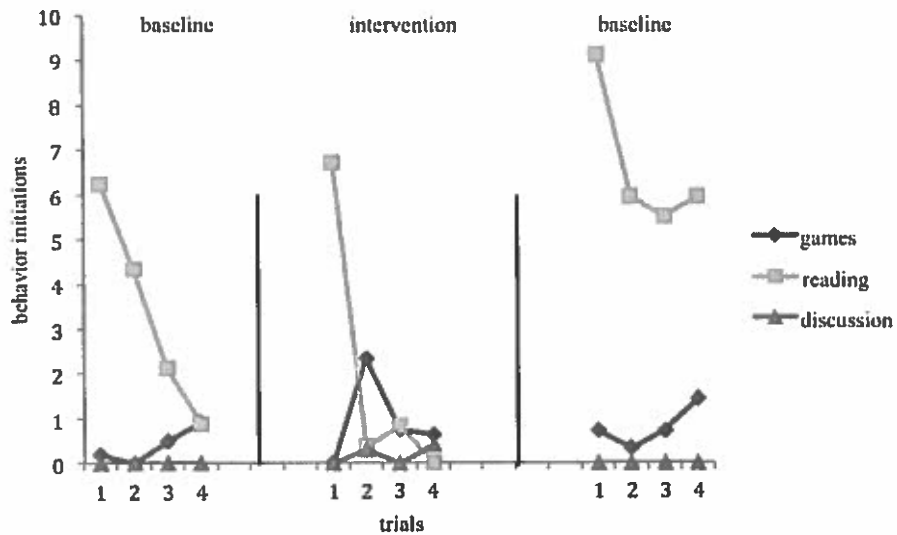


Figure 4 Verbal initiation behaviors are illustrated as a baseline condition, intervention condition and final baseline condition for participant Karl. Initiations are displayed as number of occurrences per minute.

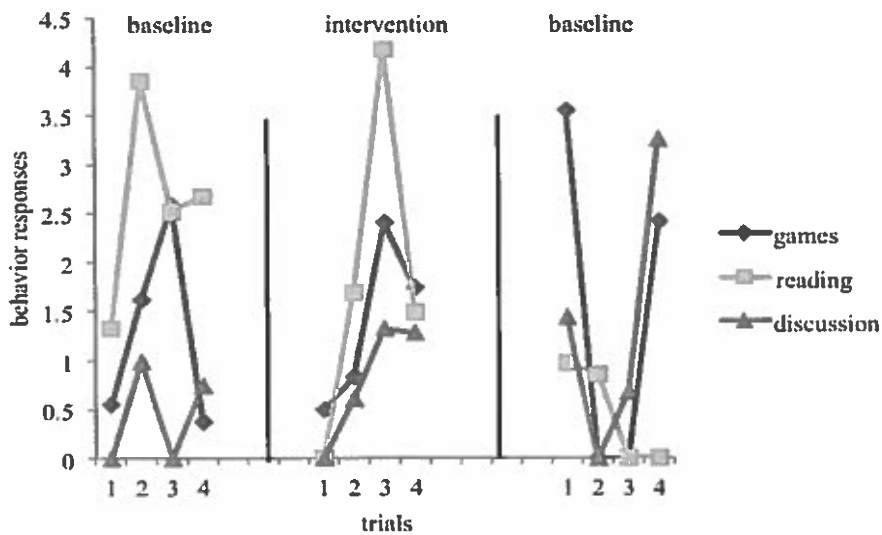
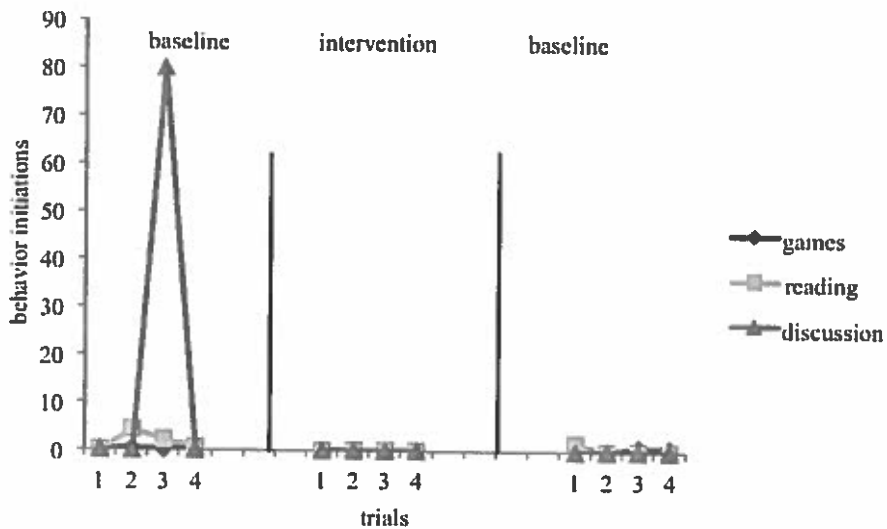


Figure 5 Gesture response behaviors are illustrated for participant Karl. Responses are displayed as number of occurrences per minute for each condition.



*Figure 6* Gesture initiation behaviors are illustrated for participant Karl. Initiations are displayed as number of occurrences per minute for each condition.

In both the reading and game activities Karl's eye gaze responses and initiations increased. During the discussion activity, both responses and initiations of eye gaze continued to increase without returning to a similar baseline condition after the intervention was removed. Karl's responses of verbal behaviors for reading and game activities remained within the same range of responses per minute in all three conditions. Verbal responses had the highest occurrence of responses per minute during the discussion activity. Initiation of verbal behaviors had little occurrence during the discussion activity but increased during the reading activity and remained high after the intervention was removed. Karl used many more gestures responses than initiations during all three activities. Positive level of change occurred during the games and discussion activities.

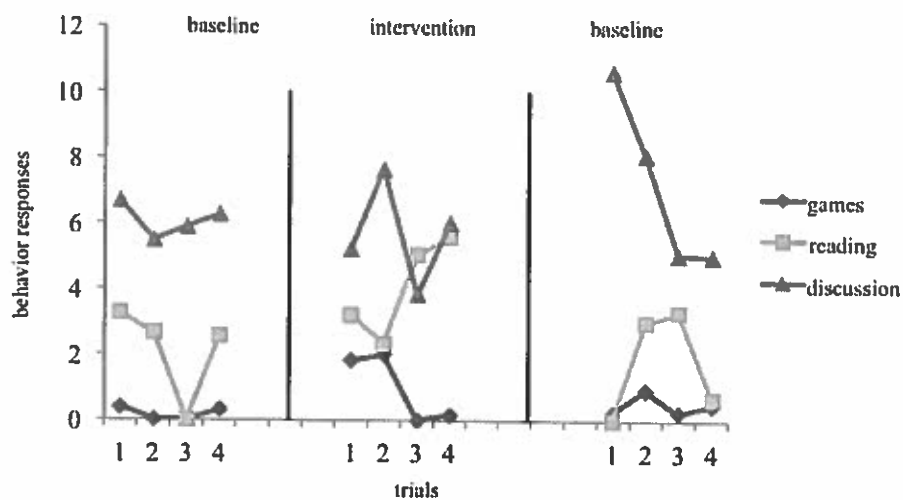


Figure 7 Eye gaze response behaviors are illustrated for participant Barbara.

Responses are displayed as number of occurrences per minute for each condition.

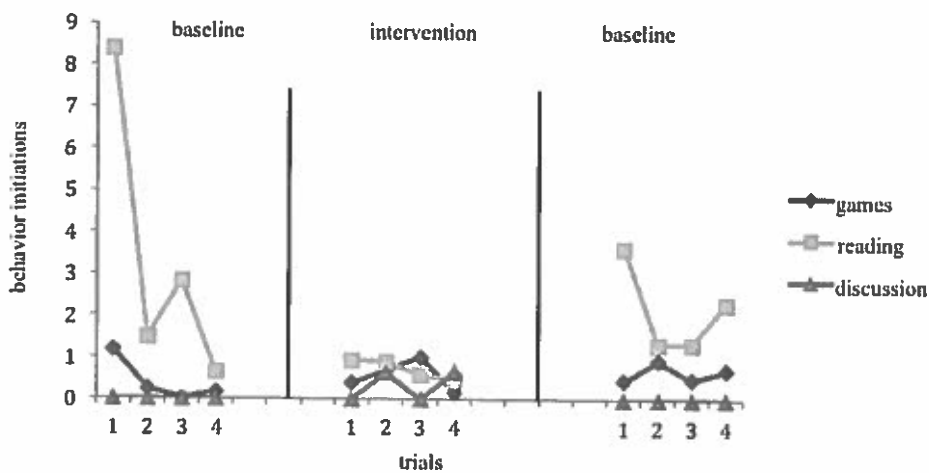


Figure 8 Eye gaze initiation behaviors are illustrated for participant Barbara. Initiations

are displayed as number of occurrences per minute for each condition.

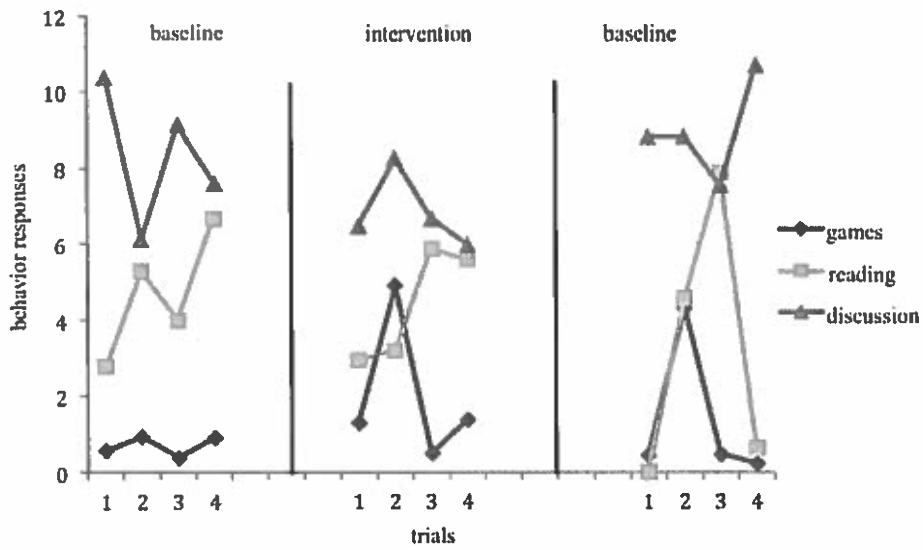


Figure 9 Verbal response behaviors are illustrated for participant Barbara. Responses are displayed as number of occurrences per minute for each condition.

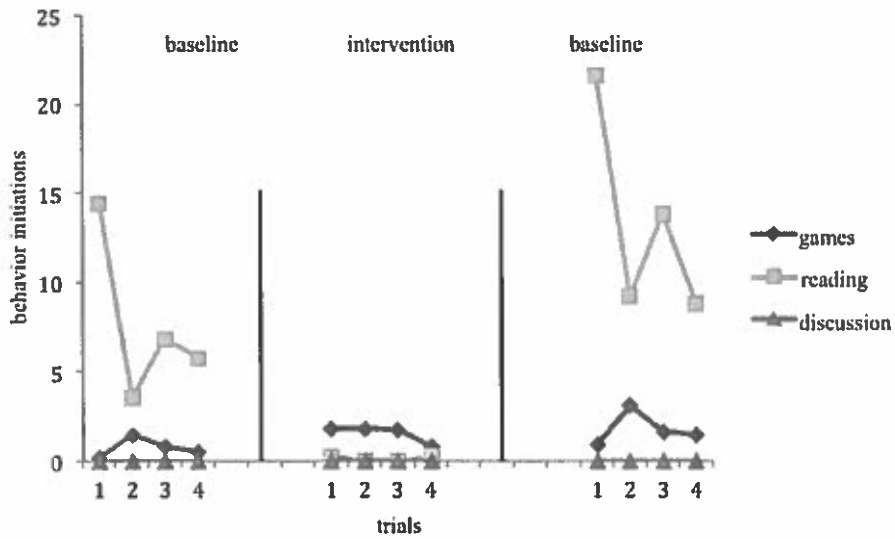


Figure 10 Verbal initiation behaviors are illustrated for participant Barbara. Initiations are displayed as number of occurrences per minute for each condition.



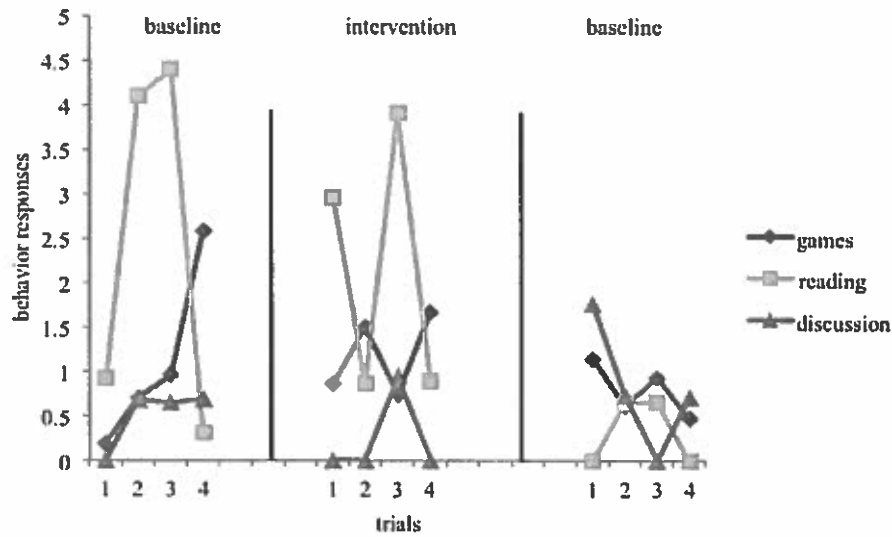


Figure 11 Gesture response behaviors are illustrated for participant Barbara. Responses are displayed as number of occurrences per minute for each condition.

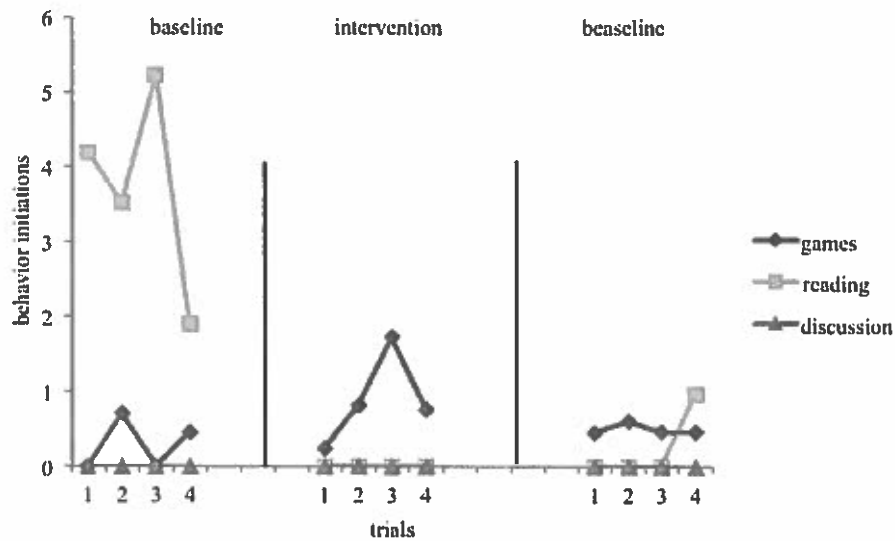


Figure 12 Gesture initiation behaviors are illustrated for participant Barbara. Initiations are displayed as number of occurrences per minute for each condition.

Barbara's eye gaze showed positive levels of change in the games and reading activities as well as the discussion activity for initiations. It is noted that when the intervention is removed that responses during discussion activity remained high and did not return to a similar baseline level. Barbara's verbal response behaviors remain similar in all three conditions for the games and reading activities with only slight changes during each condition. Verbal initiations during the reading activity actually decreased during the intervention. Gesture behaviors occurred more frequently in both responses and initiations in the games activity.

#### **Data analysis.**

The following tables illustrate the eye gaze behaviors, the verbal behaviors and the gesture behaviors for each participant including the baseline and intervention conditions. The level and direction of change for each condition and the calculated percentage of non-overlapping data (PND) for that activity and target behavior is also displayed. This researcher is only using the percentage of non-overlapping data figure of 75% or higher in order to determine impact on the behavior. Each table shows the PND and direction of the level of change for the target behavior during each activity.

Table 2

*Eye gaze behaviors, Karl*

	baseline (median)	intervention (median)	level of change	PND	baseline (median)	level of change
games responses	1.36	2.24	.88+	50%	1.68	.56-
reading responses	4.91	5.3	.38+	50%	.88	4.42-
discussion responses	7.35	11.2	3.85+	75%	10.31	.89-
games initiations	.70	2.31	1.61+	75%	.55	1.76-
reading initiations	.33	.68	.35+	25%	.71	.03+
discussion initiations	.64	.36	.28-	25%	.65	.29+

Note. PND = percentage of non-overlapping data.

Table 2 shows the level of eye gaze behavior change for Karl was positive for all activities except the discussion initiations. Using the PND calculations of 75% and greater, discussion responses and game initiations showed the greatest positive change. These behaviors had the greatest impact when using the intervention to increase eye gaze.

Table 3

*Verbal behaviors, Karl*

	baseline (median)	intervention (median)	level of change	PND	baseline (median)	level of change
games responses	2.15	1.49	.66-	25%	1.9	.41+
reading responses	6.13	3.55	2.58-	75%	2.83	.97-
discussion responses	9.09	6.37	2.72-	100%	8.73	2+
games initiations	.33	.68	.35+	25%	.71	.03+
reading initiations	3.22	.6	2.62-	100%	5.95	5.35+
discussion initiations	0	.15	.15+	50%	0	.15-

Note. PND = percentage of non-overlapping data.

Table 3 shows four activities have a PND of 75% or greater when analyzing Karl's verbal behaviors with the intervention. When combined with the level of change these behaviors showed a decrease in behaviors when the intervention was used, therefore they cannot be considered as having a positive impact on verbal behaviors when using the intervention. It can be noted that verbal behaviors were more likely to occur without using the intervention.

Table 4

*Gesture behaviors, Karl*

	baseline (median)	intervention (median)	level of change	PND	baseline (median)	level of change
games responses	1.08	1.28	.20+	0%	1.20	.08-
reading responses	2.59	1.58	1.01-	50%	.42	1.16-
discussion responses	.37	.94	.57+	50%	1.05	.11+
games initiations	.3	0	.03-	0%	.81	.81+
reading initiations	1.50	.09	7.5-	0%	0	.09-
discussion initiations	0	0	0	0%	0	0

Note. PND = percentage of non-overlapping data.

With a high of only 50% PND and little positive level of change it Table 4 shows that the intervention had little impact on Karl's gesture behaviors.

Table 5

*Eye gaze behaviors, Barbara*

	baseline (median)	intervention (median)	level of change	PND	baseline (median)	level of change
games responses	.15	.97	.82+	50%	.35	.62-
reading responses	2.59	4.11	1.52+	50%	1.8	2.31-
discussion responses	6.06	5.59	.47-	75%	6.56	.97+
games initiations	.19	.52	.33+	0%	.45	.07-
reading initiations	4.28	.71	3.57-	50%	2.29	1.58-
discussion initiations	0	.31	.31+	50%	0	.31-

Note. PND = percentage of non-overlapping data.

Barbara's responses and initiations showed some positive levels of change for reading and game responses. Discussion responses showed a 75% PND. However, a .47- level of change showed a decrease in the responses when using the intervention. Therefore the impact was negative on Barbara's eye gaze behaviors when using the intervention.

Table 6

*Verbal behaviors, Barbara*

	baseline (median)	intervention (median)	level of change	PND	baseline (median)	level of change
games responses	.74	1.33	.59+	75%	.45	.88-
reading responses	4.65	4.4	.25-	0%	2.62	1.78-
discussion responses	8.39	6.59	1.8-	0%	8.19	1.6+
games initiations	.61	1.76	1.15+	75%	1.52	.24-
reading initiations	6.27	.11	6.16-	100%	11.49	11.27+
discussion initiations	0	0	0	50%	0	0

Note. PND = percentage of non-overlapping data.

Table 6 shows positive levels of change occurred in game responses and initiations. This combined with a 75% PND illustrates an impact on Barbara's verbal behaviors when using the intervention. Although reading initiations showed a 100% PND, the level of change was negative illustrating that Barbara's verbal behaviors in this condition were more likely to occur when not using the intervention.

Table 7

*Gesture behaviors, Barbara*

	baseline (median)	intervention (median)	level of change	PND	baseline (median)	level of change
games responses	.57	1.18	.61+	0%	.77	.41-
reading responses	2.52	1.92	.6-	0%	.32	1.6-
discussion responses	.66	0	.66-	25%	.72	.72+
games initiations	.22	.70	.48+	75%	.46	.24-
reading initiations	3.85	0	3.85-	100%	.48	.48+
discussion initiations	0	0	0	0%	0	0

Note. PND = percentage of non-overlapping data.

Games initiation show both a positive level of change and a PND of 75% indicating that using the intervention had an impact on Barbara's gestural behaviors. Although reading initiations showed a 100% PND, the level of change was negative indicating that during this condition gestural behaviors occurred more often when not using the intervention.

Analysis of this data was to determine if the intervention had a positive impact on the target behaviors, causing an increase of the behavior. Karl's discussion responses and games initiations showed impact on eye gaze, up to a 75 % PND. Barbara had no conditions that showed impact on eye gaze.



Verbal behavior for Karl indicated a high level of impact in three areas; reading responses, discussion responses and reading initiations. However the level of change was negative indicating that there is greater impact on Karl's verbal behavior when not using the intervention. Barbara's verbal behaviors showed a 75% PND with the games responses and initiations. These activities used with the intervention increased her verbal behavior.

The intervention had little impact on the gesture behaviors of the participants. Impact was demonstrated in only one out of the six activity conditions conducted. Barbara showed a 75% PND with games initiation.

The levels of impact of the intervention on the target behaviors were studied to determine how using the intervention in the school setting would affect the target behaviors. After analysis the results show that in some activities video calling had an impact although inconsistencies were found throughout all of the activities in all conditions. Eye gaze behaviors were the most impacted by the intervention showing the highest levels of PND measurement. Verbal and gesture behaviors were only impacted in five of the twelve activity conditions.

Overall analysis indicates the intervention does impact eye gaze, verbal and gesture behaviors in the participants in the study to various degrees. The greatest impact of the intervention on the target behaviors occurred with eye gaze in both participants. When considering not only PND but also level of positive change and return to baseline calculations, eye gaze initiation behaviors were most impacted with Karl during the games activity. The intervention also showed the greatest impact on Barbara's eye gaze response behaviors during game and reading activities when considering the PND, level

of positive change and return to baseline. Likewise the intervention had similar impact on Barbara's verbal response behaviors during the games activity. Analysis of response and initiation of joint attention behaviors was also conducted. This researcher found responses and initiations to be equally impacted during this study. The games activity produced the greatest amount of initiations during the study. This researcher concludes that the video calling intervention did impact joint attention behaviors of eye gaze, verbal and gestures as well as responses and initiations in the participants to varying degrees of impact during the games, reading and discussion activities. The greatest impact of the video calling intervention occurred with eye gaze behaviors in both participants.

#### **Parent surveys.**

The parent surveys show the mothers' perception of how they communicate with their child before the study and after the study. The parents rated each of the target behaviors observed with the child participants. Additional categories were included. The category (needs based) refers to the percentage of communication interactions that are associated with the child's needs, for example, asking for a food item. Social based communication is an interaction that is social in nature, not asking for something, rather saying "hello" or responding to "I love you". The following figures show initial and final responses to the survey by each mother.

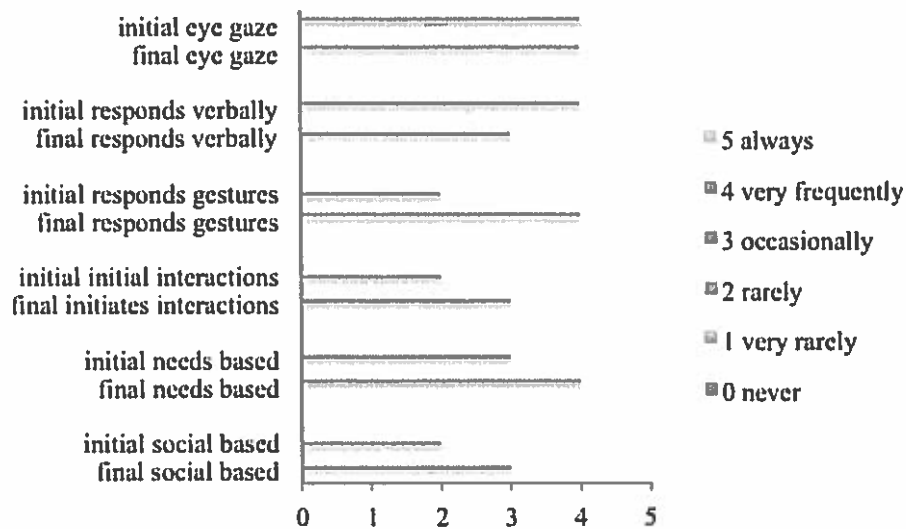


Figure 13 Survey results for Karl's mother.

Karl's mother rated Karl's eye gaze as very frequently in the initial and final rating. Her rating of verbal response was initially very frequently and occasionally at the end of the study showing a decrease in her perception. Gesture responses increased from a rating of rarely to very frequently and initiations by Karl were rated rarely initially and occasionally at the end of the study. Karl's mother rated both needs based interaction and social based interaction as increasing from the beginning of the study to the end of the study.

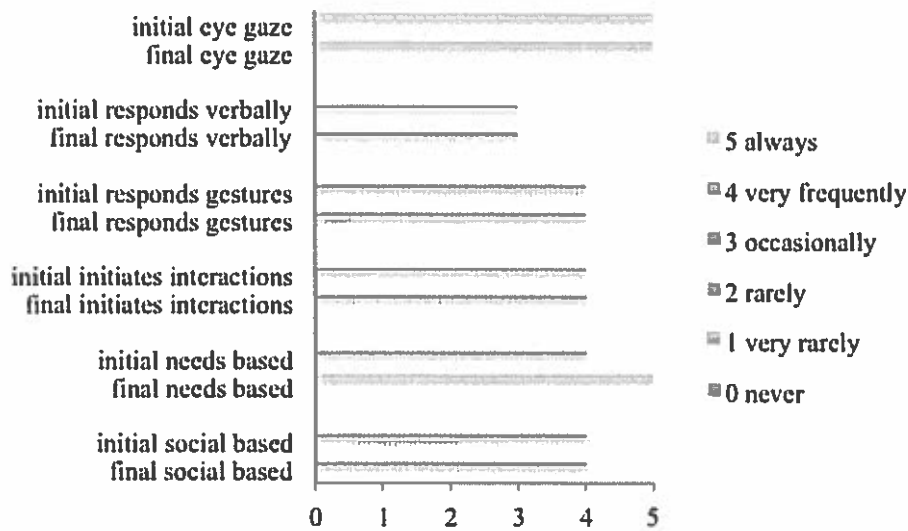


Figure 14 Survey results for Barbara's mother.

Barbara's mother rated Barbara's communication behaviors as constant from the beginning of the study to the end of the study. There was no change in her perception of Barbara's initiating interactions from the beginning of the study to the end of the study. Barbara's mother rated needs based interactions as increasing from occasional to very frequently and social based interactions as constant from the beginning of the study to the end of the study.

### Results - Qualitative

Qualitative data was collected from each participant's mother. The data consisted of an initial and final interview and mothers' notes and data collected during the study. An additional written questionnaire was completed at the end of the study in order to cross reference interview comments with written comments for greater validity. This researcher used Creswell's (2009) six-step process for making meaning of data collected.

The analysis portion included collecting and analyzing open-ended data from the parent participants. The following results were presented in tables and narrative form to help the reader understand this inductive process. The following tables show the emerging themes and narrative responses.

Table 8

*Initial interview themes for Karl's mother.*

Theme category	Supporting narrative
surprise/joy	"For the first time he went up to Santa when his name was called and he said 'Thank you Santa' and was really, really looking at him! I was so surprised!"
	"Lately he will surprise me because I was doing baking and he'll be like 'Mom, what are you doing?' I see that more and more.
	"Sometimes he surprises me. I don't have to say the things again, he does them right away."
frustration/anxiety	"It's frustrating because I know he's got a lot to say and it's frustrating that he's not able to get it out."
	"It's extremely frustrating because he does not respond and you have to ask him two or three times."
	"He's not responding so I have to ask him again. He gives you a one word answer."

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hope/benefit

"But I am excited about his future. I feel all the frustration is worth it."

engaged/focused

"He's not responding so I have to ask him again."

"It takes 30 seconds to a minute for him to decide what he wants for breakfast."

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An integral part of this study was to examine the perspectives of the parents when communicating with their child using video calling. Table 8 shows Karl's mothers' perspectives prior to the study intervention beginning. She has experienced both surprise and frustration when communicating with her son. Although routine experiences are most comfortable for Karl, interactions involving waiting for responses from Karl when he is given choices throughout the day continue. When he does communicate verbally he uses mostly single word answers. Having visuals helps Karl communicate but can also restrict his choices throughout the day when something new is introduced.

Table 9

*Final interview themes for Karl's mother.*

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Theme category	Supporting narrative
surprise/joy	"I saw positive things with him."

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frustration/anxiety	<p>"50% of the time he will say 'we did this', 'we had art'. The other 50% it was like pulling teeth to get him to say anything.</p>
hope/benefit	<p>"I was hoping it (video calling) would be the answer to get through his brain."</p> <p>"It (video calling) is something to pursue further. I think Karl would benefit from it."</p> <p>"It worked in some instances but I was hoping we would come up with a different outcome."</p>
engaged/focused	<p>"He was more engaged in the conversation and it helped the task we were doing."</p> <p>"He stayed more focused than he would have without the Skype, most of the time, 80% of the time."</p> <p>"I think it might be beneficial (video calling) if it was for a specific thing, something more important."</p> <p>"I think this (video calling) would definitely engage him more now."</p>

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Table 9 showed Karl's mother's perspective after the video calling intervention has been used. Karl had been using an iPad for several years but primarily for games and Internet sites. He had occasionally used Skype to communicate with his family. Karl's mother hoped that using Skype would be something Karl would use more often as a way to interact and communicate with her. She stated: "It worked in some instances but I was hoping we would come up with a different outcome". Throughout the study, Karl did not

initiate any calls with his mother and as earlier data from the school observations show, his initiations with video calls did increase but the increases for discussion were minimal. She shares that she felt it helped him to be more engaged and stayed more focused when using Skype to communicate with her. Karl's mother felt that he was focused on the task or discussion they were having approximately 80% of the time as opposed to being distracted and not responding to interaction without using Skype.

Table 10

*Initial interview themes for Barbara's mother.*

Theme category	Supporting narrative
surprise/joy	<p>"When I get what she is saying her face lights up."</p> <p>"When she tells me a word and I get it right away, she smiles and claps her hands! She gets so happy!"</p>
frustration/anxiety	<p>"It's a little frustrating. Sometimes you try to guess every time she says something."</p> <p>"I get anxiety because if she tells me a word and I don't get it right away she's going to get mad."</p> <p>"If I got it wrong she'll repeat it again and then after the third time I start seeing frustration. She starts to cry."</p> <p>"It breaks my heart."</p>



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hope/benefit

"She's gotten a lot more patient."

engaged/focused

"She just grabs me and sits down and wants me to sit there with her while she looks through her book, that's social."

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Table 10 shows that before the study began Barbara's mother had feelings of frustration and anxiety when communicating with her daughter. She had difficulty understanding her daughter's words and was anxious about hearing her words correctly. Barbara mostly communicated with her mother using single words. Barbara's mother often used an iPad or paper and pencil to clarify what her daughter was trying to say to her. Barbara would write or draw what she was trying to communicate. In addition to the frustration there have also been moments of joy. Barbara's mother shares that "when I get what she is saying her face lights up". Frustration and anxiety are common emotions both mother and daughter experience while communicating.

Table 11

*Final interview themes for Barbara's mother.*

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Theme category	Supporting narrative
surprise/joy	"When we were doing it (video calling) it was like "wow" my mom is on a video! She liked it!"

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	"I felt like I was trying to force her to do something because I wanted to see a result and it wasn't working well. Barbara doesn't like being forced, she walks away."
frustration/anxiety	"I face time her when I'm not home and she would think that I wasn't in the house and she would be a little nervous."  "With Skype she didn't have me in front of her so it was almost like it was weird to her, it wasn't a comfortable situation."  "She would sit in her spot and we would interact, but she would know that I was in the house and so she would go find me."
hope/benefit	"Anytime she initiates anything I think it's great because it's not normal for her."  "This is the goal. I want my child to be understood."
engaged/focused	"The basic thing was the eye contact because she was engaged with me. When I was baking the cake she was so engaged in what we were doing that she didn't take her eyes off the screen or me the whole time. When I'm personally with her there is no reason for her to continually look at me because she knows I'm here."  "When I would do anything with cooking in the kitchen, she would tell me what to do next. This is one of the biggest times when she herself said something."

---

In the final interview Barbara's mother explains that her child loved being with her parents face to face. She sought them out throughout the day at home to be with them. One of the difficulties of using video calling during the study came out of Barbara's confusion of using Skype when her mother was home. Rather than looking at her mother through a tablet, Barbara looked for her in the house until she found her.

Some of the ways Barbara's mother interacted with her during the study included using her stuffed animals in animated ways to capture her attention. She also did cooking projects, one of Barbara's favorite activities.

### **Analysis - Karl's mother.**

Some of the themes that emerged during the analysis of data from Karl's mother involved the emotions that were evoked during the study. At the beginning of the study she shared both surprising moments and frustrated moments when communicating with Karl. She began the study anticipating learning a new way to communicate with her son with video calling. She was surprised by recent verbal joint behaviors from her son when he was interacting with others. When she was baking cookies she shared this experience: "I was doing baking and he'll be like 'Mom, what are you doing?' I see that more and more." Another time he walked up to Santa and said "Thank you Santa" and looked him in the eye, both rare behaviors for Karl.

Most of the time Karl's mother is frustrated because "he does not respond and you have to ask him two or three times". She knows that he has a lot to say and it's frustrating to her that he can seem to be able to get it out. At the end of the study Karl's mother was more hopeful. She shares, "It (video calling) is something to pursue further, I think Karl would benefit from it. It definitely opened my eyes to seeing that there are options and this one is a viable option because I saw such positive things with him."

Another theme of engagement and focus dealt with how Karl interacts with his mother. Prior to the study most of Karl's discussions had to do with routines. His mother shares, "When there is a normal routine the only communication is me because he'll go

and do things right away." She does have to wait for him to respond when she gives him choices. It often takes him up to 30 seconds to decide between two of the same choices for breakfast each day. The conversations are mostly mom asking questions and Karl answering with one word. Positive results for joint attention eye gaze behavior and verbal behavior increased during the study, however Karl's mother shared that she had hoped for more remarkable results that would allow her to have conversations with her son that expanded beyond her asking questions about tasks and Karl responding with one word. The joint attention behaviors targeted in this study are often considered as preliminary behaviors to gaining language in general (Charman, 2003). These developmental behaviors are necessary in order to be able to jointly attend to others and events in the environment outside of ones self (Mundy & Newell, 2008). This being said, the joint attention behaviors targeted in this study will not necessarily lead to greater language but can be vital for stages of development necessary for language to be possible.

Karl's engagement and focus to task were two themes that Karl's mother agreed had increased while using video calling. "I think this (video calling) would definitely engage him more now." He was still distracted often during the short five-minute video calling sessions but definitely more focused for a longer period of time. "Once he got used to it, it was easier to use. I felt it helped him get engaged in what we were doing." Karl's mother explains that using video calling to review the day's lessons and work from school proved to be the most effective strategy. "We would read books and talk about them. That would keep him engaged a little bit longer." In talking about having conversations with her son she shares "He was engaged a little bit longer than if I was

sitting down at the table just face to face. He stayed more focused than he would have without the Skype, most of the time, 80% of the time." Karl's mother's experiences were similar to those of the school observation sessions during the reading time activities where his eye gaze behavior increased during discussion responses and game initiations. His verbal behavior increased during reading and discussion activities as well.

During the sessions of video calling at home, Karl's mother collected data and reflected on the experience. She found it difficult to engage in the activity and also watch for specific target behaviors. She would have liked to be able to record the video sessions so that she could go back and view them more thoroughly. During the final interview she shared that many of the behaviors that were evident in the school setting were also happening at home. She had not realized that these behaviors, such as sustained eye gaze, were critical for joint attention. She was more focused on the verbal responses and particularly the verbal initiations. In talking about continued use of video calling after the study, she is interested in providing opportunities for Karl to initiate a call to her at home or from school. Karl's mother plans on continuing the use of video calling by downloading Skype onto her son's iPad. Although she finds it not too convenient to use (you have to set up the tablet, make sure wireless internet is working and then start Skype) she will try to offer opportunities for using it in the home. During the final interview she shared that because of his engagement and focus she anticipates using it to discuss important matters with him in the future and for communicating when apart.

### **Analysis - Barbara's mother.**

The theme of frustration and anxiety emerged during the data analysis of Barbara's mother was how frustrating it was to communicate with her daughter. "If I don't understand what she is saying, she gets really frustrated and starts to cry, it breaks my heart." Barbara has difficulty pronouncing all of the sounds in the words she says making it difficult to understand her, even for those who are with her all the time. For example at the beginning of the school year Barbara pronounced the word bathroom as "btoom." After months of language therapy and prompting she was able to say "batroom." Barbara's mother explains how anxiety was always present when communicating with her daughter. "I get anxiety because if she tells me a word and I don't get it right away, she's going to get mad. If I get it wrong she'll repeat it again and again and then after the third time I start seeing the frustration."

When communicating with Barbara, her mother has some strategies that she uses to help facilitate learning and success. "She doesn't use words as much so I hide a lot of things. She will know where it is and I tell her I don't know what she wants, so she'll point and then she will use her words." Most of Barbara's communication was to fulfill her needs during the day at home or at school. She would mostly gesture and say a word while looking at you until you respond. Barbara's mother describes communication at home; "She tells me a word and I repeat it back to her and she says 'yes' and gestures, that's what she wants." When communication breaks down and gestures and words don't help Barbara's mother uses an iPad or paper and pencil to help Barbara get her point across.

A theme of surprise and joy emerged from the initial interview that expressed Barbara's emotions while communicating with her daughter. When she tells her mother a word and she gets it right away, Barbara smiles and claps her hands. "Her face just lights up!" exclaimed her mother. There was also frustration on the part of Barbara too. "If I don't understand what she is saying she gets really frustrated and starts to cry" shared Barbara's mother.

During the sessions with video calling at home Barbara's mother was optimistic and hopeful but also realistic. She shared that Barbara was confused as to why they were Skyping when Mom was at home. She would become anxious thinking her mother was gone and would run through the house to find her. Using video calling was often difficult with Barbara. "With Skype she didn't have me in front of her so it was almost like it was weird to her, it wasn't a comfortable situation. It felt like I was trying to force her to do something. Sometimes she would just walk away." Over the course of a month or so Barbara's mom practiced the video calling about twice a week or more and Barbara became more comfortable with the process.

Through perseverance Barbara's mother was able to conduct successful chatting sessions with her daughter. Games proved to be the most effective for increasing joint attention behaviors at home. Playing with Barbara's stuffed animals also brought successful results. During the final interview her mother shared how she brought out Barbara's stuffed animals and while Barbara was in another room asked her the names and what kinds of animals they are. "That's how I'd start it, 'hi there penguin' so she'd sit there and go 'hi there' so that I would do it again. That was one initiation." Eye gaze increased when playing games at home as well as in the school sessions. Barbara's

mother shares her experience, "With Skype she had no other choice but to look. She was looking at me the whole time. In person it's not like that. The basic thing was the eye contact because she was engaged in what we were doing and she didn't take her eyes off the screen or me the whole time." Another time that was a successful interaction was when Barbara's mother was cooking. Barbara loved to cook and had many cooking apps on her iPad. She also watches uTube videos of cooking. Barbara's mother set up a session with her in the kitchen and Barbara in her bedroom. Barbara loved watching her mother do everything. "When I would do anything in the kitchen she would say 'water, water' or tell me what to do next. This is one of the biggest moments when she herself said something."

Barbara's mother does not believe that using video calling as a communication method is effective for at home use. She said that Barbara loves to be face to face and the tablet does not allow that type of communication. Barbara was full of hugs and stayed by her parents' side most of the time at home. When using face time with her father when he is away she would say "off, Daddy home!" The family will continue to use video calling with family relatives from time to time and would like to explore using video calling to call Barbara when she is at school.

### **Summary.**

The narrative data of both parents was reviewed to see if there were any similarities or common themes that emerged. In an analysis of the narrative data collected from both parents during the initial interview both mothers expressed feelings of frustration in communicating with their child. Karl's mother explains "It's frustrating



because I know he's got a lot to say and it's frustrating that he's not able to get it out."

Barbara's mother says that at times "it's a little frustrating, you try to guess every time she says something." Although the two children were different in their communication development, Karl can pronounce things properly but does not voice them, Barbara speaks words but they cannot be understood, the feelings of frustration were a common theme the mothers shared.

The two mothers were persistent in communicating with their child even though it was frustrating and difficult. Each mother had developed strategies for communicating that fit the child's development level. Karl's mother gave him choices and waited sometimes a minute for Karl to make a choice. Although it might be easy to make the decision for him, she insists that he needed to be an individual and speak for himself. Barbara's mother also found strategies that help her communicate with her daughter. She often used the iPad and writing as a means for Barbara to express herself and her desires. Rather than dismissing her daughter, she persisted in finding out what her daughter might want or need.

Each mother shared experiences of extreme joy when her child made even a small step in his/her communication development. Karl's mother became so animated when retelling the story about her son and the Santa fire truck. She and her son had a circle of communication that lasted five or six rotations about the coming of the fire truck. Then when the truck came "For the first time he went up to Santa when his name was called and said 'Thank you Santa' and he was really, really looking at him. It was the first time he wanted to be there and he was engaged. I was so surprised I said to my girlfriend 'when has he ever done this?' and she said 'never'. I was like WOW! This is great!"

Barbara's mother shared a story about Barbara. Barbara's speech is difficult to understand and often her family has difficulty understanding what she is saying. On an occasion while visiting cousins Barbara asked to go to the bathroom and a cousin replied where it was. For the first time Barbara's mother did not have to be an interpreter. She shared "that little piece there made me feel so hopeful, it changed me, this is the goal that I want for my daughter, to be understood".

Another common theme was the engagement each parent experienced with his or her child when using the video calling. Both expressed increased sustained eye gaze when using the video calling with their child as opposed to no video calling. In their final interview they both shared their experiences. Karl's mother shared "He stayed engaged in the task at hand, he was engaged in the conversation." Likewise, Barbara's mother enjoyed the cooking activity with her daughter. "The basic thing was the eye contact because she was engaged with me."

A final step in Creswell's (2009) data analysis process is to make meaning of the data. This researcher wanted to look at the parents' perspectives of communicating with their non-verbal child with video calling. Karl's mother's emotional responses were initially surprise and frustration when communicating with her child. At the end of the study the responses in the interview revealed that Karl's mother had been more hopeful at the beginning of the study of behavioral changes in her child than at the end of the study. She did feel that the intervention had been worth exploring and that she and her child did benefit but that it would only be used in select circumstances, not as an everyday tool. Another observation of the results indicate that most of her interactions with her child rotated around routines and waiting for responses. Although using video calling might be

cumbersome and not easy to set up and use, it did engage Karl to a greater extent and helped him stay more focused during conversations. Karl's mother revealed that she would reserve video calling communication for times when attention and focus are important in communication. For example having a discussion about a big change in her child's life such as going to a new school for sixth grade would be a good time to use video calling. Another such discussion might be talking about safety issues when playing outside. These are examples of when communication warrants greater engagement between the parent and child.

Barbara's mother shared during the initial interview her experiences of frustration and anxiety at times when communicating with her child. She was excited to try this intervention of video calling to see if it would release some of those emotions and open up a new way of communicating with her child. She communicated primarily with her daughter through single words and gestures as well as the iPad search features and paper and pencil, whichever was most readily available. The process of using video calling with her child was uncomfortable and difficult for many of the sessions. Video calling was previously used in the home for communicating when a parent was not home. This confused Barbara greatly when she knew her mother was home. Although difficulty was experienced when using video calling, Barbara's mother was able to find some strategies for successful communication with her child. She used stuffed animals and cooking activities to engage her. These activities even helped Barbara initiate some conversation, something she rarely does. Given the right activities, Barbara's mother found the video calling to be engaging for her child.

One of the major advantages of using video calling revealed in this study was the greater engagement and focus of each child. The results share that video calling increases eye gaze and verbalization during certain activities. By using this intervention at school and at home both the teacher-researcher and parents have found new ways to connect with the children with greater engagement and focus. A disadvantage of using video calling as it was presented in this study is that it was cumbersome to use. Each situation and activity was planned and set up. Spontaneous communication did not occur during the time of the three conditions. This greatly limited joint attention behaviors being recorded spontaneously.

## CHAPTER V: CONCLUSIONS

### Discussion

This section discusses the quantitative and qualitative research questions addressed in this study, how the results found in this study related to previous studies and the themes that emerged during the process.

One of the purposes of this case study was to see what relationship exists between video calling and joint attention in nonverbal children with autism. This researcher wanted to know if there were advantages to using video calling with non-verbal students with autism and would video calling increase joint attention behaviors of eye gaze, verbalization, and gestures? Joint attention is a process by which a child communicates with a partner by alternating attention between the partner and an object. Bates (1979) discusses how joint attention first develops in a child as eye gaze with a communicating partner. It then develops into the child's eye gaze alternating between that partner and an object, usually one of desire or need. Ultimately, other joint attention behaviors of verbalization and gesture accompany the communication. Children with autism have diminished joint attention behaviors (Bakeman & Adelson, 1984), particularly eye contact with partners. Mundy et al. (1986) found that children with autism were significantly more likely to be object centered rather than person centered. Building on these theories of joint attention and object preference this researcher used an object, a tablet with video calling, to determine if eye gaze, verbalization and gestures could be increased when communicating with a partner. The results from this study indicate the greatest impact of video calling was on the joint attention behavior eye gaze.

The research question asked if there was a relationship between video calling and joint attention in non-verbal students with autism. In the results shared in this study each behavior had instances of increases with the video calling intervention. Karl had increases 75% of percentage of non-overlapping data supporting a strong impact on eye gaze in the discussion activity. Barbara had increases of 75% of non-overlapping data supporting a strong impact on verbal and gesture behaviors in the games activity. In the development of joint attention this study supports the use of video calling to increase joint attention behaviors in non-verbal children with autism for the activities used in this study.

In order to fully discuss the impact of video calling on joint attention behaviors threats to validity must be discussed. When analyzing the quantitative data it was clear that a number of the second baseline conditions did not return to a baseline after the intervention. Karl's eye gaze responses during the discussion activity remained high and did not return to baseline. His verbal initiations in the reading activity also did not return to baseline. Barbara had similar findings from her activity and behavior data. Gast (2010) describes these as threats to the validity of the findings. This researcher believes that one or two things were happening during the study. First this researcher believes that learning was taking place prior to the introduction of the intervention when the students learned to use the tablets and during the conditions. The withdrawal of the intervention did not return to baseline because behaviors had been learned earlier and during the study. The other influencing factor may be the wide range of inconsistent behaviors the children display on any given day. From experience of working with these children and other children with autism, levels of engagement in joint attention behaviors fluctuate

often depending on the child's level of arousal and their ability to regulate themselves in a classroom setting. If this researcher had more time an ABAB design could have been implemented and more participants could have been used to bring greater validity to the findings. Using the video calling intervention could have determined if the intervention was functioning or if it was simply a learned behavior.

This researcher also explored the parents' perceptions of communicating with their non-verbal child with autism when using video calling. This researcher wanted to know if using video calling as a communication method would impact the perspectives of the parents and if so, how? Multiple tools were used for the qualitative analysis including interviews, questionnaires and parent notes. Quantitative analysis of the survey used in the study illustrates the parents rating of the target behaviors at the beginning and ending of the study. Barbara's mother had no change in her perception of the target behaviors. Karl's mother showed increases in her perception of gesture behaviors and a decrease in verbal behaviors. She also rated initiating interactions as increasing. This survey comparison showed that Karl's mother experienced greater change in her perception of her child's communication with her during the study.

The interviews gave a more in depth look at the parents' perceptions and perceptual changes throughout the study. Four major themes emerged from the interviews with the parents: surprise/joy, frustration/anxiety, hope/benefit, and engaged/focused.

Both parents shared experiences of surprise and joy when communicating with their child. Karl's mother shares her experience of surprise when her child initiated conversation with Santa and Barbara's mother experiences joy when she is able to

understand her daughter's words and needs. These types of experiences shared by both parents were expressed throughout the study. In analysis of a perceptual change, this researcher did not see evidence of change over the period of the study; these experiences were intermittently shared in both initial and final interviews.

Frustration and anxiety were emotions felt by both parents when communicating with their child. Communication was time consuming for Karl's mother, as she had to wait for her child's responses and had to repeated questions often. Communication with her child was limited to routines especially concerning food. Barbara's mother shared moments of anxiety when communicating with her child. She often had a hard time understanding her child and did not want to disappoint or frustrate her child. She shared many strategies she used to help understand her daughter's requests including using paper and pencil or an iPad, and gestures although still had moments of anxiety. Analysis of this theme throughout the interviews showed that these emotions still existed but had changed. Using the video calling did not erase or minimize these emotions instead it brought them to light in a new way. Both parents expressed difficulty using the intervention with their child for activities at home. Barbara's parent shared that it was difficult for her child due to previously experienced uses of video calling. At home it had been used for communicating when a parent was away. Using the video calling confused her child and created an uncomfortable experience.

Throughout this study both parents learned a great deal about the development of their child's joint attention. Engagement and focus was a major theme that emerged from the parent interviews. Prior to this study the parents had not really considered eye gaze as part of communication. Previously these parents viewed communication primarily as



verbalization or talking back and forth. Both parents were surprised to see such an increase in eye gaze and focus while using the video calling. A circle of communication as described by Greenspan & Weider (2003) is any back and forth exchange between two people. The parents originally thought a circle of communication involved mostly verbalization. After participating in the study and learning about joint attention behaviors and communication they know that eye gaze is a central component. Barbara's mother shared in her final interview experiences during one of the cooking sessions with video calling that her daughter was looking at her the whole time and was so engaged she didn't take her eyes off of her mother. Karl's mother shared that her child stayed 80% more focused during a reading session using video calling. These revelations have significantly changed the parents and their perception of communicating with their child.

A final theme that emerged from the interviews and parent notes was hope and benefit. Both parents felt that there is hope in the future for developing more complex communication with their child. Karl's mother shared that she thinks Karl will benefit from using video calling in the future. She can imagine him using it to communicate with her when he is an adult. She also experienced disappointment in that the video calling did not bring about significant changes in communicating with her child. She had hoped it would bring her child to the next level of communication development. Barbara's mother is hopeful that her child's communication will improve over the years although she does not think that video calling will necessarily bring about these communication changes in her child. Barbara's mother definitely sees using technology as being an integral part of communication but sees her child as seeking person to person interaction rather than through a tool. Both parents definitely see video calling as a

benefit to their child's communication in many ways including talking with parents while they are away and talking with relatives. They would both like to explore using video calling from the school to home.

After analyzing the narrative data and the themes that emerged this researcher has determined that parent's perspectives have changed in many ways. The parents have experienced frustration and anxiety both with and without video calling as well as joy and surprise. The most significant change in their perceptions took place in how eye gaze can influence engagement. Their understanding of joint attention behaviors has changed how they view communication with their child. Their hope for their child's increased communication development is high and they are ready to explore ways that video calling can benefit their child.

Considering all of the data findings from this study, this researcher asks the question if video calling with a tablet is a viable means for communicating with nonverbal students with autism and did it change the parent/teachers experience of communicating with the child? The National Research Council (2001) states that communication is difficult for students with autism and schools need to include interventions and strategies to increase communication development for these students. The findings of this study show that video calling may have some impact on joint attention behaviors in nonverbal students with autism. Were the findings strong enough to evoke a change in how we use tablets in the classroom? This researcher believes that given the instructional environment a tablet can be used as a video calling device for many activities in the classroom. Communication instruction is often modeled and practiced in school environments and setting up the tablets and software will not impede

a modeling lesson. Joint attention skills continue to be an area of weakness for students with autism (Mundy & Newell, 2007) and our educational programming must continue to meet the communication needs of students with autism.

### **Limitations**

During the course of this study numerous factors were considered to have an impact on the results of this study. These included the quantitative design, sample selection, length of study, technical issues with the tools as well as activities chosen for the observation sessions and the teacher-researcher's role.

The ABA withdrawal design (Gast, 2010) used by this researcher in the school setting was chosen for its simplicity and use with small sample sizes, in this case, two purposefully selected participants. This design was also chosen in order to conduct functional analysis to determine if the intervention was responsible for changes in the joint attention behaviors. To strengthen the results the impact of change in joint attention behaviors, replication would need to be conducted with similar participants. Another way to increase the validity of this study would have been to reintroduce the intervention making it an ABAB design. The length of this study was seven months with data collection spanning 18 weeks. Due to time constraints the intervention was not conducted repeated times or extended.

This case study used an ABA research design for the target behaviors. In an ABA design the second baseline condition is supposed to strengthen the design when assessing maturational and history threats. In Figures 1 and Figure 4 the second baseline does not return to similar initial baseline levels indicating that learning occurred during the

intervention with Karl. Figures 7 and 10 show the same phenomena indicating that learning also occurred for Barbara for some behaviors in some discussion and reading activities. One of the threats to an ABA design is that the introduction and withdrawal of an intervention coincide with natural cycles of behavior cycles (Gast, 2010). Although an ABA design is preferable to an AB and allows for greater analysis of behaviors, an ABAB design would have repeated the intervention and withdrawal again and would have provided a much clearer demonstration of the intervention's impact on the target behaviors. The time constraints of this study and the school year did not make an ABAB design possible.

This researcher chose activities for this study that were readily available in the classroom and the children were familiar with. Not wanting to restrict the study to one type of interaction, this researcher selected three activities to use in this study. The results of impact on the intervention only apply to these activities that were introduced. This researcher described each activity in detail as it was performed but there may be some degree of difficulty in replicating the activities as they were presented in this study. A more detailed protocol for each activity along with digital recordings would allow for more accurate replication. A longer intervention time or repeated interventions would increase reliability of the results. The results of this study only show impact of joint attention behaviors as they were demonstrated in this study.

This teacher-researcher discussed researcher bias previously in the methods chapter. This researcher mentions it again as it is important to consider the relationship between the children participants and the researcher as well as the parent participants and the researcher. Replication with other participants or another researcher would bring

greater credibility to this study. This researcher presented these results as a preliminary exploration of an intervention tool.

The home component of using the video calling intervention included an in home training for the parents using the tablet and video calling. The joint attention target behaviors were operationally defined and presented in written form for them to refer to during the course of the study. The parents did not have much trouble operating the tablets and video calling but were not able to digitally record the video calling sessions. The video recording software that anticipated being used was not compatible with the tablets purchased for the intervention. The parents were unable to review their video sessions with their children and make accurate counts of the target joint attention behaviors. Therefore the home intervention piece was used as a description.

These limitations may have had some impact on the results of this study. This researcher is sharing these limitations in order to bring greater validity and credibility to the study.

## **Implications**

Joint attention develops in stages with eye gaze being one of the first behaviors shared with another person. That eye gaze is then transferred between a person and an object to request a desired object. Students with autism are more likely to be object centered than person centered (Philips et. al., 1995). This researcher explored using an object to increase joint attention behaviors in non-verbal children with autism. The results of this study do not conclusively show that using video calling software increases joint attention behaviors. This study would have to be conducted with multiple

intervention conditions over a period of time to determine if there was impact using a tablet. It is hoped that this study is the beginning of research that will look at using video calling and other technological advances to increase the development of joint behaviors and communication in non-verbal children with autism.

This researcher explored advancing the use of 21st century tools in the education of non-verbal students with autism. Jacobs (2010) charges educators to become active researchers using interventions in new ways to stimulate forward thinking. The results show that using video calling at home has limitations and is best used for communicating with family members not present in the home. At school, a tablet can be used in many more ways and is not as cumbersome as home use. In the school environment interaction is more planned and less spontaneous making a device for communicating easier to use. This researcher will continue to explore methods and activities that will continue to develop joint attention and communication behaviors in the school setting. Some of these are as follows:

- Video calling with typical peers in mainstream classrooms

- Peer to peer discussions in the same classroom

- Show and tell with other peers

- Setting up video calling between classroom and parent

- Skills building and practice

- Develop question and response models

At the end of this study this teacher-researcher asked the participating mothers if they would continue to use video calling with their child in the future. They both

indicated they would use it from time to time to help their child communicate with friends, relatives and themselves. Because of the inconvenience of using a tablet and setting it up, the spontaneity of communication is lost. More research should be conducted exploring other video calling methods that may be available with other more convenient devices such as cell phones. Both parents indicated that as their child reaches a more independent stage in life video calling would be a great way to communicate with their child. Here are some ways video calling can be used at home:

To communicate with parents when they are not home

To communicate with other relative members of the family

Play a puppet theatre with a sibling or parent

Put on a show for a parent or sibling

Talk with a friend/neighbor

Practice modeling requests and phrases

There were two unintended implications that came out during the course of this study. The first being the parents' perception of what communication consisted of. Both parents understood communication to be mostly verbal and some gestural. They did not realize how much eye gaze plays a part in communicating with a partner. Eye gaze is the first stage of communication in the development of joint attention behaviors (Bates, 1979). The first circle of communication between partners is exchanging eye gaze. With this new definition of communication and the added focus to this behavior both parents were surprised to learn just how much communication was occurring between themselves and their child.

The other unintended implication came from the classroom intervention sessions. While reviewing and recording the target behaviors from the activity sessions, this researcher found that Karl was in fact responding more often than thought. His responses were very soft and barely audible and were not accompanied by eye gaze so they were missed most of the time. By reviewing the digital recordings this researcher was able to replay and review responses that were first missed. This researcher realized that in the day to day bustle of an active classroom many responses and interactions are being missed. Karl often responds to inquiries without looking at the other person. Close listening is required in order to hear Karl. This revelation has changed this researchers behavior in the classroom when attending to communication with children with autism.

The results of this study may have importance for schools and school districts as well as parents with nonverbal children with autism and children with autism in general. Mundy & Newell (2007) prescribed that it is important to continue to study joint attention in students with autism. Joint attention is critical to social development in all children, particularly children with autism. Charman et. al. (1997) found that high levels of eye contact were used in social play among typically developing children. Schools should consider this when developing curriculum for students with developmental delays. Teachers can use this study to explore other ways to use iPads and tablets with children with autism. From this study this researcher learned about using a tablet with video calling. Using an object such as a tablet with video calling increases joint attention for some activities and some nonverbal children with autism. This researcher also learned that video calling increased parent and child engagement as well as their perception of how they communicate with their child. This researcher hopes that other educators and



researchers will continue to explore interventions similar to this one to increase joint attention behaviors and circles of communication in children with autism.

## References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Bakeman, R., Adamson, L. (1984). Coordinating attention to people and objects in mother-infant and peer-infant interactions. *Child Development*, 55:1278-1289.
- Bates, E. (1979). Intentions, conventions, and symbols. In: Bates E., editor. *The emergence of symbols: Cognition and communication in infancy*. New York, Academic Press.
- Bhat, A., Galloway, J., & Landa, R. (2010). Social and non-social visual attention patterns and associative learning in infants at risk for autism. *The Journal of Child Psychology and Psychiatry*, 51(9), 989-97.
- Bondy, A. S., & Frost, L. A. (1994). The Picture Exchange Communication System, *Behavior Modification*, October 25(5), 725-744.
- Bondy, A. S., & Frost, L. A. (2001). The Picture Exchange Communication System. *Focus on Autism and Other Developmental Disabilities*, 9 (3), 1-19.
- Brandon, J. (2011). Is the IPAD a 'Miracle Device' for Autism? Retrieved from [www.foxnews.com](http://www.foxnews.com)
- Bruinsma, Y., Koegel, R., Koegel, L. (2004). Joint Attention and Children with Autism: A Review of the Literature. *Mental Retardation and Developmental Disabilities Research Reviews*, 10,169-175.

- Cafiero, J. C., & Meyer, A. (2008). Your Child with Autism: When is Augmentative and Alternative communication an appropriate option? *EP Magazine*, 4, 28-30  
Retrieved from www.eparent.com
- Charman, T., Swettenham, J., Baren-Cohen, S., Cox, A., Baird, G., & Drew, A. (1997). Infants with autism: An investigation of empathy, pretend play, joint attention and imitation. *Developmental Psychology*, 33, 781-789.
- Charman, T. (2003). Why is joint attention a pivotal skill in autism? *Philosophical Transactions of the Royal Society*, 358, 315-324. doi:10.1098/rstb.2002.1199
- Creswell, J. W. (2009). *Research Design, Qualitative, Quantitative and Mixed Methods Approaches*, Sage Publications, California.
- Creswell, J. W. (2012). *Educational Research*. Pearson Education. Boston, MA
- Denzin, N. K. (2012). Triangulation 2.0. *Journal of Mixed Methods Research*, Sage 6: 80-88.
- Field, T., Nadel, J., and Ezell, S. (2011). Imitation Therapy for Young Children with Autism, *Autism Spectrum Disorders - From Genes to Environment*, Prof. Tim Williams (Ed.), ISBN: 978-953-307-558-7, InTech, DOI: 10.5772/20731
- Flick, U., Garms-Hormolova, V., Herrmann, W. J., Kuck, J., & Rohson, G. (2012). I can't prescribe something just because someone asks for it: Using Mixed Methods in the Framework of Triangulation. *Journal of Mixed Methods Research*, 2(23). doi:10.1177/1558689812437183
- Gast, D. L. (2010). *Single Subject Research Methodology in Behavioral Sciences*. New York. Routledge.

- Gordon, K., Wade, A., Pasco, G., Howlin, P., Charman, T. (2011). A Communication-Based Intervention for Nonverbal Children with Autism; What Changes? Who Benefits? *Journal of Consulting and Clinical Psychology*, 79 (4), 447-457.
- Gordon, K. (2011). A Communication-Based Intervention for Nonverbal Children with Autism; What Changes? Who Benefits? *Journal of Consulting and Clinical Psychology*, 79 (4), 447-457.
- Greenspan, S. M. D., Weider, S. Ph.D. (2006). *Engaging Autism*. Philadelphia, PA Da Capo Press
- Hammil, D. P., Pearson, N. A., & Weiderholt, J. L. (2009) Comprehensive Test of Nonverbal Intelligence, Second Edition (CTONI-2). Austin, TX: PRO ED
- Ingersoll, B. (2008). The Social Role of Imitation in Autism: Implications for the Treatment of Imitation Deficits. *Infants & Young Children*. 21 (2). 107-119.
- Jacobs, H. H. (2010). *Curriculum 21: Essential Education for a Changing World*. Alexandria, VA, ASCD
- Lapan, S, D., Quartaroli, M, T., Riemer, F, J. (2012). *Qualitative Research: An introduction to methods and designs*. San Francisco, California. Jossey-Bass
- Luyster, R., & Lord, C. (2009). Word Learning in Children with Autism Spectrum Disorders. *Developmental Psychology*. 45 (6). 1774-1786.
- Maxwell, J. A. (2013). *Qualitative Research Design, An interactive approach*. Thousand Oaks, California, Sage Publications
- Muijs, D. ( 2011). *Doing Quantitative Research in Education with SPSS*. Los Angeles, CA. Sage Publications.

- Mundy, P., & Newell, L.(2007). Attention, Joint Attention, and Social Cognition.  
*Current Directions in Psychological Science*. 16 (5). 269-274.
- 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 Psychological Psychiatry*, 27, 657-669.
- National Research Council. (2001). *Educating Children with Autism*. Committee on Educational Interventions for Children with Autism, Division of Behavioral and Social Sciences and Education. National Academy Press.
- Nunes, D., R. (2008). AAC Interventions for Autism: A Research Summary.  
*International Journal of Special Education*, 23 (2), 17-26.
- Patton, M. Q. (1999). Enhancing the Quality and Credibility of Qualitative Analysis, *Health Services Research*. 34.5. Retrieved from [www.hsr.org](http://www.hsr.org)
- Phillips, W., Gomez, J. C., Baron-Cohen, S., Laa,V., & Riviere, A. (1995). Treating people as objects, agents or subjects: How children with autism make requests. *Journal of Child Psychological Psychiatry*, 36, 1383-1398.
- Sanefuji, W., Ohgami, H. (2011). Imitative Behaviors Facilitate Communicative Gaze in Children with Autism. *Infant Mental Health Journal*, 32 (1) 134-142.
- San Ramon, G, R. (2010). How People on the Autism Spectrum Learn - A detailed Explanation. Retrieved from [autismspectrumdirectory.com](http://autismspectrumdirectory.com)
- Tawney, J, W., & Gast, D, L. (1984). *Single Subject Research in Special Education*. Columbus, Ohio, Merrill Publishing Company.

- Teddlie, C., & Tashakkori, A. (2003). *Methods and Strategies of Mixed Methods*.  
Handbook of Mixed Methods In Social and Behavioral Research. Thousand Oaks,  
California. Sage Publications.
- Teddlie, C., & Tashakkori, A. (2009). *Foundations of Mixed Methods Research:  
Integrating Quantitative and Qualitative Approaches in the Social and Behavioral  
Sciences*. Sage Publications. Thousand Oaks, CA
- Turnbull, A., Turnbull, R., Wehmeyer, M., Shogren, K. (2013). *Exceptional Lives*.  
Upper Saddle River, New Jersey, Pearson Education, Inc.
- Wood, J., M. (2007). Understanding and Computing Cohen's Kappa: A Tutorial.  
WebPsychEmpiricist, Retrieved from <http://wpe.info/>

Appendix A

Survey Protocol

Video Calling with Non-Verbal Children with Autism

Survey Questions

Beginning of Study

Name \_\_\_\_\_

Date \_\_\_\_\_

How often do the following behaviors occur when you communicate with your child?

Behavior	Always	Very Frequently	Occasionally	Rarely	Very Rarely	Never
Eye gaze (He/she looks at your eyes when you/he/she speak)						
Child initiates interactions (He/she begins the conversation)						
Child responds to interactions verbally (He/she responds verbally to your talking)						
Child responds to interactions with gestures						
Child communicates for his/her needs (Speaks for wanting something)						
Child communicates for social reasons (speaks for reasons other than needs)						

Video Calling with Non-Verbal Children with Autism

Survey Questions

End of Study

Name \_\_\_\_\_

Date \_\_\_\_\_

How often do the following behaviors occur when you communicate with your child?

Behavior	Always	Very Frequently	Occasionally	Rarely	Very Rarely	Never
Eye gaze (He/she looks at your eyes when you/he/she speak)						
Child initiates interactions (He/she begins the conversation)						
Child responds to interactions verbally (He/she responds verbally to your talking)						
Child responds to interactions with gestures						
Child communicates for his/her needs (Speaks for wanting something)						
Child communicates for social reasons (speaks for reasons other than needs)						



Appendix B  
Interview Protocol

Video Calling with Non-Verbal Children with Autism

Interview Questions

Beginning of Study

Name \_\_\_\_\_  
Date \_\_\_\_\_

**Interview questions**

1. Describe your communication relationship with your child/student?

How does the relationship with your student/child make you feel?

If you have other children, how would you describe your relationship with your non-verbal child compared to your typical child?

2. What type of responses does your child give when you communicate with him/her?
3. What are some other ways your non-verbal child communicates with you?
4. How does communicating with your child make you feel? Explain.

Video Calling with Non-Verbal Children with Autism

Interview Questions

End of Study

Name \_\_\_\_\_

Date \_\_\_\_\_

**Interview questions**

1. Describe your video calling (Skype) experience with your child.
2. How is using Skype to communicate different from communicating without Skype/tablet?
3. Did using Skype/tablet change in any way your communication with your child?  
Explain.
4. Will you continue to use Skype/tablet as a means for communication with your child?  
Why or why not? Explain.
5. How has using Skype video calling changed your perspective of communicating with your child?

Appendix C

Questionnaire Protocol

Video Calling with Non-Verbal Children with Autism

Questionnaire - End of Study

Name \_\_\_\_\_ Date \_\_\_\_\_

Describe your child's exposure to using a tablet prior to the study.  
(How many years, how often each day, type of use etc.....)

Describe your child's exposure to Skype prior to the study.  
(How often, for what purpose, etc.....)

How often did you use Skype during the study?  
(approx. # of times per week, month etc..)

Describe your experience using Skype for communicating with your child.

Will you continue to use Skype with your child after the study?

If so, for what types of activities/purposes?

Do you think using Skype is an effective way to communicate with your child?

Why or Why not?

## Appendix D

### Consent Forms - Parents

Dear Parent B,

September 22, 2013

I am currently enrolled in an Educational Leadership doctoral program at the University of Bridgeport, CT. As a fourth year doctoral student I am currently at the dissertation stage of my program, requiring me to conduct a topic for research. I am writing to you in hopes that you and your son/daughter will participate in this research. Title: A quasi-experimental single subject study of video-calling with non-verbal children with autism and their parents/teachers.

I have chosen to research language and communication development in nonverbal students with autism. The purpose of this study is to examine the theory of joint attention and how it relates to social and communication development in non-verbal students with autism. Through this research I hope to increase communication in non-verbal children with autism and explore the perspectives of parents/teachers participating in the study. I will be using an alternative communication device for my intervention in order to study joint attention. The device will be a tablet and a video-calling app. Parents, students, and teachers will be using this intervention and data will be collected recording number and type of communications. I will also be addressing the social relationship between the participants, particularly the parents/child and teacher/student. I believe that in using this "intervention" I will be able to better help my students engage with others. The results of this research will be shared with the participants, special education department at Norwalk Public Schools and my dissertation committee at the University of Bridgeport. Analysis and conclusions may also be presented in future publications relating to communication and students with autism. All participant names will be substituted with research identities to protect the privacy of all involved in this research.

This study will begin in October of this year, 2013, and the intervention and data collection will continue for purposes of the study until January of 2014. The analysis of

the data will take place during the winter of 2014 and the full study will conclude in the spring of 2014. The participants are purposefully selected from my classroom, 3 student and their parents, 3 paraprofessionals that work with these students and myself. The study may also include teachers from the general education classes the students participate in.

If you choose to participate the following will be occurring:

1. Parent interviews (beginning and ending) to learn about your social/communication relationship with your child. (approx. 1 hour each)
2. Training in using video-calling with your child at home. (approx. 1/2 hour)
3. Use of video-calling with your child at home. (3 to 4 weeks)
4. Your child will be using video-calling at school with teachers and teacher assistants. (3 to 4 months)
5. Access to all data collected as well as results and analysis.
6. Opportunity to explore a communication intervention with your child!

This information is being provided to help you decide whether you wish to participate in the present study. You should be aware that you are free to decide not to participate or to withdraw at any time without affecting your relationship with this teacher, school district or University of Bridgeport. Please feel free to ask me any questions about this research. I hope you will choose to participate in this research. If you have any questions about this study please contact me.

If you are interested in participating with your child please sign this consent form and return to me. You are signing it with full knowledge of the nature and purpose of the procedures. A copy of this form will be given to you to keep.

Parent B Signature

9/23/2013

---

Parent signature

date

Kathleen Shea

University of Bridgeport Educational Leadership Program, September 2013.

Appendix E

Event Recording Sheet

Quantitative Data collection for baseline and subsequent data collection.

Event Data collection (Tawney & Gast, 1984)

With VC Without VC

Joint attention target behaviors

Participant

Date

Time

Activity

RESPONSE	E	E V	E V G	V	V G	G	N R	INITIATE	E	EV	EVG	V	VG	G
Total								Total						

Appendix F

Summary Data Sheet

Pre intervention Post intervention

Responses to verbal interaction

Participant Date Time Activity

<b><u>RESPONSE</u></b>	Tally occurrence	Total interactions
Eye Gaze		
Verbal		
Gesture		
<b><u>INITIATE</u></b>		
Eye Gaze		
Verbal		
Gesture		

## Appendix G

### Discussion Activity Questions

#### Discussion Questions/Topics

Good Morning \_\_\_\_\_

How are you feeling today? Happy/Sad/Mad

What color shirt are you wearing today?

What color pants are you wearing today?

What are our special activities today? Music/Gym/ Art

What is the weather today?

What games do you like to play on the iPad?

What did you eat for breakfast?

Who is the teacher on your bus?

How old are you?

Where do you live?

What game do you like to play?

What is your favorite book?

What did you have for snack/lunch today?

What is the color of my pants?

What is the color of my shirt?