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Effects of a Mixed-Mode Instructional Program on the Communicative Turns of Preschoolers with Down syndrome who use Augmentative and Alternative Communication

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EFFECTS OF A MIXED-MODE INSTRUCTIONAL PROGRAM ON THE COMMUNICATIVE TURNS OF PRESCHOOLERS WITH DOWN SYNDROME WHO USE AUGMENTATIVE AND ALTERNATIVE COMMUNICATION

by

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ABSTRACT

Children with Down syndrome are at increased risk for a variety of deficits, including those in the area of speech, language, and literacy. Speech-language pathologists (SLPs) have historically focused on building children's verbal and signed vocabulary, but these efforts do not always result in significant changes in children's functional communication. Augmentative and alternative communication (AAC) systems and interventions have been recommended by the American Speech-Language-Hearing Association as appropriate options for facilitating functional communication skills with children with Down syndrome ([American Speech-Language-Hearing Association [ASHA], 2010; New York State Department of Health [NYSDOH], 2006). In spite of these recommendations, there exists a critical shortage of SLPs who are clinically competent in providing necessary AAC services to children with Down syndrome (Edgar & Rosa-Lugo, 2007; Light, McNaughton, Drager, Roberts, & Wilson, 2004). As a result, families of children with varying disabilities, including Down syndrome report high levels of stress related to accessing important professional expertise and intervention for their children (Dabrowska & Pisula, 2010).

Researchers and clinicians alike must consider alternative treatment delivery options that are responsive to the needs of families and children with complex communication needs (Cirrin et al., 2010; Light & McNaughton, 2015). A telepractice service delivery model has been documented to ease burdens felt by families when attempting to access rehabilitative services (Gladden, 2013). Telepractice involves the use of technology to connect clinicians and clients at a distance for the purposes of assessment, intervention, or consultation (Theodoros, 2011). An

expanding body of research promotes the use of telepractice service delivery within AAC to address the needs of both children and families.

One evidence-based AAC intervention of interest is communication partner instruction. Communication partner instruction, even in small doses, has been proven to be an effective method for providing parents and children with complex communication needs, specifically children with Down syndrome, access to necessary intervention (Kent-Walsh, Murza, Malani, & Binger, 2015). Partner instruction involves educating those critical stakeholders who surround the child most frequently (e.g., parents, educators, educational assistants) to recognize and respond to children's communicative signals and to create opportunities for children to participate in the conversation (Pennington, Goldbart, & Marshall, 2004). Despite the evidence supporting the use of communication partner instruction, SLPs continue to struggle with implementation in billable contexts (Ogletree, 2013). SLPs in the United States often operate in a billable context, where the client must be actively involved in the therapy session in order for practitioners to receive reimbursement from insurance companies for time spent with clients. This issue has served as a barrier to use of communication partner instruction, as currently accepted research-validated models use introductory parent sessions independent of the children's learning to teach partner skills.

Therefore, the current investigation examined the effects of a communication partner instruction using a mixed-mode service delivery model, which incorporated face-to-face and telepractice sessions, as well as a billable context. The focus of the protocol was on educating parents in one aided language strategy using a communication partner instruction program incorporating continuous child involvement and a mixed-mode service-delivery model, including

both face-to-face and telepractice intervention components (e.g., Skype/FaceTime), to address the need for interventions which consider stressors faced by families when attempting to access evidence-based AAC intervention. The study utilized a single-case, multiple-probe experimental design across three parent-child dyads. Baseline, intervention, generalization, and maintenance phases were used to investigate the efficacy of the nine-session intervention.

Visual analysis and Improvement Rate Difference (IRD) analyses indicated that the intervention was highly effective in increasing parents' use of the target strategy and children's communicative turntaking during shared storybook reading. One-hundred percent of parent participants increased their performance from baseline to post-intervention (IRD = 1.0), and all parents maintained these levels of achievement during the maintenance phase (IRD = 1.0). Similarly, children increased their frequency of communicative turns from baseline to post-intervention (IRD = 1.0), and all children participants maintained these levels of turntaking during the maintenance phase (IRD = 1.0), as well as during a novel book series (IRD = 1.0).

These findings suggest that the mixed-mode service delivery model, which includes both face-to-face and telepractice sessions, as well as continuous child involvement is an effective method for increasing parents' use of a target strategy and children's frequency of multimodal communicative turns. Clinical and professional implications, as well as future directions for research are discussed.

This dissertation is dedicated to my husband Rick, without whom this would not have been possible.

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CHAPTER ONE: INTRODUCTION

Statement of the Problem

Communication partner instruction involves educating those stakeholders who surround children with complex communication needs (CCN) in methods that support children's functional communication. Communication partner instruction can be used as one component of augmentative and alternative communication (AAC) intervention; AAC encompasses various supports and methods used to supplement or replace communication for individuals with severe speech impairments. More than half of speech-language pathologists (SLPs) working in schools report having children with complex communication needs on their caseloads, with a mean of 8 children per caseload requiring specialized AAC interventions (Binger & Light, 2006; Fallon & Katz, 2007; Kent-Walsh, Stark, & Binger, 2008). Despite professional standards published by such organizations as the American Speech-Language-Hearing Association (ASHA, 2005a) outlining AAC service-delivery as a professional obligation, SLPs report lack of time and expertise as major barriers to effectively implementing AAC interventions with children and communication partners, such as parents and educational assistants (Bailey, Angell, & Stoner, 2011; Crisp, Draucker, & Ellett, 2014; Finke, McNaughton, & Drager, 2009).

In addition, children with developmental disabilities, such as Down syndrome, are at increased risk of not receiving those interventions that are necessary for effective communication. Families of children with developmental disabilities often face barriers related to the opportunity to access skilled AAC intervention services (Beukelman & Mirenda, 2013). These barriers include (a) limited knowledge and skills of general practice SLPs related to AAC assessment and intervention, (b) limited access to required transportation, (c) historical practice

barriers yielded when service providers do not consider contemporary AAC interventions as viable options in addition to natural speech and/or manual sign interventions, and (d) negative attitudes and/or unfounded myths relating to AAC exhibited by both professionals and family members (Beukelman & Mirenda, 2013). Additional barriers include (1) the limited number of AAC specialists in some geographic locations (ASHA, 2015a; Edgar & Rosa-Lugo, 2007; Sturm et al., 2006), (2) communication partners' limited knowledge of communication and AAC technology (Calculator & Black, 2010; Goldbart & Marshall, 2004; McNaughton et al., 2008), and (3) limited evidence-base for sustainable interventions (Light & McNaughton, 2015). These findings are alarming when considering that lack of access to reliable communication modes during critical language learning years can contribute to limited language growth, serious effects on socialization, and abandonment of otherwise viable AAC technologies (Bailey, Parette, Stoner, Angell, & Carroll, 2006; Baxter, Enderby, Evans, & Judge, 2012; Crisp et al., 2014). Furthermore, SLPs report that 83% of students on their caseloads need increased AAC services outside of direct treatment sessions, and that these increased services could lead to greater academic success (Kent-Walsh et al., 2008). Considering that SLPs repeatedly report that they have limited time and large caseloads, children with communication needs continue to face barriers to receiving appropriate AAC intervention. However, there is evidence to support communication partner instruction as a method for increasing children's communication even when implemented in limited doses (Kent-Walsh et al., 2015). Therefore, there is a need for additional research to specify varying models of communication partner instruction to meet a wide range of populations in contemporary contexts. In their review of research focusing on methods for improving outcomes for individuals with AAC needs, Light and McNaughton

(2015) made a specific call for future AAC research to "focus on environmental factors to eliminate opportunity barriers and maximize social supports for individuals with complex communication needs" (pg. 93). Communication partner instruction is one example of an environmental factor.

Children with Down syndrome comprise one specific group of individuals with developmental disabilities who face barriers to receiving important communication interventions due to policy and practice barriers. Approximately one in 700 children in the United States are born with Down syndrome, also known as a Trisomy 21 (Centers for Disease Control and Prevention [CDC], 2014; National Down Syndrome Society, 2012). Children with Down syndrome have an increased risk for medical, physical, and cognitive deficits, which can include limited speech, language, and literacy abilities. Historically, SLPs have targeted verbal speech or manual sign language as a primary communication mode for children with Down syndrome despite a lack of empirical links between these interventions and long-term functional communication gains in children with Down syndrome (Mundy, Kasari, Sigman, & Ruskin, 1995; Romski & Ruder, 1984; Wright, Kaiser, Reikowsky, & Roberts, 2013). More recently, high-tech aided AAC options have been implemented to facilitate functional communication with this population (e.g., Binger, Kent-Walsh, Ewing, & Taylor, 2010; Branson & Demchak, 2009; Foreman & Crews, 1998; Kent-Walsh, Binger, & Hasham, 2010; Wilkinson, Carlin, & Thistle, 2008). As individuals with Down syndrome age, cognitive, communication, and literacy capabilities may decline (Martin, Klusek, Estigarribia, & Roberts, 2009), and utilizing AAC from a young age can establish a foundation for functional communication across the lifespan

(Carr, 2012; Næss, Lyster, Hulme, & Melby-Lervåg, 2011; J. E. Roberts, Price, & Malkin, 2007).

In fact, one issue of contemporary concern in the United States relates to the need for a communication partner instruction service-delivery model that allows SLPs to bill for their services. Many of the communication partner instructional models validated to date have involved significant components of the intervention occurring independent of the child. This reportedly has presented challenges for practitioners who operate in billable hour contexts which require the presence of the client or patient (Ogletree, 2013). Although it is not preferable to have insurance providers dictating service-delivery models, additional barriers to children accessing relevant AAC services undoubtedly will arise if clinicians do not have access to flexible, evidence-based communication partner instruction models in contexts where insurance coverage affords access to AAC services.

In additional to personnel and insurance barriers, families often face difficulties accessing necessary communication intervention when it is available. Barriers include distance from health care facilities, lack of specialized AAC clinicians in local communities, and lack of transportation (ASHA, 2005b). According to Karp et al. (2000), clients' desires to seek services or capability to benefit from services is decreased when extensive travel is required. One viable solution to this crisis is employing a telepractice service delivery model.

Telepractice allows providers to utilize existing telecommunications technology, such as phone or online video conferencing software, in the delivery of professional services at a distance (ASHA, 2005b). This developing area of service delivery has the potential to alleviate barriers to intervention faced by families when attempting to access vital communication

instruction. Telepractice in speech-language pathology can provide cost-effective access to AAC services for all children with CCN, regardless of family financial status or distance from treatment facilities (Theodoros, 2011).

There is an apparent need for intervention to increase the functional communication skills of children with complex communication needs when considering the recognized lack of communication partner instruction routinely conducted by SLPs (Kent-Walsh et al., 2015), additional research is needed to expand the literature base to support the use of telepractice in AAC. Telepractice service delivery has the capacity to ease some of the barriers faced by families when attempting to access AAC services (ASHA, 2005b; American Telemedicine Association [ATA], 2010; Gladden, 2013; Keck & Doarn, 2014; Theodoros, 2015).

Considering these issues, a gap in the research literature and scholarship to support service delivery models designed to alleviate barriers to intervention often faced by families of children with Down syndrome exists. While communication partner instruction is a well-documented facilitator of AAC use (Kent-Walsh et al., 2015), children with Down syndrome continue to face barriers to its use. Additional research is needed to determine the extent to which gains in communication and partner skills are achievable through telepractice sessions coupled with traditional face-to-face intervention utilizing a billing approach, where the child with Down syndrome is present for the duration of the instructional time.

Purpose of the Study

The purpose of this study was to investigate the effects of a communication partner instruction program incorporating continuous child involvement and a mixed-mode service-delivery model, including both face-to-face and telepractice intervention components, on (a)

parents' accuracy of implementation of a specific prompting sequence and (b) multimodal communicative turntaking of preschoolers (ages 3 – 5) with Down syndrome.

Research Questions

1. What are the effects of a communication partner instruction program incorporating continuous child involvement with a mixed-mode service-delivery model, including both face-to-face and telepractice intervention components, on the percentage of accurate prompting strategy implementation by parents of children with Down syndrome who use mobile AAC technology?
2. What are the effects of a communication partner instruction program incorporating continuous child involvement with a mixed-mode service-delivery model, including both face-to-face and telepractice intervention components, on the frequency of multimodal communicative turns by children with Down syndrome who use mobile AAC technology?

Hypotheses

1. Parents of children with Down syndrome who participate in a communication partner instruction program incorporating continuous child involvement with a mixed-mode service-delivery model, including both face-to-face and telepractice intervention components, will demonstrate increases in the percentage of accurate strategy use. This hypothesis is supported by the findings of Kent-Walsh, Binger, and colleagues who examined the results of implementing a closely related communication partner instructional sequence with parents of children with varying developmental disabilities,

including Down syndrome (e.g., Binger, Berens, Kent-Walsh, & Taylor, 2008; Binger et al., 2010; Kent-Walsh, Binger, & Hasham, 2010; Kent-Walsh, 2003; Rosa-Lugo & Kent-Walsh, 2008).

2. The participating children will demonstrate increases in multimodal communicative turns. This hypothesis is supported by the findings of Kent-Walsh, Binger, and colleagues who examined the results of implementing a closely related communication partner instructional sequence with parents of children with varying developmental disabilities, including Down syndrome (e.g., Binger, Berens, et al., 2008; Binger et al., 2010; Kent-Walsh, Binger, & Hasham, 2010; Kent-Walsh, 2003; Rosa-Lugo & Kent-Walsh, 2008). Further, the hypothesis is supported by findings from one case study which found equal language and literacy learning by a child with complex communication needs when comparing traditional face-to-face intervention and telepractice intervention (Hall, Boisvert, Jellison, & Andrianopoulos, 2014).

Limitations

This study has the following limitations:

1. The researcher was unable to control for consistent participant attendance and engagement during intervention sessions due to the nature of the children's disabilities and the ongoing medical and therapeutic demands on the families of these children.
2. Mobile AAC technology used by children and adults was limited to iPads with the TouchChat HD- AAC with WordPower communication application, and findings may not be directly translatable to other mobile technology platforms or AAC applications.

3. The telepractice technology platforms were limited to Skype and FaceTime, based on family preference and access, so results may not be indicative of all Internet-enabled distance connection platforms.
4. Generalization of results may be limited to Caucasian children with Down syndrome ages 3; 0 to 5; 11 and their English-speaking parents with moderate-to-high socioeconomic status in the central Florida area.

Delimitations of the Study

This study has the following delimitations:

1. A single-case experimental design with (a) baseline, (b) intervention, (c) generalization, and (d) maintenance phases was used to investigate the research questions delineated above.
2. Child participants met the following inclusion criteria, as determined by both parent-report and assessment measures: (1) Down syndrome diagnosis according to parent report of diagnosis by an independent physician; (2) presentation of severe, congenital speech impairments which negatively impacted speech comprehensibility; (3) hearing and vision within (or corrected to be within) functional limits; (4) evidence of delays in expressive language ; (5) ability to listen during interactive storybook reading; (6) ability to answer simple open-ended questions based on the stories; and (7) limited prior exposure to high-tech AAC.
3. Parent participants met the following inclusion criteria, as determined by both parent-report and assessment measures: (a) primary caregiver for a preschool-aged child with

Down syndrome; (b) no known speech, language, or hearing impairments; (c) attainment of at least a high school diploma or equivalent; and (d) evidence of implementing the targeted strategy in fewer than 25% of opportunities during shared storybook reading interactions with their children during pretesting.

4. Treatment incorporated continuous child involvement with a mixed-mode service-delivery model, including both face-to-face and telepractice intervention components.

Assumptions

This study made the following assumptions:

1. Participants' diagnoses of Down syndrome were accurate.
2. Child participants were unable to meet their communication needs solely via natural speech.
3. Communication was a priority for all participating families and the participating children were motivated to communicate with others.
4. Parent participants were proficient in reading children's storybooks.
5. The researcher and research team members were qualified to administer the intervention and/or score all assessments used in this study.

Operational Definitions

The following terms were operationally defined for the purposes of this study:

1. *Communication partner:* a person with whom one communicates and who serves as both a sender and receiver of messages

2. *Complex communication needs:* characterized by an inability to meet all of one's communication and interpersonal needs via natural speech alone
3. *Dyad:* pair comprised of one parent and one preschooler
4. *Mixed-mode*: consisting of a combination face-to-face and telepractice interactions
5. *Mobile AAC technology:* iPad equipped with TouchChat HD- AAC with WordPower communication application
6. *Mobile technology:* "refer[s] to smartphones; tablet devices such as iPads, Androids, or similar products; and other devices such as the iPod Touch that can connect to the Internet, display videos, and download "apps" (mobile applications)" (Common Sense Media, 2013, p. 13)
7. *Multimodal communicative turn:* "comments or questions related directly to the book being read or related to the child's relevant experiences and [include] responses to questions asked by the parents, comments, or labeling book illustrations or events, and pretending to read the book" via any mode of communication, including verbal speech, manual sign, or aided language (Rosa-Lugo & Kent-Walsh, 2008, p. 54)
8. *Novel semantic concepts*: characterized by words which carry unique meanings (Kent-Walsh, 2003)
9. *Opportunity:* one double-page spread in a book (Kent-Walsh, 2003)
10. *Preschool-aged:* characterized as 3; 0 to 5; 11 years old at time of enrollment in the investigation
11. *Read-Ask-Answer strategy:* As defined in Kent-Walsh (2003, p. 58-59), the use of the following elicitation and response components:

a. Elicitation component:
    i. Read + Model: “oral reading of the text on a given double-page spread of the book, accompanied by modeled use of the AAC system to produce key words in the text (at least one word);”
    ii. Expectant delay: “pausing for an individually predetermined period of time (e.g., typical student turn transfer time + 5 seconds), while looking directly at the student using AAC to convey an expectation for him/her to take a conversational turn;”
    iii. Open-ended Question + Model: “oral asking of one of a series of predetermined open-ended question types (appropriate to the student’s language comprehension level), which was related to the book being read, accompanied by modeled use of the AAC system to produce key words in the question (at least one word);”
    iv. Expectant delay: as defined above
    v. Answer + Model: “sample response to the open-ended question asked, provided orally, and accompanied by modeled use of the AAC system to produce key words in the response (at least one word)”.
b. Response component: “a communicative turn that served as a direct reply to the [students’] prior communicative turn, shared the topic of the partner[s’] prior turn, served to acknowledge the prior turn, and/or fulfilled the communicative attempt of the prior turn (e.g., answering a question, turning a page).”

Summary

This chapter presented an introduction to the current study by discussing the problem, purpose of the proposed investigation, research questions, hypotheses, limitations and delimitations, assumptions, and operational definitions. The purpose of this study was to investigate the effects of a communication partner instruction program incorporating continuous child involvement and a mixed-mode service-delivery model, including both face-to-face and telepractice intervention components, on (a) parents' accuracy of implementation of a specific prompting sequence and (b) multimodal communicative turntaking of preschoolers ages 3; 0 to 5; 11 with Down syndrome.

CHAPTER TWO: LITERATURE REVIEW

This investigation will determine the effects of a communication partner instruction program incorporating continuous child involvement and a mixed-mode service-delivery model, including both face-to-face and telepractice intervention components, on the communicative turntaking of parents of preschoolers with Down syndrome who use mobile AAC technologies and their children. This chapter reviews the research and scholarship on (a) augmentative and alternative communication, (b) communication partner instruction, (c) telepractice within augmentative and alternative communication, and (d) service delivery for children with Down syndrome.

Augmentative and Alternative Communication

The American Speech-Language-Hearing Association Special Interest Division 12, Augmentative and Alternative Communication defined AAC as:

> Augmentative and alternative communication (AAC) refers to an area of research, clinical, and educational practice. AAC involves attempts to study and when necessary compensate for temporary or permanent impairments, activity limitations, and participation restrictions of individuals with severe disorders of speech-language production and/or comprehension, including spoken and written modes of communication (ASHA, 2005a, p. 1).

Professionals utilize clinical knowledge in tandem with assistive technology to improve the lives of persons with disabilities. According to the *The US technology-related assistance for*

individuals with disabilities act of 1988, Section 3.1. Public Law 100-407, August, 9, 1988, assistive technology (AT) is:

> Any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities. AT service is directly assisting an individual with a disability in the selection, acquisition, or use of an assistive technology device.

AAC and AT practices join collectively to provide persons with disabilities (a) access to technology, (b) customization of technology, and (c) assistance in using technology. SLPs, AT specialists, and special educators utilize AAC practice and AT devices to assist persons with disabilities in activities of daily living and educational practices.

The American Speech-Language-Hearing Association (ASHA, 2005a) states that practicing SLPs must:

- assist individuals who may benefit from AAC to help them communicate,
- implement a multimodal communication approach,
- integrate perspectives of several stakeholders, including parents, throughout service delivery,
- facilitate individuals' use of AAC to promote quality of life, and
- advocate for individuals and families to address communication needs and continuing rights to access communication.

SLPs, therefore, have a professional responsibility to provide service and access to technology to persons with disabilities and their families.

AAC technology can be classified in accordance with a variety of key comparative features, including (a) unaided versus aided AAC systems, (b) dedicated versus non-dedicated AAC systems, and (c) single meaning picture symbol representation versus semantic compaction-focused language representation (Beukelman & Mirenda, 2013; Mirenda, 1999). Unaided technologies are those devices that do not require supports external to a person's body, while aided technology requires external equipment or supports. Examples of unaided communication systems are manual sign, gestures, or facial expressions (Beukelman & Mirenda, 2013; Mirenda, 1999; Sigafoos & Drasgow, 2001). Aided systems are those communication aids that require external equipment, such as a low-technology picture board or a high-technology computerized voice-output device. Aided systems require a transmission device to help individuals convey messages and rely on symbolic understanding, where a symbol represents a tangible object, feeling, or nontangible part of speech (Beukelman & Mirenda, 2013; Mirenda, 1999; Sigafoos & Drasgow, 2001). Examples of aided systems include iPads with specially designed communication applications, picture boards, and push button talkers.

Individuals who use AAC

Individuals with complex communication needs (CCN) who are unable to meet some or all of their communication needs via natural speech can use AAC to supplement or replace their existing spoken. Individuals who use AAC have a wide range of profiles; they may have (a) congenital or developmental disabilities, (b) acquired disabilities, (c) progressive conditions, or (d) temporary conditions (Beukelman & Mirenda, 2013). Individuals who use AAC have unique communication needs, and professionals are responsible for identifying individual strengths and limitations to ensure identification of relevant AAC options and interventions. Individuals use

AAC to (a) express wants and needs, (b) exchange information, (c) develop social closeness, and (d) fulfill social etiquette routines (Light, 1988).

Nationally, there are approximately 1.3% of the population, or 4 million Americans, who are unable to meet all of their communication needs with speech alone (Beukelman & Mirenda, 2013, p. 4). There is variability in the published worldwide prevalence of persons with AAC needs, as country, age groups, and types of disabilities surveyed all result in conflicting information. Specific to a pediatric population, Binger and Light's (2006) survey indicated that approximately 12% of preschoolers in Pennsylvania receiving special education services required AAC. These children represented diverse racial and ethnic backgrounds, a variety of disabilities, and utilized a range of AAC devices. The prevalence of preschoolers with Down syndrome who use AAC was not expressly reported; however, there were 38% of preschoolers identified as developmentally delayed, 10% as having multiple disabilities, and 1% as having other disabilities. Furthermore, of the children receiving speech-language services, approximately 24% of preschoolers required AAC (Binger & Light, 2006).

Approximately a quarter of the preschoolers being served by SLPs require AAC (Binger & Light, 2006), therefore additional research is needed to describe further this important population. Updated demographics, prevalence, and device use information is needed to aid researchers, practitioners, and policy makers with important decisions regarding allocating additional resources to preschoolers with AAC needs.

Mobile AAC Technology

Mobile technology "refer[s] to smartphones; tablet devices such as iPads, Androids, or similar products; and other devices such as the iPod Touch that can connect to the Internet, display videos, and download "apps," also known as mobile applications (Common Sense Media, 2013, p. 13). With over three-quarters of the world's population having access to mobile technologies and just over 1.3 million applications or "apps" available via Apple's "App Store" as of September 2014 (World Bank, 2012; Statista, 2015), this technology is rapidly gaining influence in both mainstream and assistive technology arenas. Consumers have increased access to AAC applications, which can serve as children's primary method for communication and a variety of other technology options to support activities of daily living. For persons with CCN who require AAC, wide-spread mobile technology use has resulted in increased (a) awareness and acceptance of AAC technology, (b) connectivity with other mainstream technologies, (c) consumer power and activism, and (d) dissemination of AAC research and development (McNaughton & Light, 2013).

A recent survey by Common Sense Media (2013) investigated mobile technology use by children under the age of 8 years. The questionnaire asked a nationally representative sample of 1,463 parents of children ages 0 to 8 years old about children's technology use in and out of the home. Participants were randomly selected across the United States using address and phone-number generating software, and statistically significant (p<0.5) differences from previous surveys were reported. Survey results indicated that approximately 17% of children ages 0 to 8 years old engaged with mobile technologies at least once per day in 2013, as compared to only 8% in 2011. Approximately 40% of children come from families with mobile technology in the

home, and roughly 7% of children in this age group have their own mobile devices. In comparison, only 8% of *families* had access to mobile technology in 2011. In just two years, the number of children with access to mobile technology has grown over 500%. Finally, more than one-third (38%) of children under the age of two have used mobile technologies, and these numbers increase at rapid rates as children age. Approximately 80% of two-to-four year olds and 83% of five-to-eight year olds regularly use mobile technologies (Common Sense Media, 2013). With over 80% of preschool-aged children using mobile technologies, parents and other adult stakeholders are becoming increasingly aware of the applications and variety of uses of mobile technology.

Despite the widespread awareness, acceptance, and use of mobile technologies, additional empirical research is needed to determine the extent to which mobile AAC technology can support children's communication, language, and literacy skills. Even with increases in *access* to mobile AAC technology, families continue to struggle with gaining access to specialized *services*, and professionals continue to struggle to provide adequate intervention to support *functional use* of the technology to stimulate language and literacy learning. With the plethora of mobile technologies available in today's market and stakeholders' self-reported lack of knowledge about communication interventions using AAC, persons with CCN are in danger of becoming victims of the mobile AAC technology revolution. This danger lies in stakeholders' focus being directed towards the actual technology and *not* the technology's role in communication (McNaughton & Light, 2013).

Considering these issues, there exists a gap in the research and scholarship to support the use of mobile AAC technology as a communication intervention for preschoolers with complex

communication needs. Additional research is needed to determine the extent to which gains in communication are achieved through access to technology or through access coupled with expert language and literacy intervention via mobile AAC technology.

Parents' Attitudes and Beliefs about AAC

Children with AAC needs are at increased risk for experiencing negative attitudes and beliefs towards AAC from key stakeholders (McCarthy & Light, 2005). McCarthy and Light (2005) synthesized 13 studies investigating attitudes and beliefs towards persons who use AAC; this review noted many factors and human characteristics related to personal opinions towards persons who use AAC. Beliefs about individuals who use AAC were influenced by many factors including (a) age, (b) gender, (c) previous experience with individuals with disabilities, (d) perceived competency of the individual using AAC, and (e) comprehensibility and naturalness of the synthesized output (McCarthy & Light, 2005).

Across the literature, parents express conflicting attitudes and beliefs regarding AAC, such as desires for children to communicate using the device for finite purposes and in discrete locations and conversely a desire for children to have access to communication across the day (Bailey et al., 2006; Baxter et al., 2012; Kent-Walsh & Light, 2003; McCarthy & Light, 2005). Moreover, parents from diverse cultural backgrounds, such as some families from Mexican-American heritage, express beliefs that AAC has functional utility in academic environments, but not in the home setting (McCord & Soto, 2004). AAC technology can be perceived by families as being sluggish and insufficient to maintain the fast-paced communication required in the home, but as acceptable in academic settings (McCord & Soto, 2004).

Furthermore, parents identified societal views and their own lack of training in using the AAC devices as influencing their opinions and beliefs regarding AAC technology and its role in their children's lives (Goldbart & Marshall, 2004; McNaughton et al., 2008). In contrast to parents' attitudes and beliefs about AAC in general, parents maintain a desire for their children to be given the opportunity to express themselves using AAC (Calculator & Black, 2010; Goldbart & Marshall, 2004). Parents indicate the ability to express "wants and needs and to make choices" as priority needs for their children (Calculator & Black, 2010, p. 37). Further, parents have been reported to reflect on their own personal shortcomings in providing their children opportunities to communicate freely with others, expressing frustration with limited funding opportunities, lack of experienced professionals, and having to become "pushy" with others to ensure children received services (Goldbart & Marshall, 2004; McNaughton et al., 2008). Numerous parents have expressed their desire to educate society about their children and their rights to communication (Calculator & Black, 2010; Goldbart & Marshall, 2004; McNaughton et al., 2008). These examples further highlight the disparity of parents' attitudes towards AAC. Parents convey a desire for their children to communicate in discrete contexts, such as to express wants and needs, but also expand further to share a desire for their children to have the ability to communicate freely.

Barriers & Facilitators to AAC Use

There are barriers and facilitators to AAC use by children and adults with CCN. Barriers are those factors which limit a person's access to AAC technology or opportunity for AAC intervention (Beukelman & Mirenda, 2013, p. 113). Facilitators are those factors which encourage and promote access and use of AAC technology. A systematic review of twenty-

seven articles identified the following barriers to successful AAC use: (a) ease of use; (b) reliability; (c) availability of technical support; (d) voice/language of the device; (e) ability to make decisions; (f) time generating a message; (g) family perceptions and support; (h) role of the communication partner; (i) service provision; and (j) staff training (Baxter et al., 2012).

These themes represent broad areas of opportunity for or access to AAC services which might be targeted by researchers and practitioners alike. Proactively focusing research and intervention on topics falling within these identified themes may decrease the risk of related barriers. Additional research is needed to determine the specific approaches to alleviate such barriers and facilitate the use of AAC (Light & McNaughton, 2015).

Family members of persons with CCN have identified some specifically relevant barriers to device use and integration (Bailey et al., 2006; Crisp et al., 2014). Barriers include limitations of the actual device, families' inadequate training surrounding device use and integration, ineffective teaming, including a lack of trained professionals, and overreliance on non-symbolic communication (Bailey et al., 2006; Crisp et al., 2014; McNaughton et al., 2008). As previously discussed, attitudes or societal acceptance can also serve as a barrier to AAC use. Societal factors include opinions of others, acceptance by others, and those barriers related to policy, such as laws regarding funding (Beukelman & Mirenda, 2013; Crisp et al., 2014). Families have also identified the language used on the device as a barrier to its use because the language may not match the home language. Mexican-American families have specifically identified the synthetic nature of the speech output and the organization of pictures on the device as barriers (McCord & Soto, 2004). As might be logically assumed, if the communication partners are not fluent in the

language of the device, it can be extremely difficult for them to support functional use for their children.

It is important to consider also the roles of communication partners in school contexts as they may relate to functional AAC implementation. Partners have identified the time required to teach families about AAC and balancing the demands of AAC intervention (e.g., programming, funding, multidisciplinary teaming) with the other responsibilities of the clinician as barriers for school-based use (Iacono & Cameron, 2009). Barriers to inclusion for students with AAC needs in the general education classroom can be described by the following themes: (a) school-related barriers (e.g., physical layout of the buildings); (b) team-related barriers (e.g., lack of team communication); (c) teacher-related barriers (e.g., knowledge of AAC/special education); (d) educational assistant (EA)-related barriers (e.g., minimal experience and training); (e) classmate-related barriers (e.g., negative attitudes towards peers with CCN); (f) target student-related barriers (e.g., operational competence or limited attendance); (g) curriculum-related barriers (e.g., difficulty accessing the curriculum); or (h) AAC-related barriers (e.g., limitations of the technology) (Kent-Walsh & Light, 2003). Additional barriers include portability, accessibility, and volume control of the technology in the classroom (Stoner, Angell, & Bailey, 2010).

Despite the barriers discussed above, there are several facilitators to AAC use; facilitators are those features which contribute to device use by children and adults with CCN and their communication partners. These facilitators increase families' use and acceptance of the AAC device with their children and can lead to sustained use over time. The goal of AAC intervention is to increase these facilitators to ensure that persons with CCN have the opportunity to communicate effectively (Light & McNaughton, 2015). Facilitators include (a) ease of AAC

device use; (b) availability of well-trained professionals; (c) and open policies, communication, and attitudes by professionals (Bailey et al., 2006; Crisp et al., 2014). Acceptance by peers, realistic academic goals, and appropriate, working technology have been reported to support students with AAC needs in the educational settings (Kent-Walsh & Light, 2003).

While there is an established evidence base for communication partner instruction, one substantial facilitator to AAC use, there exists an expansive research-to-practice gap. Additional research is needed to determine best practices for dissemination and widespread use of evidence-based facilitators to AAC use.

Communication Partner Instruction

In its current state, wide-spread AAC intervention lacks attention to communication partners and their potential positive impact on the communication of persons with CCN (Light & McNaughton, 2015). Communication partner instruction is an evidence-based approach to helping partners modify their unsupportive communicative interaction patterns in a timely manner to yield positive effects on children's communication (Kent-Walsh et al., 2015). Historically, speech-language intervention has focused on improving the communication skills of the children or adults who use AAC systems to communication. Little attention has been placed on altering the behaviors of the speaking partners (e.g., parents, educators, peers) (Light, Dattilo, English, Guiterrez, & Hartz, 1992) despite research supporting the impact of responsivity training on children's communication (Warren & Brady, 2007; Yoder & Warren, 2002; Yoder & Warren, 1998). This gap in the practice has been steadily closed, as communication partner instruction has become a more widely-used, evidence-based practice (Kent-Walsh et al., 2015).

The research regarding communication partner instruction has identified numerous common problems with communication partner instruction implementation. Typically, communication partner instruction is dominated by (a) focusing on what is wrong with the partner, (b) trying to change too many behaviors at one time in too many settings, and (c) failing to link changes in partner behavior to meaningful changes in client behavior (Binger & Kent-Walsh, 2012). Similarly, communication partner-client interactions are usually controlled by the communication partner; where the partner (a) dominates the interactions, (b) asks mostly yes/no questions, (c) takes the majority of conversational turns, (d) provides few opportunities for the student/client to respond, (e) interrupts communicative attempts, and (f) focuses primarily on the technology (Binger & Kent-Walsh, 2012; Kent-Walsh & Binger, 2013; Kent-Walsh & McNaughton, 2005; Kent-Walsh, 2008; Light et al., 1992).

In order to change these behaviors, professionals must focus on the *skills* necessary to impact individuals with CCN, but previous communication partner interventions have focused on *knowledge* of instruction. When the above unsupportive communication behaviors are consistently demonstrated by communication partners, children with CCN have a tendency to (a) be passive, (b) infrequently initiate communication or respond to others initiations, and (c) utilize limited communicative functions and forms (Kent-Walsh, 2008). Partner skill instruction must begin with purposefully selecting those skills which contribute to individuals becoming effective communication partners. Skills should (a) result in desired client outcomes, (b) be well defined, (c) be easily practiced, and (d) be discrete. When initially implementing communication partner interventions, instruction should occur within one-to-two specific contexts that have a definitive beginning and end and last no more than 10-15 minutes (Binger & Kent-Walsh, 2012).

Effective communication partners who have an impact on children's communication (a) understand the importance of turn-taking, (b) engage in balanced conversations, (c) ask and answer questions, and (d) create shared communication spaces (Thiessen & Beukelman, 2013). Communication partner instruction should involve all relevant stakeholders, including parents, educators, siblings, and peers. The task of effectively preparing all partners to be effective communicators is too extensive, therefore, only selected individuals should receive training (Kent-Walsh, 2008).

Several communication partner instruction models are featured throughout the AAC literature, and these models employ varying levels of the recommendations made by Binger and Kent-Walsh (2012) referenced above. Such models include: (a) the Developing Communication Interactions (DCI) model, which is a paraprofessional training program designed to increase communication by children with CCN (Sack & McLean, 1997); (b) the Improving Partner Applications of Augmentative Communication Techniques (ImPAACT) model (Binger et al., 2010; Kent-Walsh, Binger, & Hasham, 2010; Kent-Walsh, Binger, & Malani, 2010), which is a protocol designed to teach a variety of communication partners new behaviors based on the 2005 review and synthesis of strategy instruction research by Kent-Walsh and McNaughton; and (c) the Enhanced Milieu Teaching (EMT) approach, which is a hybrid instructional approach to naturalistic early language intervention using videotaped examples and live-action practice of teaching methods (Hancock & Kaiser, 2002a, 2002b; Hemmeter & Kaiser, 1994; Kaiser, Hancock, & Nietfeld, 2010; Kaiser & Roberts, 2013a; Kaiser & Roberts, 2013b; Kaiser & Wright, 2013).

Despite the scope of research into communication partner instruction, numerous studies fail to make connections between communication partner instruction and gains in student communication (e.g., Bingham, Spooner, & Browder, 2007; Calculator & D'Altilio Luchko, 1983; Light, Dattilo, English, Guiterrez, & Hartz, 1992; Sack & McLean, 1997; Smidt, Balandin, Sigafoos, & Reed, 2009; Wood, Luiselli, & Harchik, 2007). While the training programs were successful in changing adult behaviors, the authors failed to show the impact of the instruction on children's communication, and therefore, this review focuses on the evidence-based Improving Partner Applications of Augmentative Communication Techniques (ImPAACT) approach discussed below (Kent-Walsh et al., 2015).

Improving Partner Applications of Augmentative Communication Techniques (ImPAACT)

Direct strategy instruction approach. While there are many models for communication partner instruction (e.g., Kaiser & Hancock, 2004; Sack & McLean, 1997; Stoner, Meadan, & Angell, 2013; Thiemann-Bourque, 2012), meta-analysis results from Kent-Walsh and colleagues (2015) support the use of a direct strategy instruction approach. This approach (Kent-Walsh & McNaughton, 2005) has been the foundation for many models and the lens through which literature reviews of partner instruction are completed (Douglas, 2012). Direct strategy instruction models reported in the AAC literature to date have primarily been based on models developed in other disciplines. Direct strategy instruction focuses on explicit instructional practices that aid in the acquisition and generalization of learning, regardless of the content being learned (Deshler, Alley, Warner, & Schumaker, 1981; Ellis, Deshler, Lenz, Schumaker, & Clark, 1991). The ImPAACT approach is based in the following instructional steps:

1. Pretest and commitment to instructional program

2. Strategy description
3. Strategy demonstration, including video review activities
4. Verbal practice of strategy steps
5. Controlled practice and feedback, including role play activities
6. Advanced practice and feedback, including coached practice with the student using AAC
7. Posttest and commitment to long-term strategy use, including video review activities
8. Generalization of targeted strategy use, including formulation of plans for future strategy use

While these steps have been used across several empirical studies and models, including the ImPAACT approach discussed below, there is a lack of evidence to support the inclusion or exclusion of each individual step. Additional research is needed to determine if each step is required to achieve the same overall effectiveness of the partner instruction (Douglas, 2012; Kent-Walsh, 2003).

ImPAACT approach. The Improving Partner Applications of Augmentative Communication Techniques (ImPAACT) approach (Binger et al., 2010; Kent-Walsh, Binger, & Hasham, 2010) is one evidence-based model designed to teach communication partners new behaviors based on Kent-Walsh and McNaughton's (2005) review and synthesis of strategy instruction research. The model has been evaluated for use by practitioners with communication partners to promote communication between stakeholders and children who use AAC. The eight stages, discussed in detail below, have been implemented by Kent-Walsh, Binger, and colleagues (e.g., Binger et al., 2010; Kent-Walsh, Binger, & Hasham, 2010; Kent-Walsh, Binger, & Malani, 2010) across several instructional sessions with communication partners using an errorless

learning approach, where communication partners are provided with consistent and immediate feedback on their performance. This instructional model has been used in several studies across multiple geographic regions with a variety of communication partners and, therefore, is considered to be an evidence-based practice (e.g., Binger et al., 2008, 2010; Kent-Walsh, Binger, & Hasham, 2010; Kent-Walsh, Binger, & Malani, 2010; Kent-Walsh & Binger, 2013; Rosa-Lugo & Kent-Walsh, 2008). The stages of the ImPAACT approach, as defined in Kent-Walsh, Binger, and Malani (2010) are discussed in detail below:

Stage 1: Pretest and commitment to instructional program. Stage one of the instructional model is designed to motivate communication partners to implement the strategy with persons with CCN. During this stage, instructors (1) pretest communication partners' unprompted use of the strategy, (2) introduce the concept of strategy instruction to communication partners, (3) make a mutual commitment with participating communication partners to learning about the strategy, and (4) sign a written contract outlining the expectations of the program.

Stage 2: Strategy description. Stage two includes a (a) description of the overall strategy, (b) description of component skills and steps of the strategy, (c) mnemonic device, and lastly (d) discussion of the impact the strategy has on persons who use AAC and their communication partners. The final component of the stage, the discussion of the impact of the strategy, provides communication partners information about persons with CCN and the struggles they face with communication.

Stage 3: Strategy demonstration. During this stage, the instructor demonstrates the strategy for communication partners. The instructor models the strategy using a metacognitive

approach to help communication partners internalize the strategy and component skills. There is no finite timeline for this stage, and the strategy is demonstrated as many times as is necessary.

Stage 4: Verbal practice of strategy steps. Similar to stage three, stage four of the model occurs for as long as is required by the communication partners. During this stage, partners verbally practice the strategy steps and component skills. Communication partners practice stating the strategy mnemonic repeatedly until mastering the steps and component skills of the strategy.

Stage 5: Controlled practice and feedback. Communication partners practice implementing the strategy with instructor feedback during stage five. Partners practice in the instructional setting using peers while the instructor provides immediate verbal and written feedback on partners' implementation of the strategy. As with the previous stages, this stage continues until the communication partner masters the strategy and expresses a level of comfort with implementing the strategy with persons who use AAC. Throughout the stage, instructors decrease their feedback and scaffolding of communication partners until partners are able to implement the strategy independently.

Stage 6: Advanced practice and feedback. During stage six, communication partners practice the strategy in authentic, diverse environments with decreasing instructor prompts. Strategy practice occurs in the natural environment with persons with AAC needs and instructor feedback. Stage six concludes after the communication partner is able to master the strategy with minimal instructor feedback and prompting.

Stage 7: Posttest and commitment to long-term strategy use. Stage seven is designed to assess communication partners' use of the strategy following the instructional sequence.

Instructors assess communication partners' ability to implement the target strategy in the natural environment, and comparisons are made to pretest performance levels. Additionally, instructors seek the council of communication partners to determine those changes that are needed to the communication strategy or instructional sequence. Finally, the instructor drafts action plans with communication partners and caregivers for sustained and generalized use of the target strategy with persons with AAC needs.

Stage 8: Generalization of target strategy use. The final stage of the instructional model focuses on partners' use of the strategy in multiple, diverse settings. Communication partners practice and implement the strategy across settings and time.

Rationale for use. Families of children with Down syndrome report increased levels of stress related to children's cognitive impairment and stress related to limits on family opportunities when compared to parents of typically developing children (Dabrowska & Pisula, 2010). Communication interventions must be sensitive to the barriers and increased stressors that families of children with disabilities experience, and communication partner instruction is one method for increasing families' access to intervention (Kent-Walsh et al., 2015; Light & McNaughton, 2015). With the increasing numbers of children who require AAC services and the decreasing numbers of SLPs prepared to service them, additional interventions which require limited time investments by experts are needed (Binger & Light, 2006; Kent-Walsh et al., 2008).

Use of the ImPAACT approach has yielded significant increases in children's communication and parents' use of aided language modeling strategies with minimal partner instruction (Kent-Walsh et al., 2015). Binger, Kent-Walsh, and colleagues (2008) investigated the effects of the approach on caregivers and their children. Following minimal instruction

(range = 2.4-2.7 hours) in the Read-Ask-Answer (RAA) aided language stimulation strategy (Kent-Walsh, 2003), caregivers exhibited statistically significant increases in their ability to employ the RAA strategy (PND=100%) and generalized their learning to other novel shared storybook reading sessions. Furthermore, 100% of child participants increased their use of multisymbol messages following the intervention phase (PND=100%). The intervention has been documented to be effective for Latino families as well (Binger, Kent-Walsh, et al., 2008; Rosa-Lugo & Kent-Walsh, 2008).

Telepractice within Augmentative and Alternative Communication

The American Speech-Language-Hearing Association has defined telepractice as: (ASHA, 2015b):

> The application of telecommunications technology to the delivery of speech-language pathology and audiology professional services at a distance by linking clinician to client/patient or clinician to clinician for assessment, intervention, and/or consultation.

Telepractice extends service delivery from one location to another using video conferencing, such as Skype or FaceTime, or telephone. The use of synchronous and asynchronous connections allow for clients and clinicians to experience conditions similar to face-to-face therapy sessions (Shenker & Tetnowski, 2013).

While over 1,700 professionals self-identified as "telepractice/ telehealth" professionals with the American Speech-Language-Hearing Association (ASHA, 2014a), telepractice is not considered a separate medical specialty, but a service delivery model (Gladden, 2013). The term *telepractice* was adopted by ASHA to contrast commonly used terms *telemedicine* or *telehealth*,

which imply that telepractices are confined to health care settings (ASHA, 2015b). Several terms can be used interchangeably to specify further the contributions made by professionals; these terms include *teleaudiology*, *telespeech*, and *speech teletherapy*. The broader term *telerehabilitation* also encompasses those services offered by both speech-language pathologists and audiologists (American Telemedicine Association [ATA], 2010).

> The telepractice service delivery model grew out of advances in global telecommunications, where persons are now able to exchange information more efficiently and economically across greater distances. Technological advances driven by space exploration, such as television, closed-circuit television, and video communication, have fostered unprecedented global communication growth (Mashima, 2011). Telepractice service delivery can include (a) assessment, (b) monitoring, (c) prevention, (d) intervention, (e) supervision, (f) education, (g) consultation, and (h) counseling for adults and children, across a wide variety of professions and purposes (ATA, 2010).

Telepractice service delivery has been documented to ease burdens felt by families when attempting to access rehabilitative services (Gladden, 2013). These burdens may include increased gasoline prices, lack of transportation, geographical barriers, lack of childcare for siblings, medically-fragile state of clients, lack of certified, experienced professionals, and many more (Baxter et al., 2012; Crisp et al., 2014; Gladden, 2013; Light & McNaughton, 2015). Specifically, the *Speech-Language Pathologists Providing Clinical Services via Telepractice: Technical Report* (ASHA, 2005b, pp. 1–2) identified the following barriers to accessing speech and language services:

distance from healthcare facilities; lack of clinicians or specialized clinicians in a geographic area; and lack of transportation. When extensive travel is required to access services, factors such as fatigue and reduced mobility may also affect the client's desire to seek services or capacity to benefit from those services.

Telepractice service delivery seeks to alleviate these barriers by allowing clients to access therapy from remote locations, such as their home, school, or clinical settings. Furthermore, telepractice requires minimal financial investment from clients and practitioners, as no- or low-cost videoconferencing software, such as Skype, has been demonstrated to be an effective medium for speech-language evaluations and interventions (Ciccia, Whitford, Krumm, & McNeal, 2011). The low capital costs, as well as the reduced fees for transportation and care help to alleviate those stressors often faced by families of children with disabilities.

The telepractice service delivery model requires hardware and software which facilitate video communication, such as using webcams, personal computers, mobile devices, and high-speed Internet connections (Armfield, Gray, & Smith, 2012; Fleming, Brown, & Houston, 2013). With over 66% of all adults in the United States having access to the Internet (Smith, 2010), there is no shortage of access to telepractice technology. No- or low-cost video conferencing software, such as Skype, FaceTime, or Oovoo, is required to connect clients and practitioners during telepractice sessions (Fleming et al., 2013). Currently, however, there is a limited evidence base to support the use of one platform over the other in a healthcare setting (Armfield et al., 2012), and practitioners must be sure to use a software platform that aligns with all federal and state mandates for privacy (Fleming et al., 2013).

Telepractice in AAC

There exists a growing body of research to support the use of telepractice services, where practitioners are able to deliver specialized rehabilitative services remotely (Hill, Theodoros, Russell, & Ward, 2009). While the majority of telepractice research has occurred outside of the field of speech-language pathology (Rogante, Grigioni, Cordella, & Giacomozzi, 2010), research is being conducted to examine the efficacy of telepractice in AAC, sometimes known as *tele-AAC* (Hall et al., 2014).

Case-study research methods have been implemented to investigate the effects of telepractice service delivery of AAC intervention. For example, Hall, Boisvert, Jellison, and Andrianpoulos (2014) compared the efficacy of traditional face-to-face service delivery when compared to tele-AAC service delivery. Specifically, the authors examined the effects of four weeks of on-site therapy with a 7 year-old male participant, immediately followed by four weeks of telepractice therapy, on the appropriate use of three target morphemes (Hall et al., 2014). A single-case ABC design was used to determine the effectiveness of language intervention across the two previously mentioned settings. Each intervention phase was four sessions in length, and the participant's AAC device was connected to a computer using a standard USB cable to allow for screen sharing and visualization during all sessions. Intervention sessions were 60 minutes in length and consisted of a pre-intervention probe and grammatical morpheme intervention. Both traditional face-to-face sessions and telepractice sessions occurred in the participant's home. Data analyses comparing baseline probes to onsite probes resulted in an IRD of 1.00, which indicates that all treatment probes exceeded baseline levels. Tau-U analysis indicated a statistically significant correlation between baseline probes and onsite probes ($p<0.05$).

Furthermore, there was a statistically significant correlation between baseline probes and telepractice probes ($p<0.05$). Of particular interest was the non-statistically significant correlation ($p=0.25$) between onsite and telepractice sessions. These results indicate that intervention outcomes may not vary when services are transitioned from onsite to telepractice service delivery. Additional research is needed to explore further the efficacy of telepractice AAC services.

Children with Down syndrome

Down syndrome is the most common congenital disability occurring in approximately one in 700 live births per year and is typically caused by a trisomy, or extra copy, of the 21st chromosome (CDC, 2014; Contestabile, Benfenati, & Gasparini, 2010; Sherman, Allen, Bean, & Freeman, 2007). While there are several other causes of Down syndrome, including translocation of the 21st chromosome and the nondisjunction of chromosome 21, trisomy accounts for over 98% of cases (J. E. Roberts et al., 2007). Characteristics of children with Down syndrome include congenital heart defects and digestive abnormalities, but these are expressed in less than 50% of individuals with Down syndrome (Sherman et al., 2007). Life expectancy of children with Down syndrome is shorter than that of typically developing children and the survival rate has increased from 12 years in the 1940s to over 60 years old in the 2000s (Contestabile et al., 2010). This monumental increase in the life expectancy further supports the need for long-term, sustainable communication and educational opportunities for all. As children with Down syndrome age, they begin to experience symptoms consistent with Alzheimer's disease. These symptoms include declines in memory, learning, and orientation which eventually lead to aphasia, agnosia, and apraxia (Carr, 2012).

Furthermore, in addition to the physical characteristics, such as hypertonia, associated with Down syndrome, there exists a wide variety of cognitive deficits, with over 80% of individuals showing cognitive deficits (Pueschel, 1994; J. E. Roberts et al., 2007; Rosin, Swift, & Bless, 1988). Consistent with the prevalence of cognitive disorders, there is a high incidence of speech and language disorders among children with Down syndrome (Kent & Vorperian, 2013). These impairments have not been expressly linked to differences in anatomy in persons with Down syndrome or to cognitive deficits, as these impairments have been identified in children both with and without these factors.

Speech Production in Children with Down syndrome

Speech production in children with Down syndrome is typically associated with severe impairments in verbal communication. The research and scholarship investigating speech disorders with this population focuses on children's voice, speech sounds, fluency and prosody, and intelligibility (Kent & Vorperian, 2013). The 2013 research review by Kent and Vorperian synthesized research published over the past 60 years, and noted a marked increase in the number and focus of articles focused on individuals with Down syndrome. Research focusing on speech production in persons with Down syndrome has increased from fewer than 5 articles published in the 1950s to over 35 students published between 2000-2012. Similarly, the focus of research has shifted from investigating voice disorders to increased focus on speech production and intelligibility by individuals with Down syndrome (Kent & Vorperian, 2013).

The focus of the present review is on speech production and intelligibility of speech by children with Down syndrome given the clear relevance of these factors to overall functional communication in this population. Relative to speech production, children with Down syndrome

have an increased frequency of articulation errors, with emphasis on consonant errors (Brown-Sweeney & Smith, 1997; Bunn, Simon, Welsh, Watson, & Elliott, 2002; Kumin, 1994, 2006; J. Roberts et al., 2005; Sommers, Patterson, & Wildgen, 1988). These errors may be due to children's atypical emergence and mastery of consonant phonemes, when compared to typically developing children (Kumin, Councill, & Goodman, 1994). For example, typically developing children often master /d/, /t/, /n/ by age 3 years (Sander, 1972), but individuals with Down syndrome ages 15-22 years misarticulated these phonemes (Sommers et al., 1988). Sommers et al. (1988) identified the ten most commonly misarticulated sounds by adolescents and young adults with Down syndrome, and seven of these common errors involve the alveolar place of articulation. As the alveolar location is used most frequently in articulating English (Kent & Vorperian, 2013), articulation errors by individuals with Down syndrome have serious implications for intelligibility of their speech.

A variety of definitions of and methods for assessing speech intelligibility exist (Leddy, 1999). Decreased speech intelligibility has significant implications for daily communication and can interfere with numerous activities of daily living (Barnes, Roberts, Mirrett, Sideris, & Misenheimer, 2006; Bray & Woolnough, 1988; Bunton, Leddy, & Miller, 2007; Kumin, 1996, 2006). Speech intelligibility is directly related to the individuals' ability to produce speech sounds, and limited intelligibility is intensified as spoken utterance length increases (Kumin, 1994; Yoder, Hooshyar, Klee, & Schaffer, 1996). Kumin (1994) also noted that intelligibility decreases as familiarity with the speaker decreases.

Numerous measures of intelligibility exist (Price & Kent, 2008), and the most frequently used methods in studies of Down syndrome are scaling procedures (e.g., percentage estimate of

intelligibility; Kumin, 2006), word identification (Bunton et al., 2007) and scoring from transcriptions (Chapman, Seung, Schwartz, & Bird, 1998, 2000; Rosin et al., 1988). Parent ratings of intelligibility often correlate with measures used during research investigations (Chapman et al., 1998). Intelligibility measures are complemented by measures of comprehensibility, or contextual intelligibility (Yorkston, Strand, & Kennedy, 1996). Comprehensibility measures intelligibility when the contextual information of the utterance is present via semantic cues, syntactic cues, orthographic cues, or gestures (Yorkston et al., 1996).

Intelligibility and comprehensibility are serious problems for children with Down syndrome, as these issues typically persistent across the life span for many individuals and may have negative effects on interpersonal communication (Kent & Vorperian, 2013). Additional research is needed to determine the etiology of limited intelligibility by children with Down syndrome. The prevalence of limited intelligibility is well documented, but little attention has been paid to determining the underlying cause.

Language Development in Children with Down syndrome

Children with Down syndrome have diverse language development profiles, where children show strengths in receptive vocabulary and deficits in expressive syntax and semantics (Chapman, 1997). Children with Down syndrome often begin speaking their first words at roughly the same *mental* age as typically developing children. While chronological age varies, children's expressive vocabulary is similar in semantic diversity to their mentally-age matched peers (Cardosa-Martins & Mervis, 1985; Gillham, 1990). Lexical growth and development occurs much more slowly than typically developing peers (Kumin, 1994; Pueschel & Hoppman, 1993), and intervention often focuses on increasing the expressive vocabulary of children with

Down syndrome (Miller, Sedey, & Miolo, 1995). As children with Down syndrome age, the disparity between their expressive and receptive vocabulary continues to expand, and children tend to lag behind in social settings (Dykens, Hodapp, & Evans, 1994).

Researchers continue to debate about language learning by children with Down syndrome, where discussion focuses on the typical nature of children's development. Researchers debate whether the developmental trajectory of language acquisition in children with Down syndrome is typical or atypical (Abbeduto et al., 2003; Chapman, 1997; Fowler, 1999). There has been some suggestion that children with Down syndrome learn language in a typical sequence (e.g. Chapman, 1997), but at different rates than typically developing peers in the expressive and receptive domains, but the full extent of this has not yet been specified in the literature.

Historical Service Delivery

Children with Down syndrome have historically received speech-language intervention focusing on the use of verbal communication or manual sign language (e.g., Feeley, Jones, Blackburn, & Bauer, 2011; Foreman & Crews, 1998; Wright et al., 2013). Additionally, the use of manual sign language interventions with children with Down syndrome has enjoyed popularity (e.g. Kouri, 1989; Le Prevost, 1983). Early case studies found that children with Down syndrome were able to rapidly and extensively increase their expressive signed vocabulary to over 1,000 signed words in less than eight months in response to manual sign interventions (Kouri, 1989). Researchers (e.g. Kouri, 1989; Remington & Clarke, 1996) have discussed the benefits of signing for children's expressive language development, as well as spoken intelligibility; the literature includes discussion of how manual signs can be faded or abandoned

by children with Down syndrome as natural speech improves (Kouri, 1989; Remington & Clarke, 1996).

In order to broaden the research base, Miller (1992) investigated the effects of a signing intervention of 44 children with Down syndrome and their typically developing peers ages 11-27 months (mental age). Both groups were mentally age-matched, and Miller (1992) found that children with Down syndrome had larger expressive vocabularies (spoken and signed) than their mental-age matched peers (spoken only). The signed vocabulary of children with Down syndrome continued to grow as children aged, and children evidenced an increase in spoken language when reaching a 26-month mental age. As children aged, their use of sign language decreased and the use of spoken language increased (Miller, 1992). Researchers and practitioners favored the use of verbal communication and sign language taught through interactive self-modeling (i.e., hand-over-hand) or passive observational techniques (i.e., video modeling, adult/peer modeling) (Biederman & Freedman, 2007; Feeley et al., 2011). Interactive self-modeling has been reported to be a preferred method for communication intervention with children with Down syndrome for several decades; this finding is alarming when considering that Robertson and Biederman completed a systematic review and meta-analysis in 1989 which concluded that interactive modeling is not statistically supported. Following these important results, a shift in teaching techniques for children with Down syndrome was evidenced in the literature and practice. Passive observational techniques, where children are expected to observe the targeted skills, such as using a desired sign, were implemented and reported to be more beneficial than interactive modeling approaches (Biederman & Freedman, 2007).

Despite these historical approaches to service delivery with children with Down syndrome, professional organizations are calling for more contemporary approaches to speech-language therapy with this population (e.g., ASHA, 2010). While manual sign interventions have been used for over three decades, this communication method is not effective with communication partners who do not know manual signs, and limited longitudinal evidence exists to support long-term language learning by children with Down syndrome. Children with Down syndrome have made gains in their receptive vocabulary following manual sign interventions (e.g. Iacono, 2001; Kouri, 1989; Wright et al., 2013), but significant gaps in children's expressive and receptive vocabulary remain following the interventions. Additional research is needed to support expressive vocabulary interventions for children with Down syndrome.

Synthesis

This chapter discussed the research and scholarship in the areas of (a) augmentative and alternative communication, (b) communication partner instruction, (c) telepractice within augmentative and alternative communication, and (d) service delivery for children with Down syndrome. Historically, practitioners have used natural speech and manual sign to increase communication in children with Down syndrome despite limited empirical evidence to supported long-term, instantiated changes in children's language. Solely relying on oral language and manual sign language, when combined with the limited comprehensibility often seen in children with Down syndrome and communication partners' lack of knowledge of sign language, and children with Down syndrome often have a deficient linguistic system. High-technology augmentative and alternative communication (e.g., iPad with a specially design application) has the potential to broaden children's communicative options.

In order for AAC intervention to be successful, those barriers that lead to device abandonment (e.g., availability of experts) must be addressed directly. Communication partner instruction is one known method for decreasing barriers to AAC device use in children with varying disabilities (Kent-Walsh et al., 2015), but SLPs expressed a desire for validated communication instruction models which include the client for the duration of the investigation (Ogletree, 2013). Therefore, additional efforts are needed to close the research to practice gap in an effort to promote evidence-based interventions for children with Down syndrome that also allow for SLPs to bill for their services. Therefore, the purpose of this investigation was to determine the extent to which the use of a mixed-mode face-to-face and telepractice service delivery model which allows SLPs to bill for their communication partner instruction is effective at increasing children with Down syndrome's communication.

CHAPTER THREE: METHODS

This study investigated the effects of using a communication partner instruction program incorporating continuous child involvement and a mixed-mode service-delivery model, including both face-to-face and telepractice intervention components, on (a) parents' accuracy of implementation of a specific prompting sequence and (b) multimodal communicative turntaking of preschoolers (ages 3 – 5) with Down syndrome. This chapter presents the (a) research design, (b) setting, (c) participants, (d) materials, (e) procedures, and (f) measures.

Research Design

The current investigation involved a single-case, multiple-probe-across-participants, experimental design (Kratochwill et al., 2010, 2013). The independent variable was the communication partner instruction program incorporating continuous child involvement with a mixed-mode service-delivery model, including both face-to-face and telepractice intervention components, and the dependent variables were the parents' accurate implementation of the prompting strategy and the children's multimodal communicative turntaking during the book reading activities. The investigation included (1) baseline, (2) intervention, (3) generalization, and (4) maintenance phases.

A single-case experimental design was selected as it affords preservation of experimental control and analysis of participant data within heterogeneous, low-incidence populations (Gast, 2010). Furthermore, the multiple-probe-across-participants design was selected since a return to baseline conditions was undesirable, thereby ruling out an ABA design, and implementation of continuous probes would have yielded undue hardship and increased risk of attrition for

participants waiting for those in earlier intervention positions to demonstrate treatment effects, thereby rejecting a multiple-baseline approach. Implementation of the multiple probe design decreased the number of baseline sessions required prior to intervention for participants evidencing stable baseline performance (Horner & Baer, 1978; McReynolds & Kearns, 1983; Richards, Taylor, Ramasamy, & Richards, 1999).

Setting

Sessions for this investigation took place in the communication disorders clinic of an urban university in central Florida and in the homes of the participants in surrounding areas. Face-to-face sessions occurred in a typical, clinical therapy room in the university clinic containing a child-sized table and chairs and a one-way mirror for parent observation. Participating parent-child dyads were in their homes for the telepractice sessions while the interventionist was interacting with the participants from the university clinic via mobile technology video conferencing software. Live sessions were recorded via unobtrusive ceiling-mounted dome cameras in the clinical therapy room to minimize participant reactivity. Distance sessions were recorded using a small portable video camera focused on the participants.

Participants

Criteria for Participation

Participant recruitment was accomplished with the assistance of Down syndrome parent support organizations in Florida. Organizations recruited from their existing memberships via emails and website postings advertising the purpose of the investigation and participant criteria.

Potential participants completed the Participant Demographics Questionnaire (Appendix B) via *Qualtrics*[1], a university-sponsored, secure survey research platform.

Parent Participants

Parent participation criteria. Potential parent participants were adult primary caregivers of preschool-aged children with Down syndrome. Consistent with published research in communication partner instruction (e.g., Binger et al., 2008, 2010; Kent-Walsh, Binger, & Malani, 2010; Kent-Walsh, 2003; Rosa-Lugo & Kent-Walsh, 2008), the selection criteria used to identify potential participants required that participating parents were:

- Parents or legal guardians (mothers or fathers) of preschoolers with Down syndrome who required the use of AAC;
- Had no known speech, language, or hearing impairments, as indicated by self-report;
- Had earned at least a high school diploma or equivalent, as indicated by self-report;
- Were fluent and literate in English, as indicated by self-report; and
- Demonstrated implementation of the target strategy in fewer than 25% of opportunities during the pretest assessment session, as measured by non-standardized shared storybook reading assessments.

Recruited participant demographic information was collected via the *Qualtrics* survey tool, and information included participating parent's : (1) name, (2) address and phone number,

[1] Qualtrics is a web-based survey software tool that allows the user to create surveys, view results, and generate reports based on the results. Qualtrics servers are protected by firewall systems and scans are performed regularly to ensure any vulnerabilities are located and rectified. Data are stored in a specific location, as opposed to a cloud-based server, and Qualtrics uses Transport Layer Security (TLS) encryption for all transmitted data. Qualtrics safeguards all data and uses secure data centers as mandated by the Health Information Technology for Economic Clinical Health Act and updated HIPPA rules. *Qualtrics*, 1-800-340-919, www.qualtrics.com

(3) email address, (4) primary language spoken at home, (5) highest education level earned, (6) occupation, (7) relationship to participating child, (8) family income, and (9) family race and ethnicity.

Participating parent demographics. Parent assessment measures used throughout this investigation included both descriptive and criterion assessments; measures were collected during a pretest assessment session. Potential parent participants engaged in recruitment sessions during which they (a) completed a participant demographic form, and (2) participated in pre-test shared storybook reading interactions with their children.

Descriptive measures. To determine parents' eligibility to participate in the investigation, parents were asked to self-report the following on the participant demographic form (a) their relationship to the potential child participant, (b) any known current or historical speech, language, or hearing impairments, (c) their educational level, and (d) descriptive statements of their fluency and literacy in English.

Criterion measures. A ten-minute shared storybook session was recorded to determine parents' use of the target strategy. Parents who implemented the strategy in greater than 25% of opportunities did not meet the participation criteria. Procedures for administration are outlined in Appendix C.

Child Participants

Child participation criteria. Consistent with literature supporting the use of communication partner instruction (e.g., Binger, Kent-Walsh, Berens, Del Campo, & Rivera, 2008; Binger et al., 2010; Kent-Walsh, Binger, & Malani, 2010; Kent-Walsh & Binger, 2013; Rosa-Lugo & Kent-Walsh, 2008), the participating children had to meet the following criteria:

- Diagnosed with Down syndrome, as indicated by parent report;
- Was between the ages of 3; 0 and 5; 11 years at the time of enrollment in the investigation, as indicated by parent report;
- Had hearing and vision within, or corrected to be within, functional limits, as indicated by parent report;
- Spoke English as a first language, as indicated by parent report;
- Presented with a severe speech impairment with less than 50% comprehensibility, as measured using the "with context" condition of the *Index of Augmented Speech Comprehensibility in Children* (Dowden, 1997);
- Had a multimodal expressive vocabulary of at least 25 words as measured by the *MacArthur-Bates Communicative Development Inventories: Words and Gestures* (Fenson et al., 2007);
- Had a receptive vocabulary age equivalent score of at least 2; 0, as measured by the *Peabody Picture Vocabulary Test Four* (Dunn & Dunn, 2013);
- Communicated using telegraphic messages (single-words) in more than 90% of communicative turns, as indicated by parent report;
- Were able to listen to stories and respond to simple wh-questions (i.e., who, what, where) about the stories via the child's primary modality, as indicated by parent report;
- Had never used high-tech AAC or had used high-tech AAC less than once per day in the last 6 months, as indicated by parent report; and

- Exhibited minimal levels of communication during shared storybook reading, as defined as taking fewer than 18 communicative turns in ten minutes (Moody, Justice, & Cabell, 2010).

Participant demographic information was collected via parent report on the participant demographic intake form, including: (1) developmental diagnosis; (2) medical conditions; (3) medications; (4) hearing; (5) vision; (6) history of seizures; (7) feeding/swallowing abilities; (8) sleep patterns; (9) gross motor abilities; (10) fine motor abilities; (11) positioning and mobility supports; (12) educational setting; (13) types and frequencies of therapies received (i.e., speech-language, physical, occupational, behavioral); (14) social/emotional behavior; (15) communication modes; (16) current access and use of aided AAC; (17) current access and use of technology, excluding AAC devices; (18) family availability for intervention; and (19) three longest utterances.

Assessment of participating child skills. Assessment measures used during this study included both descriptive and criterion assessments; measures were collected during a pre-test assessment session. Potential child participants engaged in a recruitment assessment session during which the following information was collected and assessments were administered: (1) Participant Demographics Form; (2) *Index of Augmented Speech Comprehensibility in Children* ([*I-ASCC*], Dowden, 1997); (3) *MacArthur-Bates Communicative Development Inventories: Words and Gestures* ([*CDI*], Fenson et al., 2007); (4) *Peabody Picture Vocabulary Test Four* ([*PPVT-4*], Dunn & Dunn, 2007); and (5) non-standardized shared storybook reading assessment designed to capture the frequency of multimodal communicative turntaking and semantic

concepts. Age equivalent and raw scores were reported for the *PPVT-4* and raw scores were reported for the *CDI*.

Descriptive measures. In order to determine children's eligibility for the investigation, the following descriptive information was collected using the Participant Demographics Form, children's (a) developmental disability diagnosis, (b) age, (c) hearing and vision performance, (d) first spoken language, (e) communication patterns, (f) ability to listen to stories and respond to wh-questions, and (g) prior AAC use. This information was collected from parents' reports and was used to determine eligibility for additional standardized and non-standardized assessments.

Criterion measures. In order to determine if children presented with significant and congenital organic impairment with less than 50% comprehensibility, Dowden's (1997) *Index of Augmented Speech Comprehensibility in Children* (*I-ASCC*) was used. This non-standardized clinical measure was designed in a manner similar to an established adult measure of intelligibility and details children's speech in discrete contexts, such as "dinner foods children hate to eat" (Dowden, 1997, p. 49). Children were presented with picture stimuli and asked to identify verbally the corresponding single word or two-word phrase. Cueing strategies were used to facilitate children's speech (1) picture only, (2) picture plus context, and (3) picture plus an embedded model. Imitative responses were avoided during administration. Children's spoken responses were recorded and unfamiliar listeners determined the word spoken by the child, both with and without the context associated with the word. The research team scored each listener response card according to procedures outlined by Dowden (1997).

Furthermore, children's multimodal expressive vocabulary was measured by the *MacArthur-Bates Communicative Development Inventories: Words and Gestures* (Fenson et al., 2007). The *CDI* is a parent self-report form designed for children from 8-to-18 months old. However, according to Fenson et al. (2007), the *CDI* may be used for children with developmental delays outside of the recommended age range to gather information about parents' knowledge of their children's emerging language skills. As the child participants are beyond the standardization window, raw scores were reported and interpreted for the purposes of this investigation.

Furthermore, children's receptive vocabulary skills were assessed using the *Peabody Picture Vocabulary Test Four* (Dunn & Dunn, 2013). The *PPVT-4* was used to determine children's vocabulary knowledge prior to enrollment in the investigation. The *PPVT-4* is an "individually administered, norm-referenced instrument that assesses vocabulary for individuals age 2 years 6 months through 90 years old" (Dunn & Dunn, 2013). The *PPVT-4* consists of 228 test items and offers two different forms for test/retest reliability. The assessment utilizes four full-color pictures as response options on a page. Administration requires the examiner to state a word, and the child responds by selecting the picture that best illustrates the word's meaning (Dunn & Dunn, 2013). For the purposes of this investigation, children's primary modality of communication was an acceptable response format for the assessments. Modalities included gestures and physical responses.

The *PPVT-4* has reliability coefficients ranging from $r = 0.87$ to $r = 0.97$. Specifically, split-half reliability ($r = 0.89$-0.97) is reported; alternate form reliability was calculated for Form

A and Form B (r=0.87-0.93); test-retest reliability was also reported, and correlations represent high levels of reliability (r=0.92-0.96) depending on age groups (Dunn & Dunn, 2013).

Lastly, a ten-minute shared storybook reading session was recorded to determine children's multimodal communicative turntaking prior to the intervention (See Appendix C). Nine minutes of the video footage was analyzed for preschoolers' frequency of multimodal communicative turntaking. Children who communicated more frequently than 18 times during the storybook session did not meet participation criteria for the investigation. This communicative eligibility decision was made based published data by Moody and colleagues (2010). In an investigation examining turn-taking with twenty-five typically developing three-to-six-year olds and their parents during 15-minute interactive storybook reading sessions, Moody, Justice, and Cabell (2010) reported that children averaged 28.2 initiations; therefore, the conversion to a 10-minute reading sample would suggest that children demonstrating 18.8 communicative turns or higher would already be communicating at rates comparable to their typically developing peers during storybook reading sessions and would not be eligible for this investigation.

Recruitment Results

Twenty children participated in recruitment assessment sessions. Of those potential participants (a) one participant withdrew following the assessment session, (b) six participants did not meet inclusion criteria, (c) ten had scheduling conflicts that precluded their participation in the investigation, and (d) three participated in the present study. Those six participants who did not meet inclusion criteria either did not meet minimum requirements on the assessment

measures or took more than 18 communicative turns during the shared storybook session. Therefore, recruitment resulted in three potential participants for this investigation.

Participant Demographics

Three parent-child dyads participated in the investigation. The children (two boys and one girl) were Caucasian and ranged in age from 3 years, 7 months to 5 years, 6 months at time of enrollment in the investigation. Participants were from middle to upper-middle class socioeconomic backgrounds and all attended different schools in the central Florida area. In alignment with the subject selection criteria, each participant presented with a congenital speech impairment secondary to Down syndrome which was characterized as less than 50% intelligibility to unfamiliar listeners (range: 0-10% and 0-10% for the *no context* and *semantic context* assessment conditions, respectively). In addition, participants demonstrated receptive language skills at or above the two year developmental age and had a multimodal expressive vocabulary of 25 words or greater. A summary of participant demographic information is provided in Table 1 below. Pseudonyms have been used to maintain the confidentiality of the participants.

All three-parent-participants were female and Caucasian. One parent was of Hispanic origin. Parents ranged in age from 37 to 43 years and were from middle to upper-middle class backgrounds. The highest level of education completed by the participating parents ranged from some college to the completion of a Bachelor of Science degree. The parents reported no known speech, language, or hearing impairments and each demonstrated the ability to read children's books. A summary of parent participant demographic information is given in Table 1 below. Pseudonyms have been used in order to maintain the confidentiality of the participants. Dyads

are identified via corresponding first letters of participants' names (e.g., Ashley was the child of Ms. Adams).

Participating Dyad Profiles

Dyad I. Ashley and Ms. Adams

Child (Ashley). Ashley was a 5 year; 6 month old female at the outset of the investigation. Her mother described Ashley as a friendly and active child who enjoyed dancing and playing with dolls. Ashley also was described as being "easygoing," but her mother indicated that Ashley did not transition well between activities. She was reported to have a 15-minute attention span for preferred activities and both interest in and ability to interact with her peers.

According to parent report, Ashley was diagnosed with Down syndrome and hypothyroidism. At the time of enrollment, Ashley was taking medication to treat her seasonal allergies and hypothyroidism. Ashley's hearing was screened 8-months prior to the parent report and was noted to be within normal limits. Ashley's vision was tested 5-months prior to the report and Ashley wore glasses, which reportedly corrected her vision to be within normal limits. She was not reported to have a history of seizures, problems with feeding or swallowing, or difficulty sleeping. Ashley was ambulatory and walked with the assistance of ankle-foot orthotics (AFOs). She was able to walk independently with no balance or safety concerns. Ashley exhibited fine motor skills sufficient to manipulate an AAC application on an iPad with no concerns relating to access, but parent report indicated that Ashley could only write for short periods prior to becoming fatigued.

Ashley did not require positioning or mobility assistance. She attended a public charter school serving children with and without disabilities in the central Florida area, where she was placed in an inclusive classroom. Ms. Adams reported that Ashley demonstrated task-avoidance behaviors and difficulty transitioning between activities in the classroom and at home. At time of enrollment, Ashley was receiving two 30-minute speech and language sessions each week with the school SLP. She also received occupational and physical therapies in the school setting; each once for 30 minutes weekly. Furthermore, Ashley received behavior therapy in the school twice weekly for 30 minutes.

Prior to the beginning of the investigation, language testing was completed and indicated Ashley's receptive language skills were below levels expected for her chronological age. As shown in Table 1, *PPVT-4* results indicated an age-equivalence score of 2 years; 1 month. Ashley understood simple directions, names for people and objects, and names for body parts, as well as color and size words. She did not yet demonstrate comprehension of prepositions (e.g., in, under, on) as reported by Ms. Adams.

Ashley used a combination of natural speech, gestures, facial expressions, and manual signs to communicate. Some of her pragmatic skills included greeting others, asking for desired items, seeking attention, and asking for help. According to unfamiliar listener reports, as evidenced in the *I-ASCC* scores in Table 1, Ashley was 10% comprehensible when the listener *did not* have information regarding the context of the word, as well as10% comprehensible when the listener *had* information regarding the context of the word. Ashley preferred to use natural speech as her primary communication mode despite the limited comprehensibility of her speech; however, she also became frustrated and stopped trying to communicate when she was not

understood. Ms. Adams reported that she typically could understand Ashley's spoken communication, but unfamiliar listeners frequently failed to comprehend Ashley's speech. Ashley's expressive vocabulary, as noted on the *CDI*, was 304 words. Ashley is a monolingual speaker of English, and her family only speaks English in the home. Her longest utterances were reported to be 2.6 words in length on average. Ashley's mother reported her longest utterances as "I not baby" and "Momma, more please." Ashley had never used a high-tech AAC device.

Parent (Ms. Adams). Ashley's mother, Ms. Adams, was a bilingual 37 year-old Caucasian female of Latina origin who spoke English as her primary language. She was also fluent and literate in Spanish. Ms. Adams had a Bachelor of Science degree and was employed as a nurse at the time of the investigation. Ms. Adams described herself as fluent and literate in English and as having no known speech, language, or hearing impairments that would prevent her from reading children's books. Prior to her involvement in the present investigation, Ms. Adams was observed to implement the targeted strategy or component skills during book reading activities with Ashley in fewer than 25% of opportunities.

Dyad II. Brandon and Mrs. Brown

Child (Brandon). Brandon was a 3 year; 7 month old male at the outset of this investigation. His mother described Brandon as a happy and content child who enjoyed music, dancing, and playing with toys. Brandon also was described as happy and sometimes shy around unfamiliar people or in unfamiliar settings; he was reported and observed to be able to transition well between activities.

Table 1. *Participant Demographic Information*

Dyad	***Parent*** Age Marital status Education Occupation	***Student*** Age Gender Siblings	Communication Modes	Speech Intelligibility		*PPVT-4*		*CDI* Number of Different Words Communicated	*CDI* M3L
				No Con-text	Seman-tic Con-text	Raw Score	Age Equiva-lent		
Dyad I	***Ms. Adams*** 37 Single B.S. Nurse	***Ashley*** 5; 6 Female 0 siblings	natural speech, gestures, some sign	10%	10%	20	2; 1	304	2.6
Dyad II	***Mrs. Brown*** 39 Married Some college Homemaker	***Brandon*** 3; 7 Male 1 sibling	natural speech, gestures, some sign	0%	0%	25	2; 3	87	2.3
Dyad III	***Mrs. Campbell*** 43 Married Some college Realtor	***Carter*** 4; 5 Male 2 siblings	natural speech, gestures, moderate sign	0%	0%	24	2; 3	87	1.0

Notes. Education = Highest Education Level. Age is given in years; months. *CDI* M3L was determined based on parent report of children's three longest utterances. The number of words spoken total across all three longest utterances was added and divided by the number of utterances. B.S. = Bachelor of Science.

Brandon was reported to have a 5-10 minute attention span for preferred activities and an interest in and ability to interact well with his peers.

According to parent report, Brandon was diagnosed with Down syndrome, a leaky heart valve, hypothyroidism, reflux, and constipation. At the time of enrollment in this investigation, Brandon was undergoing testing for possible nocturnal seizures. Brandon was taking medication to treat his constipation, hypothyroidism, and reflux. Brandon's hearing was screened 5-months prior to the enrollment in the investigation; findings indicated that he had hearing within normal limits. Brandon's vision was tested 8-months prior to enrollment in the investigation and indicated nearsightedness. Brandon wore glasses, which reportedly corrected his vision to be within normal limits, during all intervention sessions. Brandon's mother indicted that he was a selective eater who chewed by gumming his food. Brandon used ankle-foot orthotics, but was independently mobile with fine motor skills sufficient for activities of daily living and for accurate manipulation of an AAC application on an iPad. He did not require mobility or positioning assistance.

Brandon attended a public school in the central Florida area serving children with and without disabilities. Brandon was placed in a "varying exceptionalities" Pre-Kindergarten classroom for 150 minutes a week. At time of enrollment, Brandon was receiving one 30-minute and one 15-minute speech and language session each week with his school SLP. Brandon also received one 30-minute session of speech-language therapy in a private setting. Furthermore, Brandon received occupational and physical therapies weekly in the school setting; each once for 30 minutes weekly. In addition to the school-based therapy, Brandon received 30 minutes

weekly of occupational therapy in the private setting. He does not receive behavior therapy in the school or private settings.

Initial language testing indicated Brandon's receptive language skills were below levels expected for his chronological age. According to *PPVT-4* results, Brandon was able to comprehend single-word vocabulary at an age-equivalency of 2 years; 3 months. Brandon was able to understand simple directions, names for people and objects, and names for body parts. He did not yet demonstrate understanding of colors, size concepts, or prepositions (e.g., in, under, on).

Brandon used a combination of natural speech, sign, and gestures to communicate. He was able to greet others, gain attention, label people, things, and pictures around him, and to ask for help. According to unfamiliar listener reports, as evidenced in the *I-ASCC* scores in Table 1, Brandon was 0% comprehensible when the listener *did not* have information regarding the context of the word, as well as 0% comprehensible when the listener *had* information regarding the context of the word. Brandon primarily used natural speech to communicate with the assistance of sign language to support his messages. Brandon repeated messages when he was not understood, but was reported to become frustrated when listeners did not understand. Brandon's mother reported and was observed to understand Brandon's commonly used words, but she also reported that unfamiliar listeners had difficulty understanding Brandon. In addition, Brandon's mother indicated that he was able to express 87 words on the *CDI*. His longest utterances were reported to be an average of 2.3 words in length. His mother reported his longest utterance as "Mama need you" in her parent report. Brandon had never used a high-tech AAC device.

Parent (Mrs. Brown). Brandon's mother, Mrs. Brown, was a 39-year-old Caucasian female monolingual speaker of English. Mrs. Brown had completed some college courses, as she was studying to become an occupational therapy assistant. Mrs. Brown did not work outside the home, and described herself as fluent and literate in English. She had no known speech, language, or hearing impairments that would prevent her from reading children's books. Prior to her involvement in the present investigation, Mrs. Brown was observed to implement the targeted strategy or component skills during book reading activities with Brandon in fewer than 25% of opportunities.

Dyad III. Carter and Mrs. Campbell

Child (Carter). Carter was a 4 year; 5 month old male at time of enrollment in this investigation. His mother described Carter as a happy child who enjoyed dancing, watching television, and playing with balls. Carter's mother described that he was "demanding" when he wanted something, but that he did transition well between activities. He was reported to have a long attention span for preferred activities and an interest in and ability to interact with his peers.

According to parent report, Carter was diagnosed with Down syndrome, acid reflux, and asthma. He was taking medication for his acid reflux at the time of participation in this investigation. Carter's hearing was tested 1-week prior to enrolling in this investigation and he was reported to have hearing within normal limits. His vision had never been formally tested. Carter did not have a history of seizures or difficulty sleeping. Carter was reported to be an extremely selective eater who would only consume hot dogs, frozen mixed vegetables, applesauce, teddy bear-shaped chocolate chip cookies, and chocolate milk. He did not receive feeding or swallowing therapy from his SLP or occupational therapist. Carter demonstrated age-

appropriate fine motor skills and an ability to manipulate an AAC application on an iPad without difficulty. Carter's mother noted that he did not write conventionally at the time of enrollment in the investigation, but that he was able to color and draw with no concerns. Carter did not require mobility or positioning assistance.

Carter attended a public school in the central Florida area serving children with and without disabilities; he was placed in a "varying exceptionalities" Pre-Kindergarten classroom for the entire school day. At the time of enrollment, Carter was receiving four 15-minute speech and language sessions each week with the school SLP. He was also receiving occupational therapy twice a week for 30 minutes and physical therapy once a week for 15 minutes in the school setting. Carter does not receive any additional therapy in the private setting. He did not receive behavioral therapy in the school or private settings.

Carter's initial language test results indicated that his receptive language skills were below levels expected for his chronological age. According to the *PPVT-4*, Carter was able to comprehend single-word vocabulary at an age-equivalency of 2 years; 3 months. He demonstrated a 2 year; 2 month deficiency in his ability to understand the target vocabulary. Carter's mother reported that he was able to understand simple directions, names for people and objects, and names for body parts. He did not yet understand prepositions (e.g., in, under, on) or color and size words.

Carter used a combination of natural speech, gestures, and sign language to communicate. He was able to greet others and seek attention. According to unfamiliar listener reports, as evidenced in the *I-ASCC* scores in Table 1, Carter was 0% comprehensible when the

listener *did not* have information regarding the context of the word, as well as 0% comprehensible when the listener *had* information regarding the context of the word. Carter had limited verbal expressive vocabulary of 4-5 words and was reported to become frustrated when he was not understood. He demonstrated injurious behaviors, such as hitting his communication partner, when he was not understood by his caregivers. He did not exhibit self-injurious behaviors. Carter had a signing vocabulary of over 60 traditional signs and home-signs that he used with moderate to maximum cuing from his parents. Carter's mother understood the verbal and signed words that he expressed in most instances, but she also reported that unfamiliar listeners were unable to comprehend Carter's messages. Furthermore, Carter's mother reported that he expressed 87 words on the *CDI*. Carter's longest utterances were reported to be an average of one word in length. His mother reported his longest utterances as "ball," "up," and "bye bye" in her parent report. Carter had never used a high-tech AAC device, and he was referred to the university-based clinic by his school-based SLP for an AAC evaluation, which yielded his referral to participate in the current investigation. Mrs. Campbell reported that Carter had *minimal* previous exposure to one text used in the intervention; he had previously read the book at home, but had not read the book in approximately one year.

Parent (Mrs. Campbell). Carter's mother, Mrs. Campbell, was a 43 year-old Caucasian female monolingual speaker of English. Mrs. Campbell had completed some college courses and started working as a realtor during the same week Carter enrolled in this investigation. She described herself as fluent and literate in English with no known speech, language, or hearing impairments that would prevent her from reading children's books. Prior to her involvement in

the present investigation, Mrs. Campbell was observed to implement the targeted strategy or component skills during book reading activities with Carter in fewer than 25% of opportunities.

Materials

Materials utilized during this investigation included (a) mobile AAC technology, (b) themed storybooks, (c) iPhones with parent preferred video conferencing applications, and (d) age-appropriate toys.

Mobile AAC technology. Participants were provided with mobile AAC technologies for use throughout this investigation. Each child participant used an Apple iPad[2] equipped with a GoNow[3] protective case and TouchChat HD-AAC with WordPower [4] communication application. Separate communication displays were created for each storybook read during the investigation. Displays were configured in a grid format and all pages were (a) generated using PCS symbols[5], (b) seven columns wide and six rows long, and (c) consisted of symbols and organization typically used in aided AAC systems (e.g., left-to-right organization). Consistent with previous research published interactive storybook reading investigations (e.g., Binger et al., 2010; Kent-Walsh, Binger, & Hasham, 2010; Kent-Walsh, 2003), the same displays were

[2] An iPad is a Generation 2 tablet manufactured by Apple, Inc. which includes a touch interface and 9.7" screen. iPads have Wi-Fi capabilities and are designed for web browsing, e-mail, and entertainment. Apple, Inc, 1-800-MY-APPLE, www.apple.com

[3] GoNow Cases for iPad 2, 3, 4 are manufactured by Attainment Company and include a built-in handle and high-impact exterior to protect the iPad from damage. The design of the case allows for increased audio clarity and volume, as well as including a magnetic switch on the front of the case which enables users to turn the iPad on/off. Attainment Company, 1-800-327-4269, www.attainmentcompany.com

[4] TouchChat HD-AAC with WordPower is a communication application for individuals who have difficulty using their natural voice. The WordPower series includes AAC vocabulary designed by Nancy Inman, which are designed for intuitive communication. The application is available for purchase on the Apple App Store.

[5] PCS Symbols are the registered trademark of Mayer-Johnson. These line drawing representations of vocabulary items are preloaded onto the TouchChat HD-AAC with WordPower communication applications. Mayer-Johnson, 1-800-588-4548, www.mayer-johnson.com

available to each participant. Therefore, all participants had the same vocabulary, number of icons, and storybook conventions available to them during all phases of the investigation. Efforts were made to ensure communication display pages included all relevant vocabulary for each storybook while also maintaining developmentally appropriate expectations for the child. All major agents, actions, adjectives, prepositions, and objects of the narrative and illustrations were included for each page of the book. In addition, three wh-question words (i.e., "who," "what," "where") were included on each display. Common vocabulary associated with book reading (e.g., "turn page," "open flap") and device mechanics (e.g., "." to repeat entire message, "clear" to clear the display) were included on each page as applicable. The number of vocabulary items, however, did not exceed the 42 button locations. Example displays from each storybook series included in the investigation are available in Appendix D.

Themed storybooks. Storybooks selected for this investigation met the criteria outlined in previous studies by Kent-Walsh, Binger, and colleagues (2008, 2010, 2010), where the selected books (1) included illustrations, (2) incorporated developmentally appropriate text and themes as determined by parent reports and receptive language assessment results, and (3) included at least six double-page spreads (Binger, Berens, et al., 2008; Kent-Walsh, Binger, & Malani, 2010; Kent-Walsh, 2003). While several storybook series were considered, storybooks from the *Mickey Mouse Clubhouse* series by various authors were used to ensure familiarity with characters, plotlines, and storybook macrostructure by both parents and children. Additionally, storybooks from the *Disney Frozen* and *Disney Cars* series, both by various authors, were employed for generalization measures. Participants were given a choice of reading books from either *Frozen*, or *Cars*, or both series during generalization probes. A minimum of ten

storybooks from the *Mickey Mouse Clubhouse* series and a minimum of five storybooks each from the *Frozen* and *Cars* series were included in this investigation. See Appendix D for a list of the books included in the investigation.

iPhones with parent preferred videoconferencing applications. Families utilized their personal iPhone devices with FaceTime[6] or Skype[7] application and wireless Internet connections to facilitate the telepractice sessions. Given the comparable features available within these two distance connection platforms (Fleming et al., 2013), families were given a choice of their preferred platform in an effort to foster the greatest possible ease of participation. Features used during telepractice sessions included voice connection, video connection (on/off), and mute. Sessions occurred via the families' home networks, and the phone's internal camera was used to provide a visual connection. Video sessions were initiated by the researcher using a secured wireless connection in the research laboratory on an Apple iPad device. Dyad I (Ms. Adams and Ashley) used Skype and Dyads II and III (Mrs. Brown and Brandon; Mrs. Campbell and Carter) used FaceTime applications.

Age-appropriate toys. Age-appropriate toys were utilized in this investigation during each intervention session. Toys used in this investigation were (1) play dough, (2) knob and traditional puzzles, (3) bubbles, (4) crayons and coloring books, and (5) a rectangular sensory container filled with rice and small manipulates (e.g., plastic dinosaurs, farm animal erasers,

[6] FaceTime is a commercially available video conferencing software available exclusively on Apple operating systems. The application accesses the internal camera and microphone from the hosting device and connects two or more parties using an Internet connection. FaceTime is the registered trademark of Apple, Inc. Apple, Inc., 1-800-MY-APPLE, www.apple.com

[7] Skype is a commercially available video conferencing software available on Apple, Windows, and Android platforms. The application utilizes the internal microphone and camera from the hosting device and connects two or more parties using an Internet connection. Skype is a registered trademark of Microsoft. Microsoft, 1-800-936-5900, www.skype.com

strings of plastic beads). A limited selection of the toys listed above was available during each session, and toys were rotated on a regular basis.

Procedures

The investigation included four phases (1) baseline, (2) intervention, (3) generalization, and (4) maintenance phases. Strategy instruction occurred in a naturalist environment in the university-based clinic at the convenience of the parent-child dyad, and parents provided their own transportation for the duration of the investigation. Please see Table 2 below for an overview of each phase and the timeline of the investigation. Furthermore, details of the procedures within each phase of the investigation follow.

Table 2. *Investigation timeline*

Phase	Timeline	Content & (Format)
Pre-Baseline	• June	• Pre-test Assessment Session (face-to-face)
Baseline	• June • September-November	• Mobile AAC technology workshop (face-to-face) • Baseline measures (telepractice)
Intervention	• October-December	• Nine session treatment package (6 face-to-face sessions and 3 telepractice sessions)
Post-Intervention	• October-December	• Post-Intervention measures (telepractice)
Generalization	• November-December	• Generalization measures (telepractice)
Maintenance	• November -January	• Maintenance measures (telepractice)

Baseline Phase

Mobile AAC technology workshop. Two months prior to baseline data collection, participants engaged in a four-hour mobile AAC technology workshop. The parent-directed mobile AAC technology workshop was held at a local elementary school in the summer months prior to baseline data collection, and all parent participants attended. Graduate speech-language pathology students provided childcare while the parents participated in the workshop. A trained nationally and state-certified SLP with extensive knowledge of the technology and communication application conducted the workshop with the researcher present throughout. The workshop included: (a) general information about augmentative and alternative communication; (b) introduction to the TouchChat HD-AAC with WordPower communication application; and (c) specifics as to how to use, customize, and modify the application for a particular user. The workshop resembled typical workshops often hosted by local assistive technology demonstration centers, by communication application developers, and at family-focused conferences (TouchChat, 2016). The focus of the workshop was on operational competencies (Light & McNaughton, 2014; Light, 1989) associated with use of the AAC application; an introductory level hands-on introduction to the mobile AAC technology was provided during the workshop. Participants learned the Menu and Vocab features of the application to aid in customizing the display for a variety of learners. The workshop combined modeling, guided practice, and independent practice of content. The workshop was incorporated to ensure consistency of parents' knowledge of mobile AAC technology prior to the intervention protocol.

Measures. Baseline measures were taken to determine dyads' levels of interaction during storybook reading and variability on the dependent measures prior to the initiation of the

intervention protocol. Parents were asked to read the provided storybooks from the selected series (i.e., *Mickey Mouse Clubhouse* and *Disney Cars/Disney Frozen)* in a manner consistent with their typical shared storybook reading interaction for a minimum of ten minutes. Dyads were free to read as many books as desired during each session, depending on the length of the storybooks and children's attention and preferences. Families had the mobile AAC device available to them during the baseline probes. No reference was made to the devices, and parents were not given explicit instruction to use the devices.

Baseline measurements for each of the dependent variables were taken during the shared storybook reading session with each parent-child dyad. All baseline data collection occurred via telepractice in the families' homes with video recording equipment and storybooks available; dyads engaged in shared storybook reading for a minimum of ten minutes. Sessions took place in a quiet, familiar home environment with no instruction or interaction from the investigator. Video recording of the sessions began immediately upon initiation of the storybook reading and lasted for the duration of each storybook reading session. The researcher did not interrupt the dyads while they read and signaled that the minimum time period had been met as soon as a natural breaking point after 10 minutes (e.g., upon conclusion of reading a given book, upon demonstration of fatigue of the parent or child while reading a particular book). A nine-minute segment of the session of each recording was analyzed and coded for data collection purposes. Coding began 30-seconds after the recording began and continued for 9 minutes. These procedures remained consistent across all phases of the investigation.

Baseline data collection continued until stability was reached and there was no evidence of an increasing trend. Stability was defined as ±15% variability around the mean (McReynolds

& Kearns, 1983). One dyad entered into the treatment phase at a time, and the other dyads remained in the baseline condition until an apparent treatment effect was evidenced for the preceding participant. The baseline phase continued for a minimum of five data collection points, and baseline probes were taken for both treatment and generalization book series (Kratochwill et al., 2010, 2013). Participating dyads were randomly ordered by assigning each dyad a number and using a random number generator to select their position within the intervention initiation sequence.

Intervention Phase

Following establishment of a stable baseline, the instructional program was implemented sequentially with each dyad. Once a stable treatment affect was achieved for the first participating parent, the intervention program was then initiated with the next parent, and so forth. A demonstrated treatment effect was defined as an increase in parent use of the target strategy in 20% of opportunities (i.e., parents utilize the target strategy on one out of five double-page spreads). This phase of the investigation utilized both face-to-face (6 sessions) and telepractice sessions (3 sessions), and post-intervention data collection continued for a minimum of five data collection points.

The intervention phase utilized a strategic, mixed-mode communication partner instruction program incorporating ongoing child involvement and face-to-face and telepractice sessions to teach parents a specific communication prompting strategy. The communication partner instruction program was adapted from the ImPAACT approach by Kent-Walsh and Binger (2008, 2010, 2010). The instructional program included a (1) description, (2) demonstration, (3) supported practice, and (4) independent practice of a specific prompting

strategy, discussed below. This approach to instruction has been cited as a strategic approach to educating communication partners by AAC researchers (e.g., Binger, Kent-Walsh, et al., 2008; Binger et al., 2010; Kent-Walsh, Binger, & Malani, 2010; Kent-Walsh & Binger, 2013; Kent-Walsh & McNaughton, 2005; Kent-Walsh et al., 2015). Table 3 below shows a comparison of the original and modified programs.

Table 3. *Comparison of the original ImPAACT approach and modified approach*

Original ImPAACT Approach	**Modified Approach**
1. Pre-test & Commitment a. Provide examples of storybook reading sessions "with" and "without" use of the target strategy b. Discuss benefits of strategy use c. Sign a contract outlining instructional activities d. Occurs in a face-to-face setting	1. Pre-test & Commitment a. Discuss benefits of target strategy use b. Occurs in a face-to-face setting
2. Strategy Description a. Provide partners with a visual aid outlining the *entire* strategy b. Review *all* of the skills within the strategy c. Occurs in a face-to-face setting	2. Strategy Description a. Verbally describe the *entire* strategy and provide partners with a visual aid outlining the strategy b. Review *one* skill of the strategy per week c. Repeat strategy description step for *each* skill over the course of *three* weeks; extend learning from previous weeks by incorporating all previously learned skills d. Occurs in a face-to-face setting

Original ImPAACT Approach	Modified Approach
3. Strategy Demonstration a. Role play strategy use with the researcher acting as the partner and the parent acting as the child. b. Use "think-aloud" statements while implementing the strategy c. Occurs in a face-to-face setting	3. Strategy Demonstration a. Implement strategy with the *child* and researcher acting as the communication partner b. Use "think-aloud" statements while implementing the strategy to explain thought process to parents c. Focus on *one* skill of the strategy per week d. Repeat strategy demonstration step for *each* skill over the course of *three* weeks; extend learning from previous weeks by incorporating all previously learned skills e. Occurs in a face-to-face setting
4. Verbal Practice of Strategy Steps a. Rote verbal rehearsal of strategy steps b. Use a pneumonic device c. Occurs in a face-to-face setting	Verbal Practice of Strategy Steps was omitted
5. Controlled Practice and Feedback a. Role play with partner playing role of self and the researcher playing role of the child b. Gradually faded verbal corrective and positive feedback c. Gradually increased complexity of child behaviors d. Occurs in a face-to-face setting	4. Controlled Practice and Feedback a. Parents implement the *one* skill learned while reading with their child b. Researcher provides gradually faded corrective and positive feedback c. Parents are coached through complex child behaviors/responses as they arise d. Gradually faded verbal corrective and positive feedback e. Repeat controlled practice and feedback step for *each* skill over the course of *three* weeks; extend learning from previous weeks by incorporating all previously learned skills f. Occurs in a face-to-face setting

Original ImPAACT Approach	Modified Approach
6. Advance Practice and Feedback a. Live storybook reading between the partner and child b. Gradually faded verbal corrective and positive feedback c. Occurs in a face-to-face setting	5. Independent Practice and Feedback a. Shared storybook reading between the parent and child b. Parents implement the *one* skill learned while reading with their child c. Researcher provides gradually faded corrective and positive feedback d. Repeat advanced practice and feedback step for *each* skill over the course of *three* weeks; extend learning from previous weeks by incorporating all previously learned skills e. Occurs in a telepractice setting
7. Post-test & Commitment a. Review "pre" and "post" instruction videos b. Discuss differences in client behaviors and associated impact of the instruction c. Generate an action plan to encourage long term strategy use d. Occurs in a face-to-face setting	6. Post-test & Commitment a. Discuss differences in child behaviors and associated impact of the instruction using an online survey tool b. Occurs via the internet
8. Generalization d. Live storybook reading between the partner and child using a *novel* instructional context a. Gradually faded verbal corrective and positive feedback b. Occurs in a face-to-face setting	7. Generalization a. Shared storybook reading between the parent and child using a *novel* instructional context c. Gradually faded verbal corrective and positive feedback b. Occurs in a telepractice setting

Furthermore, the present intervention utilized the mixed-mode instructional program to teach parents the Read-Ask-Answer (RAA) strategy. The RAA strategy (Kent-Walsh, 2003) is an evidence-based strategy for modeling and eliciting communication from children with CCN. The RAA strategy and its variations have been used with numerous communication partners and children with AAC needs across multiple geographic regions, age-groups, and education levels (e.g., Binger, Kent-Walsh, et al., 2008; Binger et al., 2010; Kent-Walsh, Binger, & Hasham,

2010; Kent-Walsh, Binger, & Malani, 2010; Kent-Walsh & Binger, 2013; Kent-Walsh & McNaughton, 2005; Kent-Walsh, 2008; Rosa-Lugo & Kent-Walsh, 2008).

The RAA strategy is comprised of the following steps, as described in Kent-Walsh (2003, p. 58-59):

- Elicitation component:
    - Read + Model: "oral reading of the text on a given double-page spread of the book, accompanied by modeled use of the AAC system to produce key words in the text (at least one word);"
    - Expectant delay: "pausing for an individually predetermined period of time (i.e., typical student turn transfer time + 5 seconds), while looking directly at the student using AAC to convey an expectation for him/her to take a conversational turn;"
    - Open-ended Question + Model: "oral asking of one of a series of predetermined open-ended question types (appropriate to the student's language comprehension level), which was related to the book being read, accompanied by modeled use of the AAC system to produce key words in the question (at least one word);"
    - Expectant delay: as defined above
    - Answer + Model: "sample response to the open-ended question asked, provided orally, and accompanied by modeled use of the AAC system to produce key words in the response (at least one word)".
- Contingent response component: "a communicative turn that served as a direct reply to the [students'] prior communicative turn, shared the topic of the partner[s'] prior turn,

served to acknowledge the prior turn, and/or fulfilled the communicative attempt of the prior turn (e.g., answering a question, turning a page)."

The response component of the RAA strategy requires that communication partners respond contingently to all communicative turns taken by the child via any modality (i.e., speech, sign, or aided). The RAA strategy was used in its entirety for this investigation, and communication partners were provided access to a visual representation of the strategy (Appendix E).

In contrast with earlier investigations examining similar communication partner interventions (e.g., Binger, Kent-Walsh, et al., 2008; Binger et al., 2010; Kent-Walsh, Binger, & Malani, 2010; Rosa-Lugo & Kent-Walsh, 2008), this instructional protocol involved sequentially focusing on the RAA strategy steps each week. That is, as illustrated in Table 4, "Read + Model with Wait" was the focus of Week 1 intervention sessions; followed by "Ask + Model with Wait" as the focus strategy step in Week 2, and finally "Answer + Model with Wait" as the focus strategy step in Week 3. Further elaboration is provided below on how each weekly instructional strategy step focus was accomplished in a manner, which afforded sequential implementation of all steps as well as implementation of the other central skill inherent within the RAA strategy - responding contingently.

There were three types of intervention sessions used for this investigation (1) introductory sessions, (2) guided practice sessions, and (3) telepractice sessions. Appendix F describes the goals, content, and instructional strategies that were used during each session. Table 5 below summarizes the instructional content included in each session.

Table 4. *RAA Strategy Weekly Schedule*

Week	Sessions	RAA Strategy Step	Instructional Time
1	Sessions 1, 2, & 3	Read + Model with Wait	150 minutes
2	Session 4, 5, & 6	Ask + Model with Wait	150 minutes
3	Session 7, 8, & 9	Answer + Model with Wait	150 minutes

Table 5. *Session Type, Steps, and Procedures*

Session Type	Steps & Procedures
Introductory (60 minutes face-to-face)	1. *Pre-test & Commitment:* Discussed how AAC can contribute to multimodal communication, as well as benefits of the strategy use during shared storybook reading. 2. *Strategy Step Description*: Described the target RAA strategy step and provide the visual aide depicting the step. Answered parents' questions as needed. 3. *Strategy Step Demonstration*: Demonstrated using the target strategy step, along with any previously learned steps, with the child coupled with using a think-aloud approach for the duration of two storybooks. Answered parents' questions as needed.
	4. *Supported Practice with Feedback*: Guided parents in implementing the strategy step, along with previously learned steps, with their children with prompting and feedback given to parents as needed. Parents practiced for the duration of one storybook.
Guided Practice (60 minutes face-to-face)	3. *Strategy Step Demonstration*: Re-demonstrated the strategy step for parents, while also incorporating previously learned steps, using a fading think-aloud approach for the duration of one storybook. Answered parents' questions as needed. 4. *Supported Practice with Feedback*: Guided parents in implementing the strategy step, along with any previously learned steps, with their children with fading prompting and feedback given to parents as needed. Parents practiced for the duration of two storybooks.
Telepractice (30 minutes telepractice)	5. *Independent Practice with Feedback*: Parents practiced using learned steps with their children with minimal prompting and feedback given to parents as needed. Parents practiced for the duration of two storybooks.

Notes. Steps are intentionally numbered, as the second and third steps repeated during the guided practice sessions. See Table 3 for additional information.

Introductory sessions. Weekly component skill instruction began with a 60-minute introductory session. During each introductory session, the weekly target skill (e.g., Week 1 focused on "Read + Model with Wait," Week 2 focused on "Ask + Model with Wait) was described and modeled by the researcher with the parent and child present (See Table 4). After the researcher modeled the skill, the parent participated in guided practice with high levels of researcher support and feedback. These introductory sessions occurred during the first session of the skill series (i.e., Session 1 was an introductory session for the Read + Model component skill; Session 4 was an introductory session for the Ask + Model component skill).

Introductory sessions included:

- Step 1: Strategy step description,
- Step 2: Strategy step demonstration
- Step 3: Supported practice with feedback.

During introductory sessions, the researcher verbally described the component skill, modeled the use of the skill, and guided the parent's use of the skill. Additional information regarding the steps included in an introductory session is provided below.

Strategy description. During the introductory sessions, the researcher familiarized the parent with the RAA strategy. The skill (i.e., Read + Model, Ask + Model, or Answer + Model) was introduced and described for the participant and focus was given to the value of incorporating the strategy step into shared storybook reading. This strategy description occurred as soon as the dyad entered the treatment room while the child was becoming accustomed to the environment. The researcher engaged the child in a developmentally appropriate tabletop task,

such as play dough or coloring, while simultaneously describing the skill to the parent. Skill description occurred verbally, and the parent was given an 8 1/2" by 11" color copy of the information. Furthermore, a poster-size copy was hung on the treatment room wall.

Strategy demonstration. Following the description, the researcher engaged the child in shared storybook reading in order to demonstrate the use of the skill for the parent for the duration of two storybooks. The researcher demonstrated the skill (i.e., Read + Model or Ask + Model or Answer + Model) for the parent across several pages using a think-aloud model. The researcher spoke aloud while engaging with the child to illustrate the thought process involved in using the skill (e.g., "I will first read the text and provide at least one model using the iPad. Now I will wait for 5 seconds to see if Bobby responds. 1-2-3-4-5."). During the demonstration, the parent was encouraged to ask questions about the skill. The researcher answered the parent's questions and elaborated on her modeling and/or explanations as needed to assist the parent in learning the target component skill.

The focus child engaged in play between the two storybooks used during the strategy demonstration using the developmentally appropriate toys discussed in the materials section. After the first book finished, the child played with the toys for a maximum of five minutes in order to extend interest in the intervention session. Similarly, after the second book finished, the child played with the toys to provide a break from the storybook reading.

It is important to note, during the second and third introduction weeks (i.e., introductions to Ask + Model and Answer + Model), the researcher utilized those component skills previously learned by the parent. The second and third weeks built on what was taught in the first week by extending the parent's learning from week-to-week. Therefore, while the researcher was

modeling the use of the Ask + Model step, she also performed the Read + Model step that was required prior to executing the Ask + Model step. This same procedure was followed during the Answer + Model introductory session, where the researcher utilized the Read + Model and Ask + Model steps necessary prior to the Answer + Model step.

Supported practice with feedback. Lastly, the parent practiced implementing the skill with researcher support and feedback for the duration of one storybook. The parent engaged in shared storybook reading with her child using the skill, in addition to any previously learned skills, while the researcher provided verbal coaching and cuing to implement skills as needed. An errorless learning approach was employed as the parent was provided with immediate verbal feedback and assistance from the researcher while implementing the strategy. The researcher gradually reduced her feedback and scaffolding of the parent's use of the strategy until the parent was able to implement the skill independently and correctly in 80% of opportunities as measured by researcher real-time data collection.

Guided practice sessions. The second session each week focused on guided practice of the skill. During the guided practice sessions, the researcher demonstrated the skill, while also using any previously learned skills, (i.e., Week 2 Guided Practice Session incorporated the fluid use of the previously learned Read + Model step and Week 3 Guided Practice Session incorporated the fluid use of the previously learned Read + Model and Ask + Model steps), for the parents for the duration of one storybook. Following this model, the parent engaged in shared storybook reading with her child with decreasing levels of researcher support and feedback. The parent practiced with her child for the duration of two storybooks. These guided practice sessions occurred during the second session of the component skill series (i.e., Session 2

was a guided practice session for the Read + Model skill; Session 5 was a guided practice session for the Ask + Model skill).

Guided practice sessions included:

- Step 2: Strategy step demonstration, and
- Step 3: Supported practice with feedback.

The researcher demonstrated the skill for the parent and provided supportive feedback regarding implementation of the skill. Additional information regarding the steps included in guided practice sessions is provided below.

Strategy demonstration. The researcher re-demonstrated the use of the skill for the parent for the duration of one storybook. A think-aloud model was used for several pages, and the level of verbal description was gradually faded until the researcher was not providing any verbal rationale during the reading. Similarly to the introductory sessions, the parent was encouraged to ask questions throughout the demonstration. Furthermore, guided practice sessions continued the parent's learning of previously learned content, as sessions incorporated all previously learned skills.

The focus child engaged in play following the book used during the strategy demonstration using the developmentally appropriate toys discussed in the materials section. After the book was read, the child played with the toys for a maximum of five minutes in order to extend interest in the intervention session.

Supported practice with feedback. The parent practiced her implementation of the skill, in addition to any previously learned skills, for the duration of two storybooks following the researcher model. This stage was used to facilitate the parent's independent use of the RAA strategy skills while fading researcher support and feedback. The parent practiced implementing the component skills in authentic, diverse environments with decreasing prompts and feedback in order to prepare them for independent practice in the home. The naturalistic reading environment ensured that parents were able to practice their skills across several storybooks with a variety of communication displays.

Consistent with the above procedures, the child engaged in play between the two storybooks used during the supported practice stage of the session using the developmentally appropriate toys discussed in the materials section. After the first book was read, the focus child played with the toys for a maximum of five minutes in order to extend interest in the intervention session.

Telepractice session. Telepractice sessions occurred in the participant's home using personal iPhones and video conferencing applications. The researcher contacted the parent via a preferred video conferencing application (e.g., FaceTime or Skype), and the parent placed her iPhone on a hard surface for stability during the session. The parent moved the phone throughout the session as the storybook reading interactions naturally moved around the room.

The parent engaged in "Step 4: Independent practice with feedback" of component skills learned to date with minimal researcher feedback and support. The participant initially engaged in shared storybook reading with her child for the duration of one storybook. During this reading, the researcher disabled her camera and microphone to help maintain the naturalistic

reading environment. Therefore, the researcher was able to see and hear the participant, but the dyad was unable to see or hear the researcher. The researcher provided audio guidance as needed during the session, and engaged the video camera as necessary for participant performance (e.g., the child wanted to know if the researcher was engaged in the session). Additionally, the researcher took handwritten notes regarding the parents' implementation of the component skill during the reading.

Following the reading of one storybook, the researcher enabled her video camera and microphone to provide feedback to the parent. Positive comments regarding the storybook reading were given, and a maximum of three aspects of the reading which needed improvement were identified. Positive comments included, "Excellent use of the iPad to model for Bobby how he can use the iPad to communicate," "Perfect wait time!," "Great job in responding to what Bobby said while also correcting his answer to the question.," and "It's amazing to see that by you just waiting five seconds after reading, Bobby jumps in to ask questions and make comments." Improvement statements included, "Remember to wait for at least 15 seconds after you read and model before asking a question," "Remember that we are not worried about reading the book from cover to cover; rather, we want to let the story and pictures serve as conversation starters. Even if we just read a few pages in 10 minutes, it's fine. We want to give Bobby the chance to talk about what he is interested in."

After providing these brief comments, the parent engaged the focus child in shared storybook reading using the component skills learned during the face-to-face sessions for the duration of a second book. The researcher again disabled her video and audio connections during the reading. However, during the second reading, the researcher would interject quick

positive comments to reinforce the changes the parent made in response to the improvement statements. For example, if the parent was reminded to increase her wait time, the researcher would interject positive words, such as "Perfect" or "Excellent wait time" when the parent demonstrated appropriate wait time during the second reading. Furthermore, the researcher continued to write notes regarding positive implementation aspects and areas where additional attention or improvement were needed.

At the end of the telepractice session, the researcher launched her video feed to provide additional feedback and answer questions from the participant. The dyad was thanked for their participation in the session and notified that the parent would receive written feedback via her personal email account within 24 hours of the session. Positive aspects of the telepractice session were identified in writing for the parent to review, as well as a maximum of three areas where improvement in the book reading was needed. Feedback was emailed to the parent using the template in Appendix G. The parent was not asked to respond, but any requests for clarification or expansion were provided within 24 hours.

Data collection. Data collection began immediately following the completion of the nine session treatment package (e.g., post-intervention). A minimum of five probes occurred via the distance connection with dyads engaging in shared storybook reading of the *Mickey Mouse Clubhouse* books for a minimum of ten minutes per session.

Generalization Phase

Generalization measures were used to determine the extent to which participants were able to generalize their use of the RAA strategy to a novel storybook series. Generalization

probes began once the participants demonstrated stable performance in the treatment phase. Stability was defined as an increase in communicative turns of at least 100% over baseline levels and no drop in communicative turns below highest baseline levels. Stability was defined using a percentage to ensure individual variances in baseline lines levels were accommodated. Participants read storybooks from *Disney Frozen* and/or *Disney Cars* series via the distance connection for a minimum of ten minutes with nine-minutes of analysis; consistent with treatment procedures. Participants were given the choice of reading books from the *Disney Frozen* book series, or the *Disney Cars* book series, or a combination of both series. A minimum of three generalization probes were included for each dyad.

Maintenance Phase

Maintenance probes were conducted two and four weeks following the completion of the intervention to determine RAA strategy use over time. Probes were completed to measure performance on all dependent variables (i.e., parents' implementation of the target strategy and children's communicative turntaking) and collateral measures (i.e., semantic diversity) during the shared storybook reading sessions. Participants engaged in shared storybook reading using books from both the *Mickey Mouse Clubhouse* treatment series and *Frozen/Cars* generalization book series. Books were selected from each series based on children's preferences consistent with post-intervention and generalization procedures.

Fidelity of Implementation

Fidelity of implementation was monitored using fidelity checklists created by the researcher (Appendix H). The researcher provided training to two undergraduate students regarding all instructional procedures and methods. Training continued until the researcher and

reviewers reached 95% compliance and reliability of coding on the fidelity checklists. Training videos were from a pilot investigation of the intervention completed with participants not included in the present investigation.

Trained undergraduate students viewed video recordings of sessions and completed the corresponding fidelity checklist. A random sample of 20% of the sessions from each phase were selected for fidelity review (Gast, 2010, p. 161). Coders were blind to the purpose and phase of the investigation. Fidelity of implementation was calculated using the following equation: number of steps implemented correctly divided by the number of steps correct, plus number of steps incorrect, plus number of steps omitted. Mathematically written as:

$$\frac{number\ of\ steps\ correct}{number\ of\ steps\ correct + number\ of\ steps\ incorrect + number\ of\ steps\ omitted}$$

One hundred percent fidelity of 100% implementation occurred, indicating that the procedures were implemented consistently both across and within each participating dyad. If implementation had fallen below 90%, additional intervention sessions would have been provided for participants to ensure consistent implementation of intervention procedures.

Participant Compensation

Dyads were compensated for participating with a $20 Target gift card for each block of telepractice sessions completed, each live session completed, and each maintenance session completed. Therefore, participants were compensated for a minimum of 12 opportunities and had an opportunity to receive $240. Also, families were gifted storybooks and mobile AAC technology to facilitate their participation in the investigation.

Measures

Dependent Measures

Two types of dependent measures examined during the 9-minute interactive storybook reading probes (a) measures of the parents' use of the taught RAA strategy and (b) turntaking measures of the children using AAC. Specifically the following data were collected (a) the percentage of accurate implementation of the RAA strategy out of the total number of opportunities to implement the strategy and (b) the frequency of the children's multimodal communicative turns. Multimodal turns are defined as "comments or questions related directly to the book being read or related to the child's relevant experiences and [include] responses to questions asked by the parents, comments, or labeling book illustrations or events, and pretending to read the book" via any mode of communication, including verbal speech, manual sign, or aided language (Rosa-Lugo & Kent-Walsh, 2008, p. 54). Additionally, collateral measures of the number of the children's novel semantic concepts were calculated. This measure was used to determine the diversity of messages communicated by the children across the shared storybook reading probes.

The above dependent measures were selected due to their integral role in children's progress towards communicative competence. Light (1989) discussed communicative competence as being directly related and dependent on communication partners' behaviors. Therefore, parents' accuracy of interactions with their children must be measured, as they directly contribute to children's competencies. In addition, children's multimodal communicative turntaking speaks to their social competence, or ability to communicate socially. Semantic diversity, as measured through collateral data collection, further indicates children's

linguistic competence (Light, 1989). Social and linguistic competence contribute to children's overall linguistic competence and are therefore cogent, clinical indicators of the success of the AAC intervention.

Data Transcription and Coding

Training. Two blinded, trained undergraduate students transcribed and coded data for the present investigation. Training occurred using a researcher-made instructional video and participant videos from a pilot investigation. The researcher provided verbal instruction in the transcription and coding process, completed the tasks in tandem with the student, and provided samples videos for independent practice. Training continued until the students reached 95% accuracy.

Transcription. Video recordings of the 10-minute shared storybook reading interaction probes were transcribed and a 9-minute segment in the middle of each recording was coded for subsequent analysis. Videos were transcribed verbatim by a trained undergraduate student and reliability of transcriptions analyzed, as detailed below. Videos were transcribed through repeated viewings of the video segments. Transcript reliability measures were implemented and disputes over transcriptions settled prior to data coding.

Coding. Transcripts were coded by a trained undergraduate student in Communication Sciences and Disorders for parents' use of the RAA strategy and children's multimodal communication. Coding required transcripts and repeated viewings of the 9-minute probe segments using the operational definitions described in Chapter 1. The following parent behaviors were noted during coding (a) book title, (b) page number, (c) time of page turn, (d) steps implemented correctly, and (e) steps implemented incorrectly or omitted. Furthermore,

children's behaviors noted during coding included (a) book title, (b) page number, (c) time of communicative turn, (d) communicative message, (e) mode of communicative turn, and (f) spontaneity of communication.

Parent data. Parents' implementation of the target strategy was examined on each double-page spread immediately upon the parent turning the page. In accordance with Kent-Walsh's 2003 procedures (pp. 58-59), parents' implementation of the following elicitation and response components were coded:

- Elicitation component:
    - Read + Model: "oral reading of the text on a given double-page spread of the book, accompanied by modeled use of the AAC system to produce key words in the text (at least one word);"
    - Expectant delay: "pausing for an individually predetermined period of time (i.e., typical student turn transfer time + 5 seconds), while looking directly at the student using AAC to convey an expectation for him/her to take a conversational turn;"
    - Open-ended Question + Model: "oral asking of one of a series of predetermined open-ended question types (appropriate to the student's language comprehension level), which was related to the book being read, accompanied by modeled use of the AAC system to produce key words in the question (at least one word);"
    - Expectant delay: as defined above

- Answer + Model: "sample response to the open-ended question asked, provided orally, and accompanied by modeled use of the AAC system to produce key words in the response (at least one word)".

- Response component: "a communicative turn that served as a direct reply to the [students'] prior communicative turn, shared the topic of the partner[s'] prior turn, served to acknowledge the prior turn, and/or fulfilled the communicative attempt of the prior turn (e.g., answering a question, turning a page)."

As previously indicated, the first opportunity for implementation of the strategy occurred as soon the page was turned. Subsequent uses of the target strategy on the same double-page spread were not coded. It is important to note that in the event that the child took a communicative turn as soon as the page was turned, the parent was solely required to implement the "response component" of the strategy to be considered an accurate implementation. Furthermore, the target strategy is comprised of seven individual actions, and parents must have made no more than one error in their execution of the steps for the opportunity to be coded as a correct implementation (i.e., correct implementation of the read + model and expectant delay steps, but then failing to respond to the child's communicative turn was coded as correct). Furthermore, parent' use of the target strategy was coded as incorrect if the parent made more than one error per opportunity (i.e., correct implementation of the read + model, failure to utilize the expectant delay, correct implementation of the ask + model, and failure to respond to the child's communicative turn was coded as incorrect).

Child data. Children's multimodal communicative turns were defined as "comments or questions related directly to the book being read or related to the child's relevant experiences and

[included] responses to questions asked by the parents, comments, or labeling book illustrations or events, and pretending to read the book" via any mode of communication, including verbal speech, manual sign, or aided language (Rosa-Lugo & Kent-Walsh, 2008, p. 54). This definition is consistent with definitions used by Moody and colleagues (2010) in their study of communicative turntaking during shared storybook reading session with 25 typically developing children. Communicative turns included "labeling references (e.g. 'What is that?'), story/comprehension (e.g. 'Why is he sleeping?'), external referencing (e.g. 'My classroom looks like that one'), medium specific referencing (e.g. 'Help me click here'), and miscellaneous referencing (e.g. 'Cool', and 'Yes') (Moody et al., 2010, p. 303). Those communicative turns not related directly to the book or relevant experiences were not coded (e.g., parent asks child if he wants to read another book and the child replies with yes). Pointing to pictures, turning pages, and selecting books were not counted as communicative turns. The following modes of communication were recognized as turns (a) use of the AAC device, (b) intelligible speech, (c) manual signs, and (d) nodding or shaking head yes or no. Novel semantic concepts were defined as words which carry unique meanings from those words previously used (Kent-Walsh, 2003). Therefore, words that were different from those already expressed were coded as unique, novel semantic concepts. AAC displays used in this investigation encouraged semantic diversity, so determined of semantic diversity occurred most often during spoken messages. For example, the words "Mickey Mouse" and "Mickey" were as the same semantic concept because both are in reference to one specific character. Also, the words "yes" and "yeah" were coded as one semantic concept because both words indicated the same positive affirmation.

Coding for the main children dependent variable (i.e., the frequency of multimodal communicative turns) required each communicative turn to be classified as related or unrelated to the book content and children's experiences. Once all communicative turns were classified, the number of turns occurring during the probe segment were counted, and the modality of the turn was indicated. Coding for the novel semantic concepts consisted of determining the total number of unique communicative turns that were expressed during the 9-minute probe segment. Reference Appendix I for the data collection and reliability forms.

Reliability

To ensure consistency of data recording throughout the investigation, 2-minute segments of 100% of the sessions in which dependent measures were collected were analyzed for reliability of transcription and data coding (Gall, Gall, & Borg, 2007; Gast, 2010). Independent, trained undergraduate students randomly selected 2-minute segments within each session for review; coders were blinded to the phases of the video segments and the purpose of the investigation. Inter-rater agreement (IRA) was calculated for the two main dependent variables using a point-by-point agreement method (Gast, 2010), where IRA is equal to the number of agreements divided by the sum of the agreements, disagreements, and omissions. Average reliability scores of 96% (range = 86% to 100%) were calculated for the transcriptions. Reliability of coding was 100% for all dependent measures. This high level of reliability suggests accurate recording the data (Gast, 2010).

Data Analysis

Data were graphed and visually inspected for (1) level, (2) trend, (3) variability, (4) immediacy of the effect, (5) overlap, and (6) consistency of data patterns across similar phases

(Kratochwill et al., 2010). Visual analysis procedures were completed following the guidelines provided by Kratochwill et al. (2010, pp. 19–21).

In addition, the graphs were analyzed to determine the improvement rate difference ([IRD]; Parker, Vannest, & Brown, 2009). IRD was calculated using the procedures outlined by Parker et al. (2009); where IR_T-IR_B= *IRD* and IR_T is the improvement rate in the treatment phase and IR_B is the improvement rate in the baseline phase and *IR* is calculated as the number of improvements divided by the total number of data points in the phase. IRD scores of 0.8 or greater are considered large effect sizes (Parker & Vannest, 2009). To minimize the potential for human error, an online IRD calculator which employs the above formula was used (Vannest, Parker, & Gonen, 2011).

Social Validation

Social validity is the determination of the social significance of the (1) goals of the research, (2) procedures used during the research, and (3) effects of the results of the research (Wolf, 1978). Specific to this investigation, parents' perspectives of children's multimodal communicative turntaking during storybook reading was investigated. In order to determine the social significance of the telepractice intervention, participants' views of the importance and impact of the treatment were determined via parent questionnaire. Parents completed a questionnaire indicating the extent to which they agreed or disagreed that the intervention had a positive impact on their children's communication during shared storybook reading. The questionnaire was completed anonymously using the *Qualtrics* survey platform, and parents

were asked to answer Likert-scale questions, as well as short answer questions. Reference Appendix J for the parent questionnaire.

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CHAPTER FOUR: RESULTS

This study investigated the effects of systematic partner instruction via a mixed-mode (i.e., face-to-face and telepractice) service delivery model with the child present for the duration of the intervention on parents' use of the target strategy and multimodal communicative turntaking by children ages 3; 0 to 5; 11 with Down syndrome. Visual inspection analysis and Improvement Rate Difference (IRD) are reported. This chapter discusses (a) parents' implementation of the target strategy, (b) children's multimodal communicative turntaking, and (c) social validation.

Parents' Implementation of Read-Ask-Answer Strategy

Level of Acquisition

Figure 1 illustrates parents' percentage of accurate Read-Ask-Answer strategy use, as calculated by dividing the number of opportunities implemented correctly by the total number of opportunities and multiplying by 100%. The phase change lines between "Baseline" and "Post-Intervention" represent the implementation of all nine instructional sessions (i.e., the "introductory," "guided practice," and "telepractice" sessions), and the additional phase change lines are used to represent the shift between post-intervention/generalization and maintenance phases. The participating parents achieved high percentages of accurate implementation of the targeted strategy following completion of all instructional sessions, which constituted a total of 6 hours of face-to-face instruction and 1.5 hours of telepractice sessions. Instructional time was consistent across all participants to reinforce further the billable model of the intervention; which considers clinical appointment schedules and insurance billing requirements.

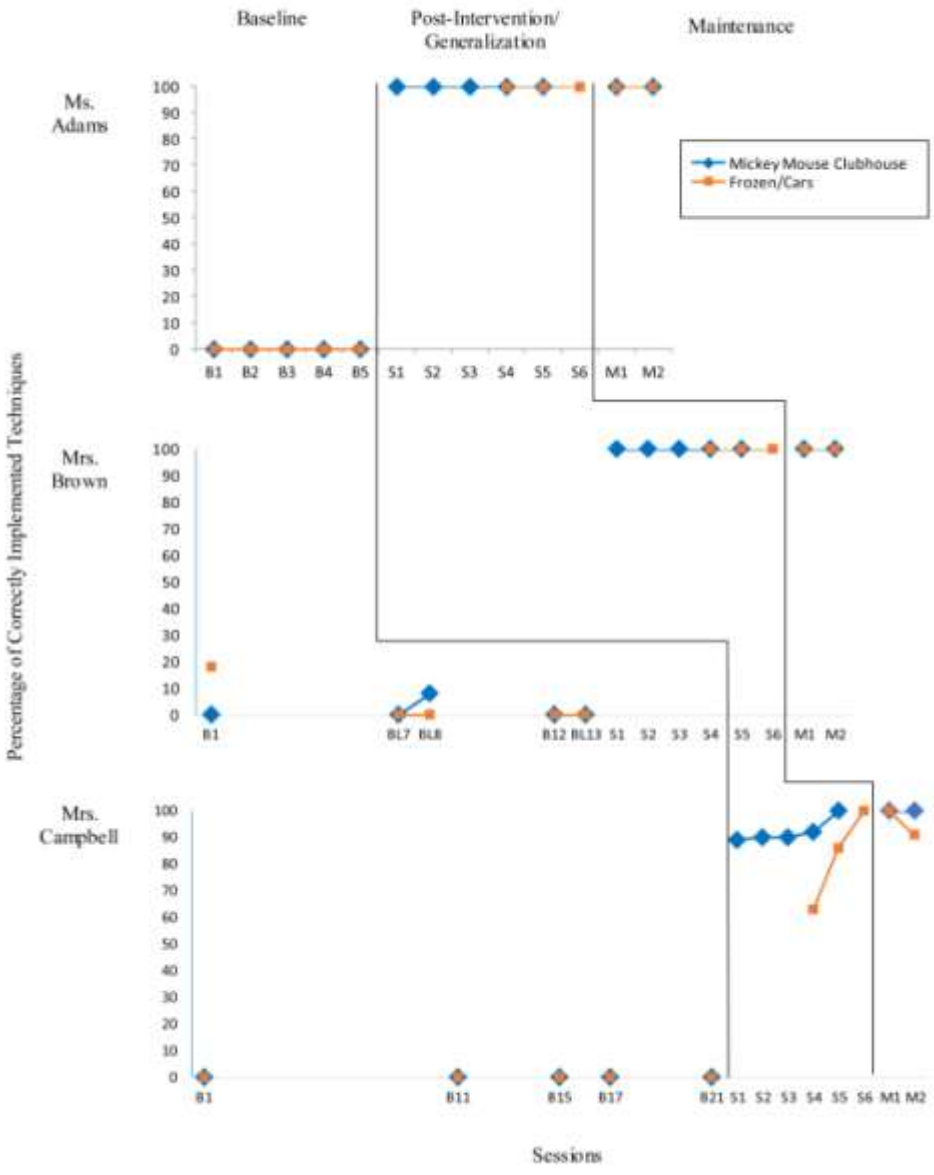


Figure 1. Percentage of parents' accurate implementation of the Read-Ask-Answer strategy

The parents' initial average percentages of accurate implementation of the RAA strategy during baseline was as follows for Ms. Adams, Mrs. Brown, and Mrs. Campbell 0%, 1.6%, and

0%, respectively. Visual inspection analyses indicate an immediate effect of the intervention, as all three participants increased from a maximum of 8% accurate implementation in baseline compared with 100% during the post-intervention phase. Please see Figure 1 for graphs depicting the percentage of parents' accurate implementation of the RAA strategy.

Generalization Phase. Results of this investigation suggest that the three parents evidenced generalized use of the RAA strategy to a novel book series. Figure 1, "Generalization" phase, depicts parents' use of the RAA strategy during a nine-minute shared storybook reading session of *Disney Frozen* and *Disney Cars* books. Parents maintained a high level of accuracy of the strategy use during the generalization phase (range = 63% to 100% accurate implementation).

Maintenance Phase. Shared storybook probes occurred two and four weeks following the conclusion of the post-intervention phase to determine if parents' use of the RAA strategy maintained over time. Figure 1, "Maintenance" phase, presents the percentage of accurate implementation across time. The three participating parents demonstrated a maintained use of the target strategy in 100% of opportunities for the treatment book series, *Mickey Mouse Clubhouse*, and a minimum of 91% accurate implementation for the generalization series, *Disney Frozen* and/or *Disney Cars* (range = 91% to 100% accurate implementation).

Improvement Rate Difference

Perfect IRD results (1.0) were obtained for comparisons between the baseline and post-intervention phases, as well as baseline to maintenance phases. IRD scores of 0.8 or greater are considered large effect sizes (Parker et al., 2009) Therefore, the intervention resulted in a large effect on parents' accurate strategy use.

Children's Turntaking

Level of Participation

Children's frequency of post-instructional multimodal communicative turns per shared storybook reading session is depicted in Figure 2. Across all participants, the greatest number of communicative turns taken in the baseline phase was 7 turns (range = 0 to 7 turns), and the least number of turns taken in the post-intervention phase was 10 turns (range = 10 to 110 turns). Perfect IRD results (1.0) were obtained for comparisons between the baseline and post-intervention phases, as well as baseline to maintenance phases. According to Parker, Vannest, and Brown (2009), IRD scores of 0.8 or greater are considered large effect sizes. Therefore, there was a large intervention effect on children's frequency of communicative turns following the intervention sequence.

Generalization Phase. During the generalization phase, all children evidenced increased frequency of communicative turntaking during novel storybook reading (IRD = 1.0). See Figure 2, "Generalization" phase, for children's frequency of communicative turns when reading a novel book series.

Maintenance Phase. Throughout the maintenance phase, all three children demonstrated a sustained ability to communicate at higher incidences than in the baseline phase (range = 26 to 63 turns for the *Mickey Mouse Clubhouse* series and 29 to 80 turns for the *Disney Frozen* and *Disney Cars* series). Improvement rate difference was 1.0 when comparing the baseline and maintenance phases.

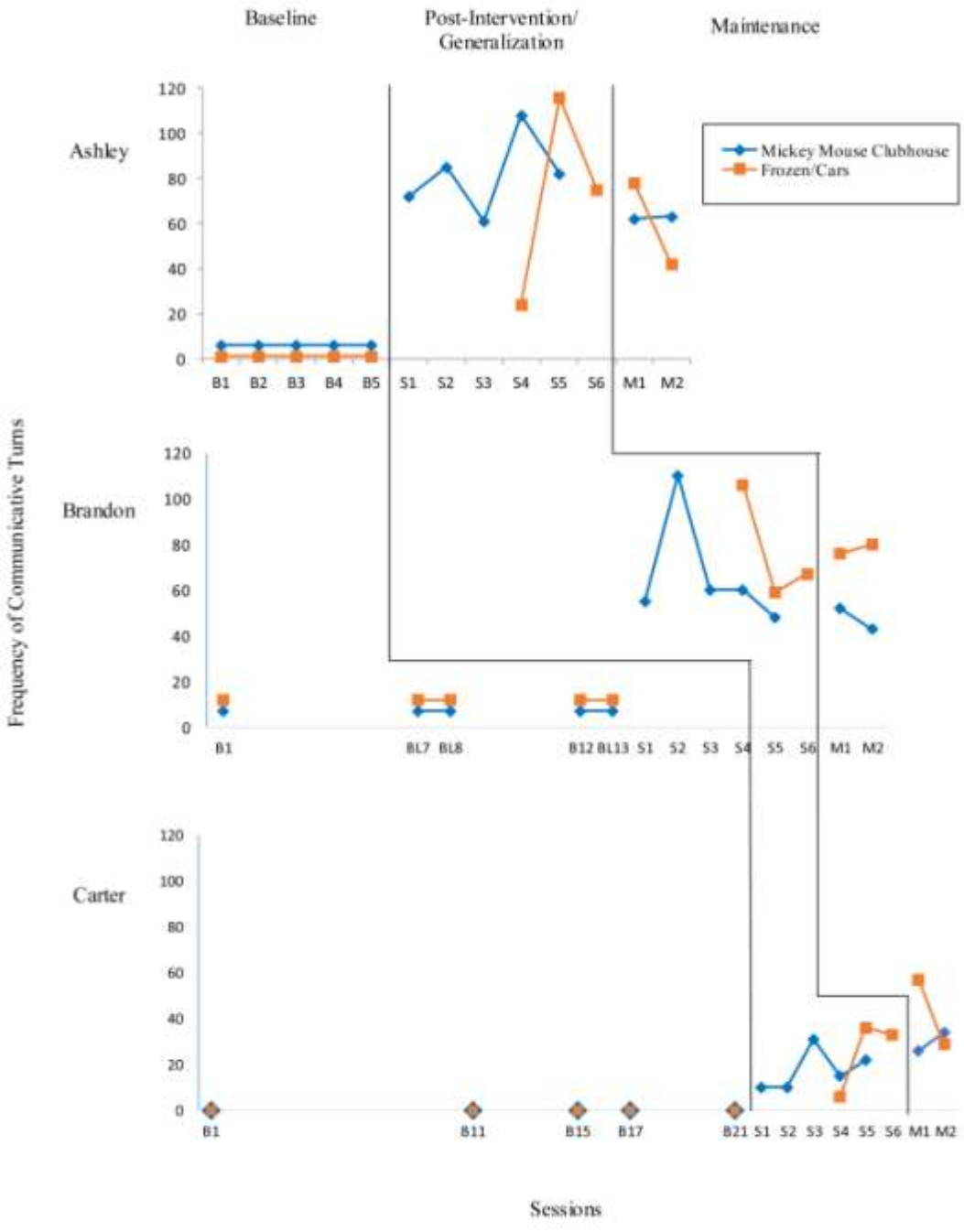


Figure 2. Children's frequency of communicative turns

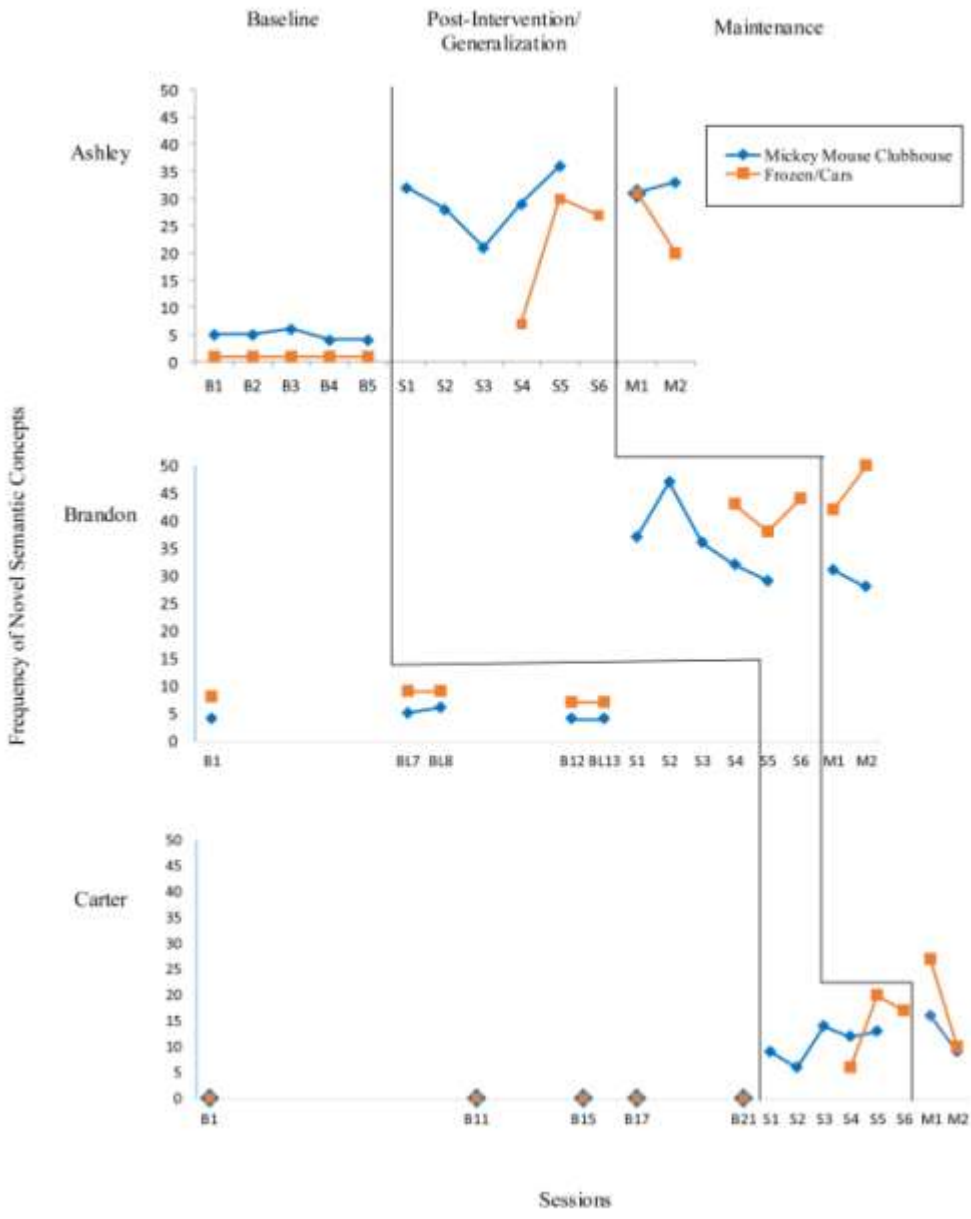


Figure 3. Frequency of children's novel semantic concepts

Frequency of Novel Semantic Concepts

Collateral measures indicated an apparent increase in the number of semantic concepts expressed by children participants during the nine-minute shared storybook reading probe (See Figure 3). Participants expressed an average of 3 semantic concepts in baseline (range = 0 to 6 concepts) and an average of 25 concepts during post-intervention (range = 6 to 47 concepts).

Generalization Phase. Similarly, participants evidenced an increase in their frequency of semantic concepts during nine-minute generalization storybook reading probes. The average number of semantic concepts expressed during the baseline phase was 3 concepts (range = 0 to 9 concepts), and the average number of concepts demonstrated during the generalization phase was approximately 26 concepts (range = 6 to 44 concepts).

Maintenance Phase. Consistent with performance in the post-intervention and generalization phases, there was a significant increase in the novel semantic concepts expressed over time. The average number of semantic concepts expressed during the baseline phase was 3 concepts (range = 0 to 6 concepts), and the average number of concepts expressed in the maintenance phase was 25 concepts (range = 9 to 33 concepts) for the *Mickey Mouse Clubhouse* book series. The average number of semantic concepts expressed during the baseline phase was 3 concepts (range = 0 to 9 concepts), and the average number of concepts expressed in the maintenance phase was 30 concepts (range = 10 to 50 concepts) for the *Disney Frozen* and *Disney Cars* book series.

Social Validation

Social validity data was collected anonymously. All participating parents indicated that they agreed or strongly agreed with the following statements: (1) The iPad was easy to use for communication during storybook reading; (2) I am likely to use the iPad and Read-Ask-Answer strategy during storybook reading in the future; (3) I am able to use some of the strategies I learned during other activities at home to help support my child's communication; (4) I am satisfied with the instruction I received; (5) I would participate in a similar program again if given the opportunity; (6) I would recommend this program to other parents; (7) I think it would be beneficial for my child's teachers and/or other therapists to receive components of the instruction I received; (8) I believe this program benefited my child overall; and (9) I would like to learn more about how to help my child communicate effectively during different activities and situations, such as play, arts and crafts, and during mealtimes.

Furthermore, two parents indicated agreement with the following statements (a) I have noticed positive changes in my child's communication since starting this program and (b) I feel confident that I can continue to help my child learn to communicate. All parents also expressed beliefs that the inclusion of the telepractice sessions was (1) beneficial to their children and (2) helped to alleviate family stressors, such as childcare for siblings, travel time to the intervention location, and scheduling conflicts.

Parents also discussed the changes they noticed in the children's communication. These changes included (1) increased verbal communication, (2) increased attention span, (3) increased interest in storybook reading, and (4) increased enjoyment during storybook reading. When

asked to discuss the aspects of the program the parents enjoyed the most, responses included appreciating (a) the encouragement children received to communicate, (b) appreciating the high levels of modeling of questioning structures, (c) the pairing of the written word with the verbal model during the storybook reading, (d) the "on-the-spot" parent education that occurred when children's behavior or interest in the reading decreased, and (e) the instructional coaching and flexibility that occurred during the sessions. In addition, parents were asked to identify those areas in which the instructional program could be improved or changed. Parents responded with (1) decrease the number of sessions per week, as the program was very intensive and (2) educate parents on how to use the aided language stimulation strategy in settings other than storybook reading.

Finally, parents were asked to provide comments about the program that they would like other families with children with communication needs, community leaders, or potential financial donors to know about the program. Please see Appendix K for a summary of parents' comments.

CHAPTER FIVE: DISCUSSION

The purpose of this study was to determine the effects of systematic partner instruction via a mixed-mode face-to-face and telepractice service delivery model with the child present for the duration of the intervention on (a) parents' use of the RAA strategy and (b) children's communicative turntaking. Results of the current investigation indicate that the intervention was effective at both increasing parents' use of the target strategy and children's multimodal communicative turntaking during book reading activities with familiar and novel book series. Effect size measures (IRD) indicated that the intervention was highly effective in increasing parents' use of the target strategy, as well as increasing children's multimodal communicative turntaking. This chapter includes (a) discussion of the findings, (b) implications of findings, (c) limitations, (d) recommendations for future research, and (e) conclusions.

Discussion of Findings: Instructional Program Effectiveness in Increasing Accuracy of Parent Strategy Implementation & Children's Communicative Turntaking

Comparison of Results to Past Research

Findings of the present investigation are consistent with previous research in communication partner instruction and parent responsivity training (e.g., Binger et al., 2010; Bingham et al., 2007; Calculator & D'Altilio Luchko, 1983; Kaiser & Roberts, 2013b; Kent-Walsh, Binger, & Hasham, 2010; Sack & McLean, 1997; Smidt et al., 2009; Warren & Brady, 2007; Yoder & Warren, 2002; Yoder & Warren, 1998), where communication partners made gains in implementing aided language approaches to supporting the communication of children with complex communication needs. Furthermore, findings from the current investigation are

consistent with previous research focusing on children with Down syndrome; where children were able to make positive gains in communication following focused intervention.

The present investigation incorporated multimodal communication intervention during storybook reading; as discussed throughout, multimodal communication incorporates both aided (e.g., manual sign, high-tech device) and unaided communication (e.g., natural speech). Findings from Wright et al. (2013) indicate manual sign combined with spoken communication (i.e., multimodal communication) results in increases in expressive language by young children with Down syndrome. The reported increases in communication by children with Down syndrome is consistent with the findings of this investigation. The stability of findings from previous and current investigations help support external validity of the present investigation, as multimodal communicative intervention results in increases in communication by children with Down syndrome are apparent in multiple studies.

The positive results obtained in this investigation were obtained after nine instructional sessions with 6 hours of face-to-face instruction and 1.5 hours of telepractice instruction. This dosage of communication partner instruction is more than one hour shorter than minimum levels published in the 2011 meta-analysis of eighteen studies investigating the effectiveness of parent-implemented language interventions with children with language impairment; in the included studies, parents received a range of 9-36 hours of parent training, including up to 9 home sessions (M. Y. Roberts & Kaiser, 2011). While the scope of these investigations differed from the present investigation (e.g., random assignment, various disability groups, focus on broader parent responsivity), findings from the current study support that changes in parent behaviors and subsequent changes in children's communication are possible with minimal dosage, as discussed

by Kent-Walsh et al. (2015). Implications of these findings are significant when considering the time sensitive nature of children developing a linguistic system (Bailey, Parette, Stoner, Angell, & Carroll, 2006; Baxter, Enderby, Evans, & Judge, 2012; Crisp et al., 2014). The data suggested that the instructional program resulted in positive changes in parents' acquisition of targets and children's multimodal communicative turntaking (IRD = 1.0) even with the low dosage of parent instruction (7.5 hours).

To expand further, it is of particular interest that previous dosage reported for children with Down syndrome to spontaneously produce manual signs was an average of 43 days of intervention as reported by Kouri (1989) in her seminal work examining the effects of manual sign intervention on the communication of one child with Down syndrome (Kouri, 1989). While the spontaneity of children's communication was not directly measured in the present investigation, the intervention protocol naturally lends itself to children's spontaneous communication because parents use minimal cuing levels when enticing children to communicate (e.g., read the text, provide model, wait for child to communicate). The levels of focus children's communication in the current investigation was evidenced after a smaller dosage (i.e., 7.5 hrs versus 43 days). The present intervention protocol has promise for minimizing the length of time children with Down syndrome require to attain a functional communication skills for implementation in daily activities.

While parents' acquisition of the strategy was the main dependent variable in the current investigation, it is important to note that corresponding improvements in the children's frequency of communicative turntaking represented the *true power and goal* of the investigation. Previous studies reporting children's communicative turntaking levels following AAC partner instruction

(e.g., Carter & Maxwell, 1998; Chung & Carter, 2013; Harrell, Kamps, & Kravits, 1997; Hunt, Alwell, & Goetz, 1991; Nunes & Hanline, 2007; Stiebel, 1999; Trottier, Kamp, & Mirenda, 2011) reported IRDs ranging from 0.00 to 0.89. The present investigation resulted in a large effect in improvement rate difference (IRD = 1.0) for children's multimodal communicative turntaking, which again supports the efficacy of the intervention.

Factors Contributing to Increased Strategy Use and Resulting Increases in Children's Communicative Turntaking

The effectiveness of the mixed-mode service delivery model in increasing parents' target strategy use was determined using 9-minute shared storybook reading sessions from both the treatment (i.e., *Mickey Mouse Clubhouse)* and generalization (i.e., *Disney Frozen* and *Disney Cars*) book series. Verbatim transcriptions and coding of dependent variables allowed for graphing and visual inspection of data, as well as IRD analyses. Results of the investigation indicated increases in participating parents' percentage of accurate implementation of the target strategy and a significant treatment effect following the intervention (IRD = 1.0). The a priori hypothesis stated that the mixed-mode service delivery model to provide communication partner instruction would result in increases in parents' use of the target strategy. This hypothesis was based on previous research in communication partner instruction and parent-implemented interventions (e.g., Binger, Kent-Walsh, et al., 2008; Binger et al., 2010; Kent-Walsh, Binger, & Malani, 2010; Kent-Walsh & Binger, 2013; Kent-Walsh, 2003; Rosa-Lugo & Kent-Walsh, 2008), as well as previous research and scholarship (e.g. Anderson et al., 2012; Boisvert & Hall, 2015; Hall et al., 2014; Hall & Boisvert, 2014).

The current intervention utilized a multifaceted approach, which was based in the research and scholarship supporting evidence-based practices in the areas of: (1) component instruction, namely the ImPAACT approach; (2) aided language strategies, specifically the Read-Ask-Answer strategy; and (3) service delivery models, particularly face-to-face and telepractice service delivery models. The foundation of the present intervention in these evidence-based practices contributed to its effectiveness.

Component instruction. Component instruction utilizes explicit, direct instruction of discrete steps which aid in learning and using knowledge independent of the content being learned (Deshler et al., 1981; Ellis et al., 1991). To explain further, component instruction involves the application of a generic framework to a variety of skills that individuals learned. As discussed in Chapter Two, the Improving Partner Applications of Augmentative Communication Techniques (ImPAACT) approach is one communication partner instruction model, or framework, based on component instruction literature, which educates stakeholders in aided AAC language strategies. Investigations utilizing the ImPAACT approach conducted by Kent-Walsh, Binger, and colleagues (e.g., Binger et al., 2010; Kent-Walsh, Binger, & Malani, 2010; Kent-Walsh & Binger, 2013; Kent-Walsh et al., 2015; Kent-Walsh, 2003) are the most closely related series of studies to the current investigation; this research group has published a series of findings documenting the effectiveness of communication partner instruction using a face-to-face service delivery format.

Although results from the present investigation are in alignment with previous studies examining the effectiveness of communication partner instruction in AAC, it is noteworthy that there were moderate modifications to the intervention in comparison to previous studies. The

present investigation incorporated modifications of the ImPAACT approach, which included (Binger et al., 2010; Kent-Walsh, Binger, & Hasham, 2010): (a) pretest and commitment to instructional program; (b) strategy description; (c) strategy demonstration; (c) controlled practice and feedback; (d) advanced practice and feedback; (e) posttest and commitment to long-term strategy use; and (f) generalization of target strategy use components of the ImPAACT approach were modified and the verbal practice of strategy steps component was removed. According to Kent-Walsh (2003), the discrete steps in the ImPAACT approach have not been independently assessed, and to this point, the effects of specific modifications to the protocol were unknown. These changes to the instructional protocol validated by Kent-Walsh, Binger and colleagues did not appear to have a negative impact on the effectiveness of the intervention, as similar levels of accurate parent implementation of the target strategy were documented in the present investigation.

However, previous findings of individual studies by Kent-Walsh and colleagues (2008, 2010, 2010), as well as a recent meta-analysis suggested that it may be necessary to include all eight instructional phases of the ImPAACT approach, particularly Stage 4: Verbal Practice (Kent-Walsh et al., 2015). The present investigation yielded positive changes in parents' use of the target strategy and in children's multimodal communicative turntaking without including a verbal practice components as described by Kent-Walsh, Binger, et al. (2008, 2010, 2010, 2010), but parent's accuracy of implementation in post-intervention phases was lower than in previous research. Analysis of parents' errors in implementation indicate the parents' most frequent initial error was modeling when asking a question (i.e., completing the Ask step correctly); see Figure 4 below. Parents verbally asked a question and waited for a response, but did not model the use of

the device during this step. These findings suggest the inclusion of the verbal practice component may be integral to parents' learning and implementation of the target strategy. Additional research is needed to understand fully the etiology of parents' errors in implementation.

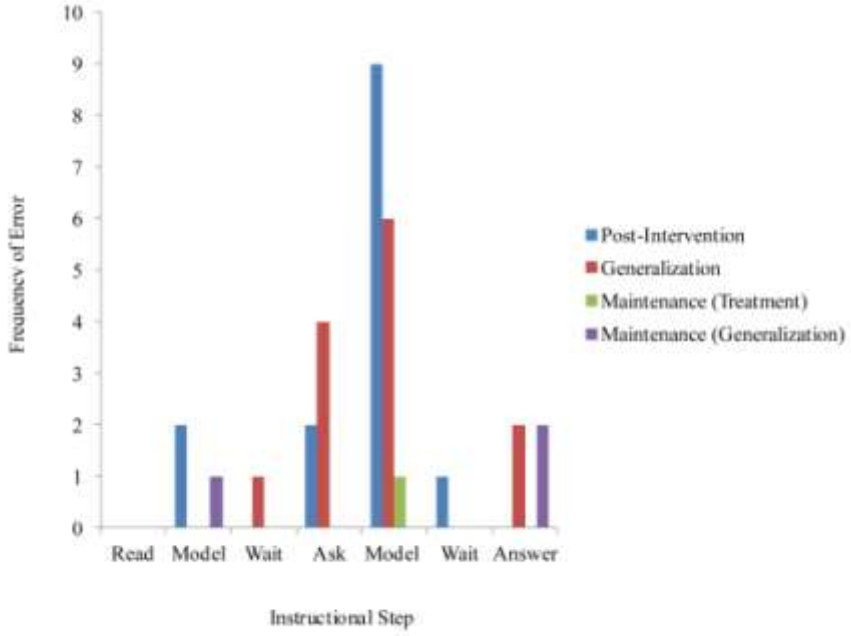


Figure 4. Parent's first error during strategy implementation

Aided language strategies. Aided language modeling approaches, such as the Read-Ask-Answer strategy used in the present investigation, represent an evidenced-based method for promoting communication by children with complex communication needs (e.g., Beck, Stoner, & Dennis, 2009; Binger, Berens, et al., 2008; Binger & Light, 2007; Dada & Alant, 2009; Drager et al., 2006). In general, aided modeling interventions require the speaking partner to use AAC, as well as speech to provide students with a consistent model of the type of output that is

expected (Drager, 2009). The purpose of aided language modeling is to provide an input strategy aimed at increasing receptive language abilities (Dada & Alant, 2009) with the ultimate goal of increasing children's messages (Binger, Berens, et al., 2008). Aided modeling interventions share several common features, such as (a) being implemented during natural language opportunities, (b) using the AAC device to augment the spoken message heard by the individual using AAC, and (c) employing modeling to expand vocabulary (Drager, 2009).

The present investigation utilized one evidence-based aided language strategy, Read-Ask-Answer (RAA), which has been utilized in several investigations with a wide variety of communication partners (e.g., Binger, Kent-Walsh, et al., 2008; Kent-Walsh, 2003). Additional investigations utilizing a similar aided language strategy, Read-Ask-Answer-Prompt (e.g., Binger et al., 2010; Kent-Walsh, Binger, & Malani, 2010; Kent-Walsh & Binger, 2013) contribute to the rationale for the use of the RAA strategy in the present investigation. Results of these investigations indicated that communication partner instruction is an effective method for teaching communication partners to use targeted aided language strategies with children with complex communication needs. Results from the present investigation are consistent with previous studies investigating the effectiveness of the RAA aided language strategy. Therefore, the external validity of findings are supported by the previous work by Kent-Walsh, Binger, and colleagues (2008, 2010, 2010) demonstrating large effect sizes when applying the same strategy during communication partner instruction.

The efficacy of the aided language strategies with children with Down syndrome is of particular importance to this investigation. Children with Down syndrome demonstrate typical learning and memory capabilities at early ages, but as these children age, they begin to

demonstrate an "instability of acquisition" of new learning (Fidler & Nadel, 2007, p. 264). Variability in children's learning must be considered in designing intervention, and the sequential, repetitive nature of the RAA strategy promotes language learning by children with DS. Aided language models provide children explicit, direct models of semantic concepts, and this exposure influences children with DS's ability to recall concepts (Fidler & Nadel, 2007). Carlesimo and colleagues (1997) examined the procedural and episodic memory skills of children with DS with regards to language learning. Results of the investigation indicated children's language learning increased with linguistic priming (i.e., explicit models) when learning occurred in a procedural manner (Carlesimo, Marotta, & Vicari, 1997). As such, the procedural nature of the aided language stimulation strategy used in the current investigation may have positively influenced children's multimodal communication.

Service delivery models. The present investigation utilized a combination of traditional face-to-face and telepractice service delivery models. The foundation of the mixed-mode service delivery model was in the evidence supporting the independent effectiveness of each model used in previous research; (a) face-to-face traditional service delivery (e.g., Binger & Kent-Walsh, 2012; Douglas, 2012; Granlund, Björck-Akesson, Wilder, & Ylvén, 2008; Kaiser & Hancock, 2004; Kent-Walsh & Binger, 2013; Kent-Walsh & McNaughton, 2005; Pennington et al., 2004; Thiessen & Beukelman, 2013; Yoder & Stone, 2006) and (b) telepractice service delivery (e.g., Boisvert, Lang, Andrianopoulos, & Boscardin, 2010; Grogan-Johnson et al., 2013; Hall et al., 2014; Irani, Marcos, & Gabel, 2015; Waite, Theodoros, Russell, & Cahill, 2015). There exists a paucity of research in utilizing a mixed-mode approach despite empirical evidence failing to identify the superiority of one service delivery model over another (Cirrin et al., 2010). Service-

delivery should not be approached with a one-size fits all mentality, but should be responsive to the individual needs of the child and family (Light & McNaughton, 2015; Nippold, 2012).

It is particularly noteworthy that that all three participating parents in the present investigation indicated high levels of satisfaction and support for the use of the telepractice interface in particular. Parents indicated that they appreciated the role the telepractice sessions played in reducing the stressors frequently faced by families of children with disabilities. Please see Appendix K for additional parent comments.

Synthesis. The present investigation represents a combination of three evidenced-based practices in AAC research: (1) component instruction, namely the ImPAACT approach; (2) aided language strategies, specifically the Read-Ask-Answer strategy; and (3) contemporary service delivery models, particularly face-to-face combined with telepractice service delivery models. The findings of this investigation are consistent with a published meta-analysis examining parent-implemented intervention techniques with children with communication needs (M. Y. Roberts & Kaiser, 2011). Roberts and Kaiser (2011) found parent-implemented language interventions to have a positive impact on children's receptive and expressive language skills, and these parent-implemented interventions can be equally as effective in yielding improvements in children's language skills as therapist-implemented interventions (M. Y. Roberts & Kaiser, 2011).

Lund and Light (2006) investigated factors intrinsic and extrinsic to individuals with AAC needs that contribute to long-term outcomes for individuals using AAC; qualitative analyses indicated that familial support and environmental factors are notable contributors to

long-term positive outcomes for these individuals. Findings specifically indicated that when parents served as active and integral participants in intervention programming, individuals with CCN had better language outcomes (Lund & Light, 2006). The present investigation allows "individuals to participate effectively and attain…goals at home, at school, at work, or in the community" (Light & McNaughton, 2015, p. 88). The combination of the evidence-based practices used in the investigation allowed families to participate not only in the treatment setting, but also in the home setting. The mixed-mode service delivery model has the potential to allow participants to communicate effectively across a variety of real-world contexts, with the expert support of SLPs.

Implications for a Billable Service-Delivery Model on Participant Outcomes

In addition to the mixed-mode service delivery model used in this investigation, the inclusion of a billable service delivery approach represented a break from previous communication partner instruction research. Since the children with complex communication needs in the current investigation were present and engaged in all components of every intervention sessions, it would be possible to successfully bill insurance providers for these AAC intervention sessions. Previous research conducted to validate the ImPAACT approach did not include the target children in all sessions (e.g., Binger, Kent-Walsh, et al., 2008; Binger et al., 2010; Kent-Walsh, Binger, & Malani, 2010; Kent-Walsh & Binger, 2013; Kent-Walsh et al., 2015; Kent-Walsh, 2003; Rosa-Lugo & Kent-Walsh, 2008); rather, participating parents received instruction and coaching for some sessions independent of their children. While this approach has been documented to be effective in increasing parent implementation of evidence-based interaction strategies and increasing communicative turn-taking and complexity of

communicative turns in children with complex communication needs (Kent-Walsh et al., 2015), speech and language practitioners in the United States have expressed a need to be able to bill insurance for all AAC interventions, including interventions involving communication partners (Ogletree, 2013). This is not surprising given the overall context of how health care services are billed in the United States, where insurance companies often determine reimbursable dosages. The present investigation addressed these issues by including the child throughout all phases of the communication partner instructional program. The comparably positive findings in the current investigation to past investigations which did not include the target children in all components of the instructional program (e.g., Binger, Kent-Walsh, et al., 2008; Binger et al., 2010; Kent-Walsh, Binger, & Malani, 2010; Kent-Walsh & Binger, 2013; Kent-Walsh et al., 2015; Rosa-Lugo & Kent-Walsh, 2008), suggests great promise for conducting communication partner instruction in a billable format.

Specific findings for the billable model indicate that all three participants increased their communicative turntaking following the intervention sequence. Ashley and Brandon communicated infrequently during the baseline phase (6 turns and 7 turns, respectively); while Carter did not engage in communicative turntaking at all prior to the intervention. Following the intervention, Ashley consistently increased her communication to over 60 turns (range = 61 to 108 turns) and was able to maintain this frequency during the maintenance phase (range = 62 to 63 turns). Similar findings were evidenced for Brandon, who increased his communication to approximately 50 turns or higher (range = 48 to 110 turns) and maintained his performance in the maintenance phase (range = 43 to 52 turns). Lastly, Carter increased his communication from 0 turns in baseline to over 10 turns following the treatment (range = 10 to 31 turns). He was able

to exceed his levels of turntaking during the maintenance phase with at least 26 communicative turns taken (range = 26 to 34 turns). Therefore, it is noteworthy that the use of the billable model did not result in unfavorable effects on children's communication, which far exceeded baseline levels[8].

A billable format allows for children with severe speech impairments to have increased access to necessary interventions. Combining expert language intervention in the billable context with a parent-implemented instructional protocol serves to expand the amount of clinical intervention children receive. As children's frequency of intervention increases, intelligibility, spoken language production, and spoken language comprehension increases (Jacoby, Lee, Kummer, Levin, & Creaghead, 2002). A billable model allows for increased intervention dosage, as children are present for the duration of the intervention, which leads to increased linguistic outcomes (Bailet, Repper, Piasta, & Murphy, 2009; Brandel & Loeb, 2011; Justice, Mashburn, Pence, & Wiggins, 2008; Moyle & Berman, 2011). The apparent clinical implications for these findings are highly notable, as practitioners will be able to provide effective communication partner instruction within the clinical setting, while still maintaining a billing service-delivery format, which has direct, empirical links to increased intelligibility, expressive, and receptive language outcomes. Additional clinical implications of these findings are discussed below.

[8] It is important to note, given that the main dependent variable was the parents' performance, and parents' performance guided phase change decisions, variability in children's frequency of communicative turns shown in post-intervention is commonly expected. Although downward trends are evident in children's turntaking, the data remain 100% non-overlapping. Since maintenance probes did not reveal a return to baseline levels of communication, experimental control did not appear to be compromised.

Factors Contributing to Generalization and Maintenance of Target Strategy Use

Dependent variables were collected and analyzed for generalization and maintenance of (a) target strategy learning and (b) communicative turntaking. Consistent with post-treatment findings, generalization and maintenance measures were gathered using 10-minute shared storybook reading sessions, with nine minutes of analysis. Parents and children engaged in shared storybook reading sessions of a novel book series, *Disney Frozen* and/or *Disney Cars*, for the generalization measures. Maintenance measures represented the dyad's performance after two and four weeks following the intervention for both the treatment and generalization series. Consistent with hypotheses for parent and children dependent measures, research supported the supposition that (1) parents' learning of the target strategy and (2) children's multimodal communicative turntaking would generalize to a novel book series, as well as maintain over time.

Given participants' level of learning and performance during treatment sessions, it is of no surprise that these high levels of achievement held constant during the generalization and maintenance phases. While Mrs. Campbell's use of the target strategy initially dropped with the introduction of the generalization probes, her use of the target strategy increased during each subsequent session and exceeded baseline levels, as reflected in Figure 1 above. Furthermore, Ashley and Carter's frequency of communicative turntaking was lower than treatment levels during the first generalization series. Similar to parent performance, the focus students' communication quickly increased during the next sessions, again remaining above baseline levels of performance. Students' performance remained significantly above baseline throughout the maintenance phases, as well.

Implications of Findings

The following section discusses clinical and educational implications of the findings. Clinical implications focus on modifications for current service provision, while the educational implications focus on alterations that can be made to pre-service SLPs' education.

Clinical Implications

The results of the current investigation provide support for using a service-delivery model that includes both face-to-face and telepractice components model with children with AAC needs when desiring to increase their communicative turntaking, while ensuring practitioners are able to meet expectations for billing. Parents were given instruction in the target aided language stimulation strategy while the interventionist simultaneously engaged with the child and parent. The child participants became more active participants in the book reading interactions, increased communication, and broadened the semantic diversity of their communication following the implementation of the instructional program.

From a clinical perspective, the findings of this investigation support SLPs use of communication partner instruction during therapy sessions with the focus child and parent present for the duration of the session. The inclusive approach of the session does not detract from parents' learning, children's achievement, or practitioners' needs to bill for the time spent with clients. As children with Down syndrome often demonstrate weakness in socialization skills and daily communication (Dykens et al., 1994), children's increased socialization during storybook reading is an important clinical implication of the investigation.. The focus of the investigation on preschool-aged children is important, as children with Down syndrome often plateau in their development of socialization as they age; communication instruction at early

ages is imperative to children with Down syndrome's later socialization and communication (Dykens et al., 1994). Figure 5 below illustrates changes in children's communicative modalities used throughout the investigation. In baseline, children had an overreliance on one modality, speech, despite their limited comprehensibility (See Table 1). Following the intervention protocol (i.e., post-intervention, generalization, maintenance), children's modalities expanded.

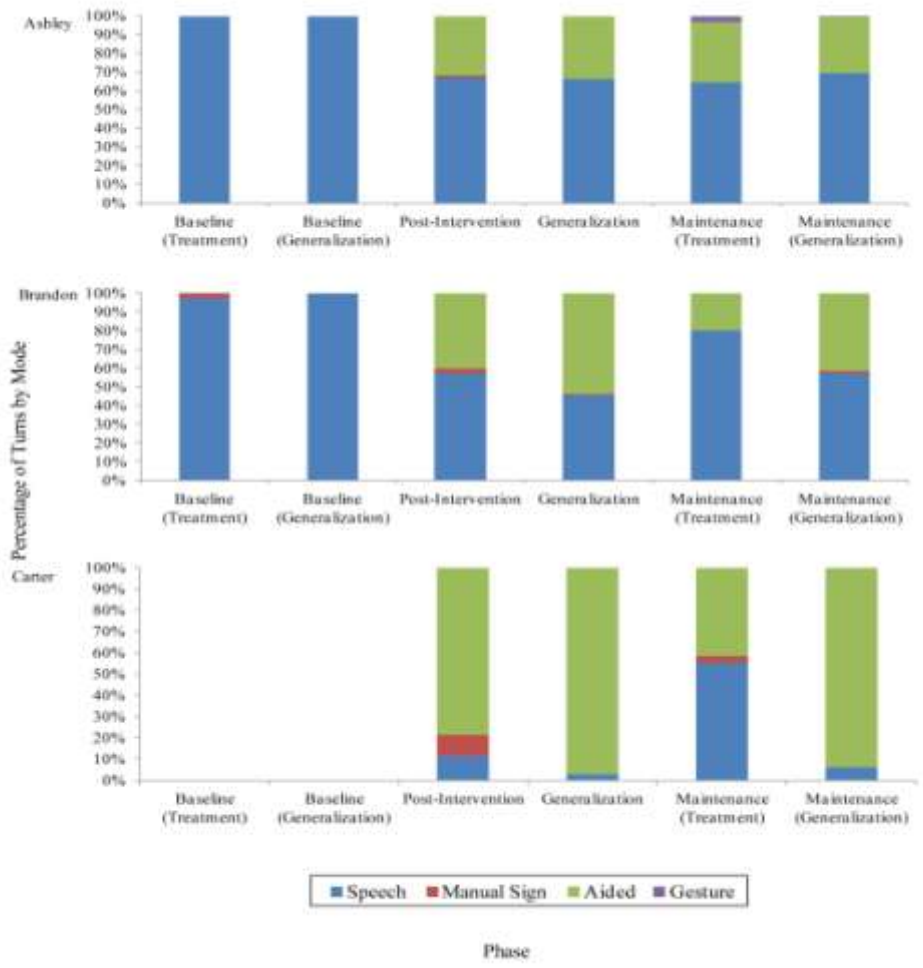


Figure 5. Children's percentage of communicative turns by modality

The clinical implications for these findings are important, as SLPs have further evidence to support multimodal intervention. The focus children expanded the modes of communication they used post-intervention. Considering that children with Down syndrome have been reported to have limited socialization and poor comprehensibility (Dykens et al., 1994; Kent & Vorperian, 2013), it is encouraging that the participating children were able to supplement their spoken communication with additional modalities (i.e., manual sign, high-tech AAC, gestures) after their parents participated in the intervention program).

Furthermore, as evidenced in this investigation, the use of a mixed-mode service delivery model resulted in the same high levels of performance evidenced in previous evaluations of traditional face-to-face instructional programs. There are significant clinical implications of this finding. First, in the face of a critical shortage of SLPs who are clinically competent in providing AAC intervention, the telepractice service-delivery model may allow experts to reach clients in broader geographic regions (Boisvert & Hall, 2015; Hall et al., 2014; Theodoros, 2011). Although this investigation utilized telepractice sparingly, these initial findings are encouraging and suggest the viability of distance-based service-delivery (Anderson et al., 2012; Anderson, Balandin, Stancliffe, & Layfield, 2014; ASHA, 2005b; Boisvert & Hall, 2015; Hall et al., 2014; Hall & Boisvert, 2014). In addition, the telepractice service delivery model naturally lends itself to generalization of target skills learned in a therapy session (Pham, 2012; Theodoros, 2008). As sessions occur in the naturalistic home or school environment, communication partners and children are able to practice and generalize skills learned in a clinical setting to other locations. The telepractice service delivery model allows for the SLP to provide support to

the children and parents in a familiar and relevant environment without placing travel demands on the professional (Theodoros, 2011).

Lastly, there are important clinical implications of the telepractice service delivery model for families and children with complex communication needs. The model decreases stressors often faced by families of children with disabilities; the need for specialized transportation, child care for siblings, missed school or work, and decreased time for family events is alleviated through use of the telepractice service delivery model (Dabrowska & Pisula, 2010; Granlund et al., 2008; NYSDOH, 2006). From a clinical perspective, the alleviation of these barriers could lead to fewer missed sessions and scheduling changes due to those stressors referenced throughout. Fewer missed sessions often result in higher levels of language growth experienced by children and families (Iacono & Cameron, 2009).

Professional Education Implications

The efficacy of the current investigation provides initial indications for consideration of modifications to pre-service speech-language pathology education. Professional education should include not only instruction in AAC and aided language strategies, but also diverse service delivery models, including telepractice service delivery. There is a lack of research-base to support the use of one service delivery model over another, despite the majority of pre-service education occurring in a one-on-one, face-to-face treatment session (Cirrin et al., 2010). In order to broaden the scope of professional education and to align with ASHA's vision for future professional education (ASHA, 2014b), pre-service instructional models could potentially include an introduction to telepractice service delivery, as the model lends itself to interprofessional education and practice.

Limitations

Despite the contributions to the research made by the present investigation, there are limitations which must be considered when interpreting the results and implications. The initial limitation is the small sample size of parents and children included in the investigation. According to the *What Works Clearinghouse* design standards for single-case research, an investigation with three participants is designated as "*Meet(ing) Standards with Reservations*" and additional replications of the study are needed to increase the external validity of the results (Kratochwill et al., 2010, pg. 10). Furthermore, participants were limited to children ages 3; 0 to 5; 11 with Down syndrome and results of the investigation are limited to this population. In addition, all parent participants were female and Caucasian. Additional research is needed to determine the effectiveness of the intervention with children with a variety of disabilities, as well as families from diverse cultural and linguistic backgrounds, as well as male participants (i.e., fathers).

The third limitation is the use of the target strategy in the discrete storybook reading setting. This investigation did not determine the effects of communication partner instruction using a mixed-mode service delivery model with the child present for the duration of the intervention in general, but rather, specific to storybook reading contexts. While the discrete nature of the intervention is consistent with recommendations in the literature (e.g., Binger & Kent-Walsh, 2012), interpretation of the results is limited to the book reading context. Additional research is needed to determine the effectiveness of the intervention in additional settings. The fourth limitation of the study is the multifaceted nature of the intervention, as the results do not lend themselves to parsing the individual contributions of each of the

modifications to the ImPAACT approach. Modifications to the approach include omission of instructional steps, inclusion of the child for the duration of the investigation, and use of the mixed-mode service delivery model. The contributions of each of these modifications to the original protocol cannot be separated from one another, and the relative contributions of each piece of the intervention could not be determined. In addition, a limitation of the investigation was the dosage of telepractice sessions included. The protocol primarily included face-to-face sessions, and efficacy of the intervention with a higher dosage of telepractice sessions cannot be determined. Future research should focus on systematically increasing telepractice dosage to determine the number of telepractice sessions needed.

To expand further, telepractice sessions were limited based on participants' internet connectivity and scheduling. Sessions during the investigation were rescheduled (i.e., occurred at a different time of the day than originally scheduled) due to limited internet connectivity. As telepractice intervention relies on a strong internet connection, efficacy of the intervention may have been limited based on a lack of internet connectivity. While scheduling conflicts also occur with face-to-face intervention, the researcher was unable to determine the extent to which scheduling differences affected the efficacy of the intervention. Finally, telepractice sessions were limited based on the restricted view through the video conferencing software. Future investigations using telepractice intervention should be mindful of the limitations of internet connectivity, scheduling, and the field of vision.

Finally, one parent indicated that she did *not* agree with the following statement: "I have noticed positive changes in my child's communication since starting this program." Anecdotal comments suggested that the mother did not believe the changes evidenced in her child's

communication during storybook expanded to general spoken communication. Moreover, the mother expressed a desire for the opportunity to learn to support her child's multimodal communication in a variety of contexts, including spontaneous communication across contexts. Parents' learning may have been limited in scope, and as indicated in past research (e.g., Deshler et al., 1981), generalization must be explicitly taught to ensure the general focus of aided language stimulation, as opposed to the specific focus of using the RAA strategy. Modifications to the protocol may be needed to ensure parents' have explicit instruction in generalizing turntaking strategies to other contexts, as well as additional information in aided language strategies in general.

Recommendations for Future Research

The results of the current investigation suggest the intervention was effective at increasing parents' use of the aided language stimulation strategy and children's multimodal communicative turntaking. Additional replications of the current investigation are needed to strengthen the external validity of the intervention and to support further its use with children with complex communication needs. Therefore, future research recommendations include the direct replication of this study to include the same experimental procedure with a larger population. Future research should include an analysis of the spontaneity of children with DS's communication; as comparisons to spontaneity of communication when using manual sign interventions may shed additional light on the applicability of the intervention to children with Down syndrome. In addition, systematic replications of the investigation are recommended to determine the extent to which each component of the intervention contributed to the overall treatment effect. Investigations where each instructional component is manipulated will help to

determine the extent to which the instructional components are necessary and relevant to participants' intended acquisition and achievement. Previous research (e.g., Binger & Light, 2007; Binger, 2004) has investigated the importance of aided language modeling in isolation for children's language growth, but research is needed to determine the effects of the instructional protocol on parents' learning. As parents' learning is the main dependent variable of the investigation, more information is needed to be able to determine the extent to which instructional steps are relevant, necessary, and contribute to parents' accuracy levels.

Furthermore, as discussed previously, the current investigation introduced the use of telepractice sessions as parents' mastered each skill used in the RAA strategy. Additional research is needed to determine face-to-face dosage levels required before intervention can transition to telepractice exclusively. A prerequisite to telepractice instruction is a skilled communication partner who is able to facilitate the intervention at the remote location (Boisvert & Hall, 2015). Research is needed to determine the amount of face-to-face intervention needed before communication partners demonstrate acceptable proficiency to facilitate effectively telepractice sessions. In addition, future research should investigate the need for rapport building sessions with the focus children prior to communication partner instruction in order to prepare the interventionist for the children's potential behaviors; research is needed to determine if rapport building sessions increase parents' accuracy and/or immediacy of learning, as well as children's multimodal turntaking.

In addition, future research directions should include the expansion of the intervention protocol to additional contexts, including imaginative play, craft activities, and generalization of target skills across multiple locations (e.g., in the home and clinical settings), as well as

including expanded storybook choice. As the intervention protocol is an instructional framework, the texts read by dyads do not impact the results of the investigation. Therefore, future research should include elements of choice, where participants are free to select their preferred storybooks. Also, parents' comments in response to questions on the social validity questionnaire included the desire for additional opportunities to learn how to interact with their child in multiple settings and situations and Light and McNaughton (2015) discuss the need for client-responsive AAC intervention. As such, future research would include the use of the intervention protocol to determine its effectiveness at increasing parents' use of aided language stimulation strategies in diverse settings and situations, as well as children's increased communication. Likewise, additional research is needed to determine the effectiveness of the intervention with more diverse populations. The present investigation was limited in scope to children ages 3; 0 to 5; 11 with Down syndrome, and research is needed to expand the evidence for mixed-mode service delivery with the child present for the duration of the instruction for children with varying disabilities, age groups, cultural and linguistic backgrounds, and socioeconomic status.

Finally, future research should include investigating the effectiveness of the intervention to teach communication partners additional aided language stimulation strategies. While the current body of research includes communication partners learning to use the Read-Ask-Answer-Prompt (RAAP) strategy (Binger et al., 2010; Binger & Kent-Walsh, 2012; Kent-Walsh, Binger, & Malani, 2010; Kent-Walsh & Binger, 2013) in addition to the RAA strategy used herein, future research should include investigating the use of aided language strategies designed to teach children communicative competence outside of the storybook context (e.g., Stay-Play-Talk

(Thiemann-Bourque, 2012) to teach peer communication; PoWR (Douglas, McNaughton, & Light, 2014) to teach communication in the academic setting). This research is needed to determine the extent to which the instructional protocol generalizes to non-storybook reading settings. Along similar lines, additional research is needed to determine the extent to which modifications to the instructional protocol are needed to ensure applicability to children with a variety of disabilities. The intervention protocol assumes children's natural desires to communication, as discussed in Chapter One. Children with Autism Spectrum Disorder (ASD), for example, are not naturally inclined to communicate, and research is needed to determine the modifications needed to the instructional procedure to ensure these children receive effective communication intervention.

Conclusions

The current investigation determined the effects of a mixed-mode face-to-face and telepractice service delivery model incorporating continuous child involvement to provide communication partner instruction to parents of children with Down syndrome who used AAC. The extent to which the intervention increased parents' use of the target strategy and children's communicative turntaking was measured, and results of the investigation were reported. The results of the investigation provided evidenced that children's communicative turntaking during shared storybook reading was positively affected by parents' receiving instruction while the children were present and using a telepractice service delivery model. The increased communicative turntaking was also evidenced during shared storybook reading sessions using a novel book series (i.e., generalization) and across time (i.e., maintenance). These findings suggest that mixed-mode service delivery, incorporating both face-to-face and telepractice

sessions with ongoing child involvement has the potential to increase families of children with Down syndrome's access to important AAC intervention without sacrificing the quality of the interactions or outcomes.

APPENDIX A: INSTITUTIONAL REVIEW BOARD APPROVAL LETTER

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Exempt Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Jennifer E. Kent-Walsh** and Co-PIs: **Erika M. Nicsinger, Nancy A. Harrington**

Date: **May 14, 2015**

Dear Researcher:

On 05/14/2015, the IRB approved the following modification to human participant research that is exempt from regulation:

Type of Review:	Exempt Determination
Modification Type:	Protocol revision; Consent revision; Removed Melissa Doan; Added Nancy Harrington and Erika Nicsinger
Project Title:	iCan Communicate: Improving the Communication Skills of Children with Down syndrome via AAC iPad Apps
Investigator:	Jennifer E Kent-Walsh
IRB Number:	SBE-12-08577
Funding Agency:	
Grant Title:	iCommunicate @ UCF Grant
Research ID:	N/A

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Signature applied by Patria Davis on 05/14/2015 10:02:21 AM EDT

IRB Coordinator

APPENDIX B: PARTICIPANT DEMOGRAPHICS QUESTSTIONNAIRE

iCan Communicate Summer Application

Thank you for your interest in the iCan Communicate program. We will be in contact with you soon about your family's placement in the program. Please complete the entire application form in order to confirm eligibility for the program. All information on the application is confidential, and the application will take approximately 20-30 minutes to complete.

The first section asks information about your family's availability during the summer and fall months. This information is necessary to ensure that you are placed in the correct iCan Communicate group.

Which sentence best describes your family's availability this summer?

- ❍ My family will be unavailable for the majority of the summer and fall months. We are unable to participate in the program at this time.
- ❍ My family will have consistent availability throughout the summer months (June-.July 2015). We will be available to go to UCF campus twice a week a week during our scheduled times. I understand weekday, weekend, and evening times will be available.
- ❍ My family will have consistent availability during the fall months (August– December 2015). We will be available to go to UCF campus twice a week a week during our scheduled times. I understand weekday, weekend, and evening times will be available.

My family is available on the following dates: (Please indicate all options that apply)

- ❑ June 5, 2015; 6pm-9pm; UCF campus
- ❑ June 6, 2015; 9am-12pm; UCF campus
- ❑ Summer weeks (June-July); 1 hour session twice weekly; UCF Communication Sciences and Disorders Clinic
- ❑ Fall weeks (Aug – Dec); 1 hour sessions twice weekly; UCF Communication Sciences and Disorders Clinic

As previously mentioned, intervention sessions will occur twice weekly for 1-hour at the UCF Communication Sciences and Disorders Clinic. Sessions will be scheduled according to family preference and availability. Please rank order your family's preferred sessions days.

_____ Monday
_____ Tuesday
_____ Wednesday
_____ Thursday
_____ Friday
_____ Saturday
_____ Sunday

Please provide additional information about your family's availability for intervention sessions throughout the week. For example, available from 9-12pm on Monday, Wednesday, Friday. Not available on Tuesdays, Thursday each week. My family has open availability throughout the

week; My child naps each day from 1-2pm, so we will not be available any day of the week at this time, etc.

The following section asks questions about your child's personal information.

Child's Full Name:

Child's Date of Birth:

Child's Gender:

- ❍ Female
- ❍ Male

Child's race:

- ❍ White
- ❍ Black or African American
- ❍ American Indian or Alaska Native
- ❍ Asian
- ❍ Native Hawaiian or Other Pacific Islander
- ❍ Other, please specify: _____

Child is of Spanish/Hispanic/Latino origin?

- ❍ Yes, of Spanish/Hispanic/Latino origin
- ❍ No, not of Spanish/Hispanic/Latino origin

Child's Address

Name
Address
Address 2
City
State
Zip Code

New to FAAST/UCF Communication Sciences and Disorders Clinic?

- ❍ Yes
- ❍ No, date last seen: _____

The next section asks questions about the child's parent/guardian.
Name of Person Completing Form:

Relationship to Child:

Who referred you to our program?

Parent/Guardian Name:

Is parent/guardian's address different from the child's address?

- ❍ Yes
- ❍ No

Parent/Guardian Address:

Name
Address
Address 2
City
State
Zip Code

Parent/Guardian Phone Number:

Home:
Cell:
Work:

Parent/Guardian Email Address:

Language(s) spoken at home:

Do you need an interpreter?

- ❍ Yes
- ❍ No

The following section asks questions about the parent/guardian who will be participating in the iCan Communicate program with the child. Please remember that the same parent/guardian must attend each session.

Name of participating parent/guardian:

Participating parent/guardian's relationship to child:

Participating parent/guardian's gender:

- ❍ Female
- ❍ Male

Participating parent/guardian's highest educational degree earned:

Participating parent/guardian's occupation:

Does the participating parent have any speech, language, or hearing impairments that would prevent reading a child's storybook?

- ❍ Yes, please specify. _____
- ❍ No

Participating parent/guardian race? (Please note, there are NO requirements for participation in this program. This information is being collected for descriptive purposes only.)

- ❍ White
- ❍ Black or African American
- ❍ American Indian or Alaska Native
- ❍ Asian
- ❍ Native Hawaiian or Other Pacific Islander
- ❍ Other, please specify: _____
- ❍ I prefer not to disclose this information.

Is the participating parent/guardian of Spanish/Hispanic/Latino origin? (Please note, there are NO ethnic requirements for participation in this program. This information is being collected for descriptive purposes only.

- ❍ Yes, of Spanish/Hispanic/Latino origin
- ❍ No, not of Spanish/Hispanic/Latino origin
- ❍ I prefer not to disclose this information.

Is the participating parent/guardian fluent and literate in English?

- ❍ Yes
- ❍ No

What is the approximate gross annual household income for the participating parent/guardian? (Please note, there are NO financial requirements for participation in this program. This information is being collected for descriptive purposes only.)

Number of persons in participating parent/guardian's household, including all adults and children:

The following section asks questions about the child's medical history.

Child's Developmental Diagnosis (e.g., autism spectrum disorder, cerebral palsy, developmental delay, Down syndrome, etc.):

Child's Medical Conditions (e.g., hearing loss, diabetes, etc.):

Child's Medications (please list name and purpose): Example: Depakote for seizures

Has your child's hearing been tested?

- ❍ Yes
- ❍ No

When was your child's hearing tested?

Where was your child's hearing tested?

What were the results of your child's hearing test?

Does your child wear hearing aids, use an FM system, or have a cochlear implant?

- ❍ Yes
- ❍ No

Has your child's vision been tested?

- ❍ Yes
- ❍ No

When was your child's vision tested?

Where was your child's vision tested?

What were the results of your child's vision test?

Does your child wear glasses?

- ❍ Yes
- ❍ No

Does your child have a history of seizures?

- ❍ Yes
- ❍ No

Please specify the type and frequency of your child's seizures.

Does your child exhibit problems with feeding/swallowing?

- ❍ Yes
- ❍ No

Please specify your child's problems with feeding/swallowing.

- ❑ Dysphagia
- ❑ Selective "picky" eater
- ❑ Drooling
- ❑ Other, please specify _____

Does your child experience difficulty sleeping?

- ❍ Yes
- ❍ No

Please specify your child's difficulties sleeping.

Please indicate all options that apply to your child's GROSS MOTOR STATUS:

- ❑ Walks independently with no balance or safety concerns
- ❑ Walks independently, but needs supervision for safety
- ❑ Walks independently using assistive device (i.e., crutches, walker, cane)
- ❑ Can walk for short distances with physical assistance of another person
- ❑ Unable to walk

Please indicate all options that apply to your child's FINE MOTOR STATUS:

- ❑ Has no problems using both hands for feeding, writing, or other fine motor tasks
- ❑ Has functional use of right hand only
- ❑ Has functional use of left hand only
- ❑ Has great difficulty with functional hand use
- ❑ Can write for short periods of time after which it becomes fatiguing and effortful
- ❑ Can isolate a finder or thumb to activate a 1 inch square/target

Please indicate all options that apply to your child's POSITIONING SUPPORTS:

- ❑ AFOs
- ❑ Trunk support, soft spinal orthosis
- ❑ Trunk support, Benik trunk support
- ❑ Trunk support, Leckey waistcoat
- ❑ Trunk support, other, please specify _____
- ❑ Wrist supports
- ❑ Other positioning supports, please specify _____
- ❑ My child does not require positioning supports.

Please indicate all options that apply to your child's POSITIONING/ ASSISTED TRANSPORTATION:

- ❑ Uses a stroller which is pushed by someone else
- ❑ Uses a manual wheelchair which is pushed by someone else
- ❑ Drives a power wheelchair using a joystick, head switch array, or chin controller
- ❑ Stander
- ❑ Walker or gait trainer
- ❑ Other specialized positioning equipment, please specify _____
- ❑ My child does not require positioning/ assisted transportation.

My child can most easily control movements of: (Please indicate all options that apply)

- ❑ Eyes
- ❑ Head
- ❑ Right hand
- ❑ Left hand
- ❑ Foot

Additional relevant PHYSICAL or MEDICAL information.

The following section asks questions about the child's educational setting and services.

Does your child attend an educational facility (e.g., school, daycare, VPK)?

- ❍ Yes
- ❍ No

Name and description of child's educational facility (e.g., public school, charter school, etc.):

Address of educational facility:
Name

Address

Address 2

City

State

Postal Code

Phone number of educational facility:

Student/teacher ratio (if known):

Teacher(s) name:

Grade level (if applicable & appropriate):

Does your child receive speech-language therapy in the school setting?

- ❍ Yes
- ❍ No

Name of school?

Name of school speech-language therapist?

How often does your child work with the school speech-language therapist? (Please indicate number of sessions and minutes per week. e.g., 2 x 30 min/week)

Does your child receive speech-language therapy in a private setting?

- ❍ Yes
- ❍ No

Name of private practice?

Name of private practice speech-language therapist?

How often does your child work with the private practice speech-language therapist? (Please indicate number of sessions and minutes per week. e.g., 2 x 30 min/week)

Does your child receive occupational therapy in the school setting?

- ❍ Yes
- ❍ No

Name of school?

Name of school occupational therapist?

How often does your child work with the school occupational therapist? (Please indicate number of sessions and minutes per week. e.g., 2 x 30 min/week)

Does your child receive occupational therapy in a private setting?

- ❍ Yes
- ❍ No

Name of private practice?

Name of private practice occupational therapist?

How often does your child work with the private practice occupational therapist? (Please indicate number of sessions and minutes per week. e.g., 2 x 30 min/week)

Does your child receive physical therapy in a school setting?

- ❍ Yes
- ❍ No

Name of school?

Name of school physical therapist?

How often does your child work with the school physical therapist? (Please indicate number of sessions and minutes per week. e.g., 2 x 30 min/week)

Does your child receive physical therapy in a private setting?

- ❍ Yes
- ❍ No

Name of private practice?

Name of private practice physical therapist?

How often does your child work with the private practice physical therapist? (Please indicate number of sessions and minutes per week. e.g., 2 x 30 min/week)

Does your child receive special education services in a school setting?

- ❍ Yes
- ❍ No

Name of school?

Name of school special educator?

How often does your child work with the school special educator? (Please indicate number of sessions and minutes per week. e.g., 2 x 30 min/week)

Does your child receive special education services in a private setting, such as my home or a clinic?

- ❍ Yes
- ❍ No

Name of private practice?

Name of private special educator?

How often does your work child with the private special educator? (Please indicate number of sessions and minutes per week. e.g., 2 x 30 min/week)

Does your child receive behavior therapy/analysis (such as ABA) in a school setting?

- ❍ Yes
- ❍ No

Name of school?

Name of school behavior therapist/analyst?

How often does your work child with the school behavior therapist/analyst? (Please indicate number of sessions and minutes per week. e.g., 2 x 30 min/week)

Does your child receive behavior therapy/analysis (such as ABA) in a private setting?

- ❍ Yes
- ❍ No

Name of private practice?

Name of private behavior therapist/analyst?

How often does your child work with the private practice behavior therapist/analyst? (Please indicate number of sessions and minutes per week. e.g., 2 x 30 min/week)

Please describe any additional services your child receives that were not previously mentioned.

Additional relevant EDUCATIONAL or SPECIAL SERVICES information.

The next section asks questions about the child's behavior.

Describe your child's typical behavior.

Describe your child's preferred activities, foods, songs, videos, etc.

How long will your child pay attention to an activity in which s/he is interested?

Describe your child's personality (e.g., easygoing, rigid, shy, happy, etc.).

Is your child able to easily transition between activities and environments?

- ❍ Yes
- ❍ No

Is your child able to interact with peers?

- ❍ Yes
- ❍ No

Does your child exhibit aggressive/self-injurious behaviors?

- ❍ Yes, please specify _____
- ❍ No

Is your child current receiving behavioral interventions?

- ❍ Yes, please specify _____
- ❍ No

Please comment on your child's pretend play skills (e.g., combing doll's hair; pushing train on tracks; etc.).

The next section relates to your child's communication abilities.

Please indicate all that apply to your child's CURRENT level of communication. (Select all options that apply)

- ☐ Understands simple directions
- ☐ Understands names for people and objects
- ☐ Understands names for body parts
- ☐ Answer simple questions
- ☐ Understand prepositions (e.g.,, in, under, on)\
- ☐ Understand color and size words
- ☐ Asks for wants/needs
- ☐ Asks questions
- ☐ Gets your attention
- ☐ Greets people
- ☐ Labels people, things, or pictures around him/her
- ☐ Shares information
- ☐ Asks for help
- ☐ Other, please specify _____

Please indicate all that apply to HOW your child communicates. (Select all options that apply)

- ☐ Points, gestures, vocalizes
- ☐ Speaks single words
- ☐ Uses eye contact, facial expressions
- ☐ Speaks two word phrases
- ☐ Babbles
- ☐ Speaks three to four word utterances
- ☐ Pulls person to desired object
- ☐ Speaks sentences with some errors
- ☐ Uses objects/tangible symbols
- ☐ Speaks grammatically correct sentences
- ☐ Uses pictures
- ☐ Writes
- ☐ Uses communication board/book
- ☐ Uses communication device
- ☐ Uses sign language
- ☐ Other, please specify _____

What are your child's three longest sentences your child has ever spoken?
For example:
Mine.
Mommy, want more.
More juice?
Can we go to the playground now?

Sentence 1
Sentence 2
Sentence 3

Please provide additional examples of your child's communicative messages (e.g., spoken words or sentences, vocalizations, signs, picture symbols, etc...).

What does your child do when he/she is not understood (e.g., repeats messages, modifies messages, stops trying to communicate, etc.)?

If your child speaks, do YOU have difficulty understanding his/her speech? (If yes, please explain.)

If you child speaks, do OTHERS have difficulty understanding his/her speech? (If yes, please explain.)

The next section relates to your child's use of a communication device and/or mobile technologies.

Has your child ever used a dedicated communication device (e.g., Dynavox, TechSpeak, etc.) or a mobile AAC technology device (e.g., iPad with communication application, Android tablet with communication application)?

- ❍ Yes
- ❍ No

Has your child used his/her communication device on daily basis during the last 6-months?

- ❍ Yes
- ❍ No

Please describe your child's history of communication device/ Augmentative and Alternative Communication (AAC) use.

Please describe your child's history of mobile AAC technology use, such as an iPad with communication application.

Names of dedicated communication device(s) and mobile AAC technologies used.

Names of communication applications used (e.g., Proloquo2Go, TouchChat).

Indicate the types of symbols/messages used on the communication device.

- ❑ Text
- ❑ Photographs
- ❑ PECS (Picture Exchange Communication System)
- ❑ Mayer-Johnson PCS Symbols
- ❑ Other, please specify. _____

Indicate the number of symbols per page display.

As a parent/guardian, what is your knowledge of the device? (Please indicate all options that apply)

- ❑ New device, no experience
- ❑ Basic skill (on/off, navigation)
- ❑ Can program
- ❑ Can operate
- ❑ Can customize
- ❑ Advanced programming

Indicate the environments where the device is used. (Please indicate all options that apply)

- ❑ Structured school activities
- ❑ In therapy
- ❑ In the community
- ❑ At home during structured tasks
- ❑ At home during free time
- ❑ Spontaneously at school
- ❑ Spontaneously in the community

Indicate the purposes for which the child uses the device. (Please indicate all options that apply)

- ❑ Initiates communication with system
- ❑ Uses system to ask and answer questions
- ❑ Needs direction/prompting
- ❑ Single key is used to express a full message
- ❑ Able to participate in a conversation using the device
- ❑ Demonstrates functional spelling skills
- ❑ Uses system as a backup to speech
- ❑ Makes wants/needs known with device
- ❑ Uses device socially (e.g., greetings, questions, comments, etc.)
- ❑ Navigates device with assistance
- ❑ Navigates independently
- ❑ Explores or plays with device, but doesn't current use it functionally

Indicate the access modes the child uses with the device. (Please indicate all options that apply)

- ❑ Direct selection (touchscreen, keyboard)
- ❑ Key guard
- ❑ Joystick
- ❑ Headmouse
- ❑ Eye gaze
- ❑ Scanning
- ❑ Other, please specify. _____

Complete the information below regarding your child's use of scanning to access the device.

Type of switch
Number of switches
Type of scanning

What are your child's individualized educational plan (IEP) goals for device use?

Is your child CURRENTLY using a dedicated device or mobile AAC technology?

- ❍ Yes
- ❍ No, please explain why not. _____

Additional relevant information about your child's COMMUNICATION DEVICE or MOBILE AAC TECHNOLOGIES.

The following questions relate to your child's computer use at home and school.

Does your child use a computer AT SCHOOL?

- ❍ Yes
- ❍ No

Please provide additional information about your child's computer use AT SCHOOL.

Platform? Windows or Mac
Operating System?
How frequently does your child use the computer?

How does your child access the computer AT SCHOOL? (Please indicate all options that apply)

- ❑ Mouse
- ❑ Keyboard
- ❑ Adaptive access (e.g., IntelliKeys, Touch window, etc.)
- ❑ My child does not independently access the computer.

What is the purpose of your child's computer use AT SCHOOL? (Please indicate all options that apply)

- ❑ Educational tool
- ❑ Reward/ Games
- ❑ Communication (e.g., computer-based voice output device, specialized software)

Does your child use a computer AT HOME?

- ❍ Yes
- ❍ No

Please provide additional information about your child's computer use AT HOME.

Platform? Windows or Mac
Operating System?
How frequently does your child use the computer?

What is the purpose of your child's computer use AT HOME? (Please indicate all options that apply)

- ❑ Educational tool
- ❑ Reward/ Game
- ❑ Communication (e.g., computer-based voice output device, specialized software)

How does your child access the computer AT HOME? (Please indicate all options that apply)

- ❑ Mouse
- ❑ Keyboard
- ❑ Adaptive access (e.g., IntelliKeys, Touch window, etc.)
- ❑ My child does not independently access the computer.

What are your child's preferred software programs or websites?

It will be necessary for you to use iTunes to keep your child's iPad applications up to date. The following questions relate to your family's iTunes account.

Do you currently have an iTunes account?

- ❍ Yes
- ❍ No

What is your iTunes account login?

What is your iTunes account password? (Please feel free to change this to a temporary password for use during the program. It will be necessary for us to use your account to ensure that you can keep the applications that we purchase on your behalf. Thank you for your understanding.)

Thank you for taking the time to complete this form in its entirely! Having a complete picture of your child's background and needs will help us prepare for the program with your child.

Additional Comments:
We look forward to being in contact with your family soon regarding your acceptance to the iCan Communicate Summer Program.

APPENDIX C: SHARED STORYBOOK READING PROBE PROCEDURES

Directions: Administer the shared storybook reading assessment according to the procedures below.

- Assessment administrator obtains parent and child assent for participation.
- Assessment administrator provides parent with: (1) Five storybooks and (2) Access to mobile AAC technology
- Assessment administrator gives the prompt: "Please read these books with your child. I will be video recording your reading for the purposes of the study. Please read with your child for 10 minutes. I will you know when time is up. Thank you."
- Assessment administrator does not prompt the parent or child to use the mobile AAC technology.
- Assessment administrator **does not** give the parent or child an indication of the correctness of the storybook reading.
- No instruction occurs during assessment administration.

APPENDIX D: BOOK SERIES TITLES & SAMPLE COMMUNICATION DISPLAYS

Mickey Mouse Clubhouse Texts

A Goofy Fairy Tale
Choo Choo Express*
Minnie's Rainbow
Minnie's Summer Vacation
Minnie's Valentine
Shop with Minnie
Space Adventure
Super Adventure
Up, Up, & Away
Whose Birthday Is It?*

Disney Cars Texts

A Cars Christmas
Look Out for Mater!
Mater and the Ghost Light
Mater's Birthday Surprise
Tractor Trouble

Disney Frozen Texts

A Day in the Sun
A New Reindeer Friend
Big Snowman, Little Snowman
Frozen
Olaf's Perfect Day

Note: * indicates interactive books with flaps

Mickey Mouse Clubhouse


Back
Menu
who
Mickey
look
in
clubhouse
gift
party
what
Minnie
blow
under
cake
flower
where
Goofy
go
big
candle
book
open flap
Daisy
ride
top
balloons
ball
turn page
Pluto
wear
in
hat
box
.
Toodles
Donald
read
little
bike
bone
clear


Back
Menu
who
Mickey
drink
thirsty
clubhouse
toys
what
Minnie
clean up
in
train
magnet
where
Goofy
bounce
hot
lemonade
spring
open flap
Daisy
ride
cold
snow
track
turn page
Professor Von Drake
Pluto
play
out
snowman
elephant
.
Toodles
Donald
roll
soft
messy
mountain
clear


Back
Menu
who
Mickey
look
over
clubhouse
mountain
what
Minnie
fly
in
kite
bird
where
Goofy
run
up
shadow
ladder
Daisy
help
high
balloon
road
turn page
Pluto
blow
scared
lunch
dinner
.
Toodles
Donald
tear
lost
sky
trees
clear

Disney Cars


Back
Menu
who
Lightning McQueen
put
red
Radiator Springs
wreath
what
Mater
hang
green
tree
fire
where
Sally
Fillmore
go
cold
lights
mistletoe
Luigi
Flo
Doc
paint
big
tire
turn page
Lizzie
Red
Guido
drive
shiny
snow
.
Ramone
Sarge
Sheriff
sneeze
ribbon
sled
clear

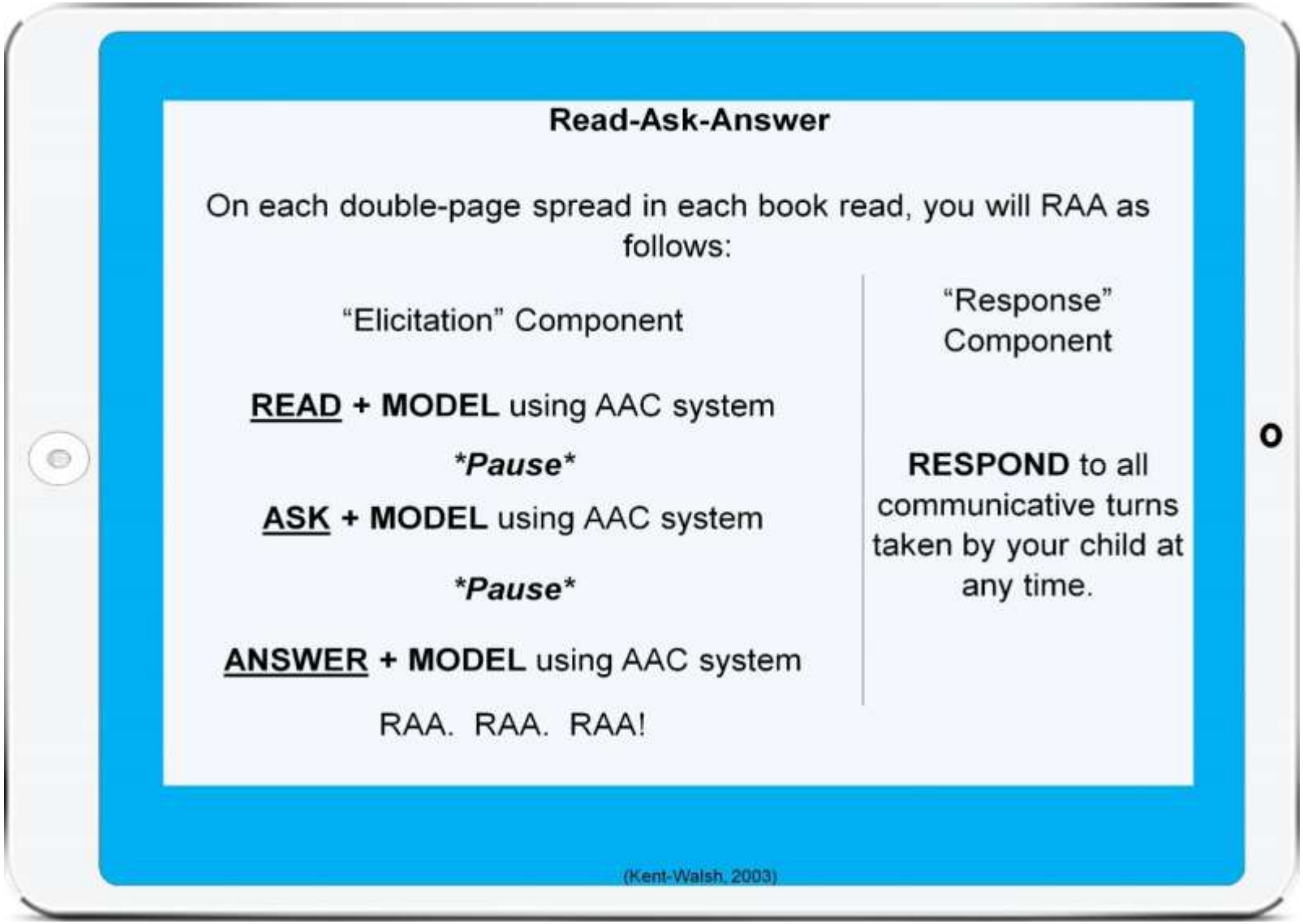

Back
Menu
who
Lightning McQueen
hide
dark
Radiator Springs
mirror
what
Sally
play
bright
tire
field
where
Mater
yell
scary
bridge
moon
Guido
drive
little
barn
building
turn page
Luigi
follow
funny
light
cloud
.
Sheriff
drop
shiny
lightning bug
fence
clear


Back
Menu
who
Lightning McQueen
Red
blow
surprise
hats
gift
what
Mater
Sheriff
go
yummy
party
streamer
where
Luigi
Lizzie
wrap
fast
balloons
costume
Ramone
Guido
Holley
lead
quiet
cake
turn page
Flo
Fillmore
Finn
hide
dark
gas
.
Sally
Jeff Gorvette
Sarge
look
funny
games
clear

Disney Frozen


Back
Menu
who
Anna
give
hot
ice
people
snow
what
Elsa
go
tired
window
bed
where
Olaf
look
excited
picnic
lemonade
Kristoff
blow
in
flowers
ducks
turn page
Sven
swim
tall
boat
sand
.
play
out
beach
seagulls
clear

APPENDIX E: READ-ASK-ANSWER HANDOUT


Read-Ask-Answer
On each double-page spread in each book read, you will RAA as follows:
"Elicitation" Component
READ + MODEL using AAC system
Pause
ASK + MODEL using AAC system
Pause
ANSWER + MODEL using AAC system
RAA. RAA. RAA!
"Response" Component
RESPOND to all communicative turns taken by your child at any time.
(Kent-Walsh, 2003)

APPENDIX F: INTERVENTION PHASE CONTENT

Intervention Phase Content
Goals, Format, and Content of Sessions[9]

Session Focus & Length	Session Goals	Content	Session Type & Content
Session 1: Read + Model (60 minutes)	• Establish rapport with parents. • Establish rapport with preschoolers. • Familiarize parent with RAA strategy • Familiarize parent with Read + Model component. • Provide models of the Read + Model component. • Provide parent with opportunities to practice the Read + Model component with prompting and feedback. • Provide child opportunities to engage in communicative	• Strategy description • Strategy demonstration • Practice with feedback	Introductory Session • Researcher describes the RAA strategy component skills to orient the parent to the purpose of intervention series. While the researcher and parent talk, the researcher will engage the child in developmentally appropriate tabletop activities (play dough, coloring, puzzles). These activities will be tailored to the child's ability to transition from task to task. *Researcher Script Guide* ○ *We can help children learn to communicate by providing them with models of us using the communication device while we read.* ○ *To do this, we will learn how to facilitate the Reading, Asking, and Answering components of the RAA strategy using the iPad during shared storybook reading. The goal is to help your child learn to communicate.* ○ *We are going to have lots of opportunities to practice each step during our sessions together.*

[9] Table title and column headings were adapted from Kent-Walsh (2003).

turntaking with parent and researcher.	• Researcher demonstrates the use of Read + Model component for parents while interacting with the child. The researcher utilizes a "think aloud" approach for the duration of one book. Parents assume an active listening and observing role. *Researcher Script Guide* ○ *We want to make sure that we are using the Read + Model step during storybook reading. I am going to show you how to do that now. This is the only part you will be responsible for learning this week.* ○ *While I am reading the story, I read each word slowly and model using the iPad as much as possible. I want to Read + Model and then wait for [child's name] to take a turn communicating. It is important that I wait for a while to give him/her time to process the story and make a comment. I can also look at [child's name] expectantly to convey my expectation that he/she takes a turn communicating. [Child's name] does not have to communicate using the iPad, verbal speech and signs are okay too. The point is not that we have to read the book, but that we need to have a conversation about the book.* ○ *I am going to read the first pages of the book to show you how to Read + Model.* ○ *Please feel free to ask any questions you have!* • The researcher and parents verbally review the Read + Model component while engaging the child in tabletop activities.

Researcher Script Guide

- *We are going to let [child's name] take a break and play with the play dough/colors/etc. again. S/he has been doing such a great job working on communicating and focusing on the story! While we play, we are going to talk about the steps of strategy and any questions you have.*
- *Remember, on each page of the book we want to read and model how to use the iPad for [child's name]. It is important to remember to wait after we read the page.*

- The researcher demonstrates the Read + Model component again for the parent with emphasis on the expectant delay. Again, a "think-aloud" model is used to demonstrate the component skill for the duration of one storybook.

Researcher Script Guide

- *Watch me Read + Model one more time and then it will be your turn to Read + Model with your child.*
- *Please ask any questions you have right away. There is no need to go fast. This is about helping [child's name] learn to communicate.*

- The researcher and parents verbally review the Read + Model component while engaging the child in tabletop activities.

Researcher Script Guide

- *We are going to let [child's name] take a break and play with the play dough/colors/etc. again. S/he has been doing such a great job working on communicating and focusing on the story! While we play, we are going to talk about the steps of strategy and any questions you have.*
- *Remember, on each page of the book we want to read and model how to use the iPad for [child's name]. It is important to remember to wait after we read the page.*

- The parent practices Read + Model with fading researcher prompts and feedback for the duration of one storybook.

Researcher Script Guide

- *We are going to continue to practice the Read + Model component on each page. I am going to have you start to take over control of reading on each page. Remember, ask questions as you have them. All you have to remember to do is step one, Read + Model and then wait.*
- *You are doing great with the Read + Model. Let's keep practicing!*
- *Don't worry, we are going to practice this step again.*

			• The researcher thanks the parent and child for their participation in the session and reminds them of the next session. *Researcher Script Guide* ○ *You both did great today! [child's name], you have earned a prize from the treasure chest!* ○ *Also, please accept this gift card to Target as a small thank you from us for traveling to UCF.*
Session 2: Read + Model (60 minutes)	• Maintain ongoing rapport with parent and child. • Provide parent with opportunities to practice the Read + Model component with fading prompting and feedback. • Provide child opportunities to engage in communicative turntaking with parent and researcher.	• Strategy demonstration • Practice with feedback	<u>Guided Practice Session</u> • The researcher and parents verbally discuss the Read + Model component while engaging the child in play. • The researcher reminds the parent of the content learned in the previous session. *Researcher Script Guide* ○ *To get us started again today, we are going to review what we learned during our last session. Don't forget that we want to Read and Model on each page of the book.* ○ *[child's name] is going to play with some small toys while we talk to get him/her comfortable with the room again.* • The researcher demonstrates the Read + Model component again for the parent with emphasis on the expectant delay. Parents are encouraged to ask questions to clarify their understanding of the strategy. The researcher models the Read + Model for parents for the duration of one

storybook.

Researcher Script Guide

- *Watch me Read + Model one more time and then it will be your turn to Read + Model with your child. Don't forget to include the wait!*
- *We want to make sure [child's name] has an opportunity to communicate, so the wait piece is very important. It is a little difficult at first, but you will get it with some practice.*

- The researcher and parents verbally review the Read + Model component while engaging the child in tabletop activities.

Researcher Script Guide

- *We are going to let [child's name] take a break and play with the play dough/colors/etc. again. S/he has been doing such a great job working on communicating and focusing on the story! While we play, we are going to talk about the steps of strategy and any questions you have.*
- *Remember, on each page of the book we want to read and model how to use the iPad for [child's name]. It is important to remember to wait after we read the page.*

- The parent practices Read + Model with fading researcher prompts and feedback for the duration of one

storybook.

Researcher Script Guide

- *We are going to continue to practice the Read + Model component on each page. I am going to have you start to take over control of reading on each page. Remember, ask questions as you have them. All you have to remember to do is Read, model, and then wait.*
- *You are doing great with the Read + Model. Let's keep practicing!*
- *Let's take a break from reading to talk again. What questions do you have before you take over the reading completely for the remainder of the session and at home?*

- The researcher and parents verbally review the Read + Model component while engaging the child in tabletop activities.

Researcher Script Guide

- *We are going to let [child's name] take a break and play with the play dough/colors/etc. again. S/he has been doing such a great job working on communicating and focusing on the story! While we play, we are going to talk about the steps of strategy and any questions you have.*
- *Remember, on each page of the book we want to read and model how to use the iPad for [child's name]. It is important to remember to wait after we read the page.*

			• The parent practices the Read + Model component with minimal cues from the researcher for the duration of one storybook. *Researcher Script Guide* o *Okay, I am going to take the backseat now and you are in charge of the storybook reading. Remember, you will Read + Model and then wait, wait, wait!* • The researcher summarizes the session information and the child receives a themed prize for his/her participation. *Researcher Script Guide* o *You both did great today! [child's name], you have earned a prize from the treasure chest!* o *Also, please accept this gift card to Target as a small thank you from us for traveling to UCF.* o *Our next session will be on-line with the video feed. Please remember to help prepare for the session by removing any distractions in the room and making sure that you have the Mickey Mouse Clubhouse books and iPad ready. Also, to make the time we have together as productive as possible, please continue to practice the Read + Model step at home for a few minutes each day. Finally, to help you at home, we have made this RAA strategy reminder for you to keep close by while you read.*
Session 3: Read + Model (30 minutes)	• Maintain ongoing rapport with parent and child.	• Independent practice with feedback	<u>Telepractice Session</u> • The researcher begins the session by calling the dyad on FaceTime/Skype and orienting them to the session schedule.

- Provide parent with opportunities to practice the Read + Model component with preschooler with minimal prompts and feedback.
- Provide child opportunities to engage in communicative turntaking with parent and researcher.

Researcher Script Guide

- *Hello, it is nice to see you again! We are going to work together today for about 30 minutes.*
- *I am going to have you read one book and then we will take a break to talk. Afterwards, I will have you read a second book.*
- *I know the video connection can be distracting, so I will disable my microphone and video. Feel free to ask questions at any time and I will jump back on to answer.*

- The parent practices the Read + Model component with minimal cues from the researcher for the duration of one storybook.

Researcher Script Guide

- *To get us started for this session, can you and [child's name] show me what you have practiced since our last session? As always, do not be nervous while you are reading. I will disable my video camera and microphone to help reduce the distractions in the room. I will be taking notes while you read to talk about after.*
- *Okay, I am going to take the backseat now and you are in charge of the storybook reading. Remember, you will Read + Model and then wait, wait, wait!*

- The researcher provides feedback on the parents' implementation of the component step. The researcher begins with positive aspects of the reading and then transitions into identifying areas that need improvement. The researcher identifies three or less areas of improvement.

- The researcher answers any questions the parent has about the storybook reading and provides additional feedback as needed.

Researcher Script Guide

  - *We are going to let [child's name] take a break while we talk about the reading session. Please keep him/her in the room because we will read again at the end of the session. He/she can play with some small toys, but we want to make sure that [child's name] will be able to transition back to reading in a few minutes.*
  - *I'm going to talk you through the reading session and give you a few pointers on how to improve for next time. Don't worry, this is a learning process.*

- The parent again practices the Read + Model component with minimal cues from the researcher for the duration of one storybook.

Researcher Script Guide

  - *I'm going to have you read again with [child's name] to practice the Read + Model one more time with the changes we just talked about. I'm going to disable my camera again and just observe your practice session.*
  - *Remember, you will Read + Model and then wait, wait, wait!*
  - *How do you think it went?*

- The researcher provides feedback on the parents'

implementation of the component step. The researcher begins with positive aspects of the reading and then transitions into identifying areas that need improvement. The researcher identifies three or less areas of improvement.

- The researcher answers any questions the parent has about the storybook reading and provides additional feedback as needed.

Researcher Script Guide

- *You both did a great job!*
- *What questions do you have about the Read + Model step?*
- *While you were reading, I noticed that you did a great job waiting after you read. Nice!*
- *Be sure that you are giving [child's name] plenty of time to think about what he/she wants to say.*

- The researcher thanks the parent for participating in the telepractice session and reminds him/her that the next session will be live in the clinic.
- The parent is reminded that they will receive a follow-up email with additional feedback.

Researcher Script Guide

- *Wow, that was a great session! Don't forget that you will receive an email from me talking about all the great things you and [child's name] did today. Please feel free to email me if you have any questions!*
- *Thank you so much for working with me on-line. Don't*

			forget that the next session will be live in our clinic. We will learn the next step of the strategy before you and [child's name] practice at home. ○ *I look forward to seeing you in person for the next session!*
Session 4: Ask + Model (60 minutes)	• Maintain ongoing rapport with parent and child. • Familiarize parent with Ask + Model component. • Provide models of the Ask + Model component. • Provide parent with opportunities to practice the Ask + Model component with prompting and feedback. • Provide child opportunities to engage in communicative turntaking with parent and researcher.	• Strategy description • Strategy demonstration • Practice with feedback	<u>Introductory Session</u> • Researcher describes the RAA strategy component skills further for the parent. While the researcher and parent talk, the researcher will engage the child in developmentally appropriate tabletop activities (play dough, coloring, puzzles). These activities will be tailored to the child's ability to transition from task to task. *Researcher Script Guide* ○ *Like we talked about before, we can help children learn to communicate by providing them with models of us using the communication device while we read.* ○ *To do this, we will continue to learn how to facilitate the Reading, Asking, and Answering components of the RAA strategy using the iPad during shared storybook reading. The goal is to help your child learn to communicate. This week we are going to learn the Ask + Model step of the RAA strategy.* ○ *We are going to have lots of opportunities to practice each step during our sessions together.* • Researcher demonstrates the use of Ask + Model component for parents while interacting with the child. The

researcher utilizes a "think aloud" approach for the duration of one book. Parents assume an active listening and observing role.

Researcher Script Guide

- *We want to make sure that we are using the Ask + Model step during storybook reading. I am going to show you how to do that now. This is the only part you will be responsible for learning this week.*
- *While I am reading the story, I read each word slowly and model using the iPad as much as possible. I want to first Read + Model and then wait. If [child's name] does not take a turn talking about the book, I need to do the Ask + Model step and then wait again for [child's name] to take a turn communicating. It is important that I wait for a while to give him/her time to process the story and make a comment. I can also look at [child's name] expectantly to convey my expectation that he/she takes a turn communicating. [Child's name] does not have to communicate using the iPad, verbal speech and signs are okay too.*
- *I am going to read the first pages of the book to show you how to do both the Read + Model and Ask + Model steps.*
- *Please feel free to ask any questions you have!*

- The researcher and parents verbally review the Ask + Model component while engaging the child in tabletop activities.

Researcher Script Guide

- *We are going to let [child's name] take a break and play with the play dough/colors/etc. again. S/he has been doing such a great job working on communicating and focusing on the story! While we play, we are going to talk about the steps of strategy and any questions you have.*
- *Remember, on each page of the book we want to read and model how to use the iPad for [child's name]. It is important to remember to wait after we read the page. If [child's name] does not take a turn talking about the book, we want to use the next step of the strategy. We then want to Ask + Model and then wait again.*

- The researcher demonstrates the Ask + Model component again for the parent with emphasis on the expectant delay. Again, a "think-aloud" model is used to demonstrate the component skill for the duration of one storybook.

Researcher Script Guide

- *Watch me Ask + Model one more time and then it will be your turn to Ask + Model with your child. I am going to combine the read, model, wait, and then ask, model, wait.*
- *Please ask any questions you have right away. There is no need to go fast. This is about helping [child's name] learn to communicate.*

- The researcher and parents verbally review the Ask + Model component while engaging the child in tabletop activities.

Researcher Script Guide

  - *We are going to let [child's name] take a break and play with the play dough/colors/etc. again. S/he has been doing such a great job working on communicating and focusing on the story! While we play, we are going to talk about the steps of strategy and any questions you have.*
  - *Remember, you are first going to Read and model, then wait, and then Ask + Model.*

- The parent practices Ask + Model with fading researcher prompts and feedback for the duration of one storybook.

Researcher Script Guide

  - *We are going to continue to practice the Ask + Model component on each page. I am going to have you start to take over control of reading on each page. Remember, ask questions as you have them. All you have to remember to do is Read + Model, wait, and then Ask + Model and wait.*
  - *You are doing great with the Ask + Model. Let's keep practicing!*
  - *Don't worry, we are going to practice this step*

			again. • The researcher thanks the parent and child for their participation in the session and reminds them of the next session. ○ *You both did great today! [child's name], you have earned a prize from the treasure chest!* ○ *Also, please accept this gift card to Target as a small thank you from us for traveling to UCF.*
Session 5: Ask + Model (60 minutes)	• Maintain ongoing rapport with parent and child. • Provide parent with opportunities to practice the Ask + Model component with fading prompting and feedback. • Provide child opportunities to engage in communicative turntaking with parent and researcher.	• Strategy demonstration • Practice with feedback	<u>Guided Practice Session</u> • The researcher and parents verbally discuss the Ask + Model component while engaging the child in play. *Researcher Script Guide* ○ *To get us started again today, we are going to review what we learned during our last session. Don't forget that we want to Read and Model on each page of the book, then we wait, and then next we want to use the Ask + Model step.* ○ *[child's name] is going to play with some small toys while we talk to get him/her comfortable with the room again.* • The researcher demonstrates the Ask + Model component again for the parent with emphasis on the expectant delay. Parents are encouraged to ask questions to clarify their understanding of the strategy. The researcher models the Ask + Model for parents for the duration of one storybook.

Researcher Script Guide

- *Watch me Ask + Model one more time and then it will your turn to Ask + Model with your child. Don't forget to include the wait! We want to read, model, wait, and then ask + model.*
- *We want to make sure [child's name] has an opportunity to communicate, so the wait piece is very important. It is a little difficult at first, but you will get it with some practice.*

- The researcher and parents verbally review the Ask + Model component while engaging the child in tabletop activities.

Researcher Script Guide

- *We are going to let [child's name] take a break and play with the play dough/colors/etc. again. S/he has been doing such a great job working on communicating and focusing on the story! While we play, we are going to talk about the steps of strategy and any questions you have.*
- *Remember, on each page of the book we want to read and model how to use the iPad for [child's name]. It is important to remember to wait after we read the page. Then we want to ask a question with the model if [child's name] has not taken a turn.*

- The parent practices Ask + Model with fading

researcher prompts and feedback for the duration of one storybook.

Researcher Script Guide

- *We are going to continue to practice the Ask + Model component on each page. I am going to have you start to take over control of reading on each page. Remember, ask questions as you have them. All you have to remember to do is Read, model, and then wait. After you wait, you will ask a question, model on the device, and wait again.*
- *You are doing great with the Ask + Model. Let's keep practicing!*
- *Let's take a break from reading to talk again. What questions do you have before you take over the reading completely for the remainder of the session and at home?*

- The researcher and parents verbally review the Ask + Model component while engaging the child in tabletop activities.

Researcher Script Guide

- *We are going to let [child's name] take a break and play with the play dough/colors/etc. again. S/he has been doing such a great job working on communicating and focusing on the story! While we play, we are going to talk about the steps of strategy and any questions you have.*
- *Remember, on each page of the book we want to*

read and model how to use the iPad for [child's name]. It is important to remember to wait after we read the page. After you wait, you need to ask and model the device. Lastly, we wait again for [child's name] to take a turn talking about the book.

- The parent practices the Ask + Model component with minimal cues from the researcher for the duration of one storybook.

Researcher Script Guide

o Okay, I am going to take the backseat now and you are in charge of the storybook reading. Remember, you will Ask + Model and then wait, wait, wait!
o Great job waiting to let [child's name] talk about the picture in the book.
o Remember, we always want to model the device for [child's name]. It helps him/her learn to use the iPad to communicate.

- The researcher summarizes the session information and the child receives a themed prize for his/her participation.

Researcher Script Guide
o You both did great today! [child's name], you have earned a prize from the treasure chest!
o Also, please accept this gift card to Target as a small thank you from us for traveling to UCF.
o Our next session will be on-line with the video feed. Please remember to help prepare for the session by

			removing any distractions in the room and making sure that you have the Mickey Mouse Clubhouse books and iPad ready. Also, to make the time we have together as productive as possible, please continue to practice the Ask + Model step at home for a few minutes each day. Don't forget that you have your reminder handout with all of the steps.
Session 6: Ask + Model (30 minutes)	• Maintain ongoing rapport with parent and child. • Provide parent with opportunities to practice the Ask + Model component with preschooler with minimal prompts and feedback. • Provide child opportunities to engage in communicative turntaking with parent and researcher.	• Independent practice with feedback	<u>Telepractice Session</u> • The researcher begins the session by calling the dyad on FaceTime/Skype and orienting them to the session schedule. *Researcher Script Guide* o *Hello, it is nice to see you again! We are going to work together today for about 30 minutes.* o *I am going to have you read one book and then we will take a break to talk. Afterwards, I will have you read a second book.* o *I know the video connection can be distracting, so I will disable my microphone and video. Feel free to ask questions at any time and I will jump back on to answer.* • The parent practices the Ask + Model component with minimal cues from the researcher for the duration of one storybook. *Researcher Script Guide* o *To get us started for this session, can you and [child's name] show me what you have practiced since our last session? As always, do not be nervous while you are reading. I will disable my video camera and microphone*

to help reduce the distractions in the room. I will be taking notes while you read to talk about after.
- *Okay, I am going to take the backseat now and you are in charge of the storybook reading. Remember, you will read with the model, wait, then do the new step Ask + Model and wait, wait, wait!*

- The researcher provides feedback on the parents' implementation of the component step. The researcher begins with positive aspects of the reading and then transitions into identifying areas that need improvement. The researcher identifies three or less areas of improvement.
- The researcher answers any questions the parent has about the storybook reading and provides additional feedback as needed.

Researcher Script Guide

- *We are going to let [child's name] take a break while we talk about the reading session. Please keep him/her in the room because we will read again at the end of the session. He/she can play with some small toys, but we want to make sure that [child's name] will be able to transition back to reading in a few minutes.*
- *I'm going to talk you through the reading session and give you a few pointers on how to improve for next time. Don't worry, this is a learning process.*

- The parent again practices the Ask + Model component with minimal cues from the researcher for the duration of one storybook.

Researcher Script Guide

- *I'm going to have you read again with [child's name] to practice the Ask + Model one more time with the changes we just talked about. I'm going to disable my camera again and just observe your practice session.*
- *Remember, you will Ask + Model and then wait, wait, wait!*
- *How do you think it went?*

- The researcher provides feedback on the parents' implementation of the component step. The researcher begins with positive aspects of the reading and then transitions into identifying areas that need improvement. The researcher identifies three or less areas of improvement.
- The researcher answers any questions the parent has about the storybook reading and provides additional feedback as needed.

Researcher Script Guide

- *You both did a great job!*
- *What questions do you have about the Ask + Model step?*
- *While you were reading, I noticed that you did a great job waiting after you read. Nice!*
- *Don't forget to ask a question with the model if [child's name] does not take a turn talking about the book.*

- The researcher thanks the parent for participating in the

			telepractice session and reminds him/her that the next session will be live in the clinic. • The parent is reminded that they will receive a follow-up email with additional feedback. *Researcher Script Guide* ○ *Wow, that was a great session! Don't forget that you will receive an email from me talking about all the great things you and [child's name] did today. Please feel free to email me if you have any questions!* ○ *Thank you so much for working with me on-line. Don't forget that the next session will be live in our clinic. We will learn the last step of the strategy before you and [child's name] practice at home.* ○ *I look forward to seeing you in person for the next session!*
Session 7: Answer + Model (60 minutes)	• Maintain ongoing rapport with parent and child. • Familiarize parent with Answer + Model component. • Provide models of the Answer + Model component. • Provide parent with opportunities to practice the Answer + Model component with prompting and	• Strategy description • Strategy demonstration • Practice with feedback	<u>Introductory Session</u> • Researcher describes the RAA strategy component skills for parents once more. While the researcher and parent talk, the researcher will engage the child in developmentally appropriate tabletop activities (play dough, coloring, puzzles). These activities will be tailored to the child's ability to transition from task to task. *Researcher Script Guide* ○ *Like we talked about before, we can help children learn to communicate by providing them with models of us using the communication device while we*

feedback. • Provide child opportunities to engage in communicative turntaking with parent and researcher.	*read.* ○ *To do this, we will continue to learn how to facilitate the Reading, Asking, and Answering components of the RAA strategy using the iPad during shared storybook reading. The goal is to help your child learn to communicate.* ○ *We are going to have lots of opportunities to practice each step during our sessions together.* • Researcher demonstrates the use of Answer+ Model component for parents while interacting with the child. The researcher utilizes a "think aloud" approach for the duration of one book. Parents assume an active listening and observing role. *Researcher Script Guide* ○ *We want to make sure that we are using the Answer+ Model step during storybook reading. I am going to show you how to do that now. We are going to combine this step with what we have already learned.* ○ *While I am reading the story, I read each word slowly and model using the iPad as much as possible. I want to first Read + Model and then wait. If [child's name] does not take a turn talking about the book, I need to do the Ask + Model step and then wait again for [child's name] to take a turn communicating. It is important that I wait for a while to give him/her time to process the story and make a comment. I can also look at [child's name] expectantly to convey my expectation that he/she takes a turn communicating. [Child's name]*

does not have to communicate using the iPad, verbal speech and signs are okay too. If [child's name] does not take a turn after I ask a question, I want to Answer and Model.

- *We need to respond any time that [child's name] talks about the book. It does not matter if the comment or question is on topic, we need to follow what [child's name] wants to talk about.*
- *I am going to read the first pages of the book to show you how to do the entire RAA strategy.*
- *Please feel free to ask any questions you have!*

- The researcher and parents verbally review the Answer+ Model component while engaging the child in tabletop activities.

Researcher Script Guide

- *We are going to let [child's name] take a break and play with the play dough/colors/etc. again. S/he has been doing such a great job working on communicating and focusing on the story! While we play, we are going to talk about the steps of strategy and any questions you have.*
- *Remember, on each page of the book we want to read and model how to use the iPad for [child's name]. It is important to remember to wait after we read the page. If [child's name] does not take a turn talking about the book, we want to use the next step of the strategy. We then want to Ask+ Model and then wait again. If [child's name] does not respond after we ask*

the question, we want to answer our own question with a model.

- *It's important to remember to respond to everything that [child's name] says when we are reading. The point is to start a conversation, we do not need to worry about reading the entire book.*

- The researcher demonstrates the Answer+ Model component again for the parent with emphasis on the expectant delay. Again, a "think-aloud" model is used to demonstrate the component skill for the duration of one storybook.

Researcher Script Guide

- *Watch me Answer+ Model one more time and then it will your turn to Answer+ Model with your child.*
- *Please ask any questions you have right away. There is no need to go fast. This is about helping [child's name] learn to communicate.*

- The researcher and parents verbally review the Answer+ Model component while engaging the child in tabletop activities.

Researcher Script Guide

- *We are going to let [child's name] take a break and play with the play dough/colors/etc. again. S/he has been doing such a great job working on communicating and focusing on the story! While we*

play, we are going to talk about the steps of strategy and any questions you have.

- *Remember, you are first going to Read and model, then wait, and then Ask+ Model. Last, we want to Answer + Model. Don't forget to respond to everything that [child's name] says.*

- The parent practices Answer+ Model with fading researcher prompts and feedback for the duration of one storybook.

Researcher Script Guide

- *We are going to continue to practice the Answer+ Model component on each page. I am going to have you start to take over control of reading on each page. Remember, ask questions as you have them. All you have to remember to do is Read + Model, wait, and then Answer+ Model and wait. Last, you Answer + Model. RAA, RAA, RAA!*
- *You are doing great with the Answer+ Model. Let's keep practicing!*
- *Don't worry, we are going to practice this step again.*

- The researcher thanks the parent and child for their participation in the session and reminds them of the next session.

Researcher Script Guide

			○ *You both did great today! [child's name], you have earned a prize from the treasure chest!* ○ *Also, please accept this gift card to Target as a small thank you from us for traveling to UCF.*
Session 8: Answer + Model (60 minutes)	• Maintains ongoing rapport with parent and child. • Provide parent with opportunities to practice the Answer + Model component with fading prompting and feedback. • Provide child opportunities to engage in communicative turntaking with parent and researcher.	• Strategy demonstration • Practice with feedback	<u>Guided Practice Session</u> • The researcher and parents verbally discuss the Answer + Model component while engaging the child in play. *Researcher Script Guide* ○ *To get us started again today, we are going to review what we learned during our last session. Don't forget that we want to Read and Model on each page of the book, then we wait, next we want to use the ask and model step. Lastly, we want to remember to answer our own question.* ○ *Don't forget that we want to respond to everything that [child's name] says!* ○ *[child's name] is going to play with some small toys while we talk to get him/her comfortable with the room again.* • The researcher demonstrates the Answer+ Model component again for the parent with emphasis on the expectant delay. Parents are encouraged to ask questions to clarify their understanding of the strategy. The researcher models the Answer+ Model for parents for the duration of one storybook. *Researcher Script Guide*

- *Watch me Answer+ Model one more time and then it will your turn to Answer+ Model with your child. Don't forget to include the wait! We want to read, model, wait, and then ask and wait. Finally, we answer our own question with a model.*
- *I need to remember to respond to everything that [child's name] says.*
- *We want to make sure [child's name] has an opportunity to communicate, so the wait piece is very important. It is a little difficult at first, but you will get it with some practice.*

- The researcher and parents verbally review the Answer+ Model component while engaging the child in tabletop activities.

Researcher Script Guide

- *We are going to let [child's name] take a break and play with the play dough/colors/etc. again. S/he has been doing such a great job working on communicating and focusing on the story! While we play, we are going to talk about the steps of strategy and any questions you have.*
- *Remember, on each page of the book we want to read and model how to use the iPad for [child's name]. It is important to remember to wait after we read the page. Then we want to ask a question with the model if [child's name] has not taken a turn. Lastly, we want to answer the question if [child's name] does not take a turn talking about the book.*

- *It is important to remember to respond to everything that [child's name] says when we are reading.*

- The parent practices Answer+ Model with fading researcher prompts and feedback for the duration of one storybook.

Researcher Script Guide

- *We are going to continue to practice the Answer+ Model component on each page. I am going to have you start to take over control of reading on each page. Remember, ask questions as you have them. All you have to remember to do is Read, model, and then wait. After you wait, you will ask a question, model on the device, and wait again. Finally, you will answer the question with a model. RAA, RAA, RAA!*
- *You are doing great with the Answer+ Model. Let's keep practicing!*
- *Let's take a break from reading to talk again. What questions do you have before you take over the reading completely for the remainder of the session and at home?*

- The researcher and parents verbally review the Answer+ Model component while engaging the child in tabletop activities.

Researcher Script Guide

- *We are going to let [child's name] take a break*

and play with the play dough/colors/etc. again. S/he has been doing such a great job working on communicating and focusing on the story! While we play, we are going to talk about the steps of strategy and any questions you have.

- *Remember, on each page of the book we want to read and model how to use the iPad for [child's name]. It is important to remember to wait after we read the page. After you wait, you need to ask and model the device. Lastly, we wait again for [child's name] to take a turn talking about the book. If he/she doesn't talk about the book, we want to answer our own question.*
- *Don't forget that we want to respond to everything that [child's name] says about the book.*

- The parent practices the Answer+ Model component with minimal cues from the researcher for the duration of one storybook.

Researcher Script Guide

- *Okay, I am going to take the backseat now and you are in charge of the storybook reading. Remember, you will Answer+ Model and then wait, wait, wait!*
- *It is important to respond to everything that [child's name] says while we are reading the book.*

- The researcher summarizes the session information and the child receives a themed prize for his/her participation.

Researcher Script Guide

			○ *You both did great today! [child's name], you have earned a prize from the treasure chest!* ○ *Also, please accept this gift card to Target as a small thank you from us for traveling to UCF.* ○ *Our next session will be on-line with the video feed. Please remember to help prepare for the session by removing any distractions in the room and making sure that you have the Mickey Mouse Clubhouse books and iPad ready. Also, to make the time we have together as productive as possible, please continue to practice the Answer+ Model step at home for a few minutes each day. Don't forget that you have your reminder handout with all of the steps.*
Session 9: Answer + Model (30 minutes)	• Maintain ongoing rapport with parent and child. • Provide parent with opportunities to practice the Answer + Model component with preschooler with minimal prompts and feedback. • Provide child opportunities to engage in communicative turntaking with parent and researcher.	• Independent practice with feedback	<u>Telepractice Session</u> • The researcher begins the session by calling the dyad on FaceTime/Skype and orienting them to the session schedule. *Researcher Script Guide* ○ *Hello, it is nice to see you again! We are going to work together today for about 30 minutes.* ○ *I am going to have you read one book and then we will take a break to talk. Afterwards, I will have you read a second book.* ○ *I know the video connection can be distracting, so I will disable my microphone and video. Feel free to ask questions at any time and I will jump back on to answer.* • The parent practices the Answer+ Model component with minimal cues from the researcher for the duration of one storybook.

Researcher Script Guide

- *To get us started for this session, can you and [child's name] show me what you have practiced since our last session? As always, do not be nervous while you are reading. I will disable my video camera and microphone to help reduce the distractions in the room. I will be taking notes while you read to talk about after.*
- *Okay, I am going to take the backseat now and you are in charge of the storybook reading. Remember, you will read, model, wait… ask, model, wait… and then answer, model, wait.*
- *Don't forget that we learned that we need to respond to everything the child says at any time.*

- The researcher provides feedback on the parents' implementation of the component step. The researcher begins with positive aspects of the reading and then transitions into identifying areas that need improvement. The researcher identifies three or less areas of improvement.
- The researcher answers any questions the parent has about the storybook reading and provides additional feedback as needed.

Researcher Script Guide

- *We are going to let [child's name] take a break while we talk about the reading session. Please keep him/her in the room because we will read again at the end of the session. He/she can play with some small toys, but we*

want to make sure that [child's name] will be able to transition back to reading in a few minutes.
- *I'm going to talk you through the reading session and give you a few pointers on how to improve for next time. Don't worry, this is a learning process.*

- The parent again practices the Answer+ Model component with minimal cues from the researcher for the duration of one storybook.

Researcher Script Guide

- *I'm going to have you read again with [child's name] to practice the Answer+ Model once more time with the changes we just talked about. I'm going to disable my camera again and just observe your practice session.*
- *Remember, you will Answer+ Model and then wait, wait, wait!*
- *It's important to respond to everything that the child says.*
- *How do you think it went?*

- The researcher provides feedback on the parents' implementation of the component step. The researcher begins with positive aspects of the reading and then transitions into identifying areas that need improvement. The researcher identifies three or less areas of improvement.
- The researcher answers any questions the parent has about the storybook reading and provides additional feedback as needed.

Researcher Script Guide

- *You both did a great job!*
- *What questions do you have about the Answer+ Model step?*
- *While you were reading, I noticed that you did a great job waiting after you read. Nice!*
- *Be sure that you are giving [child's name] plenty of time to think about what he/she wants to say.*

- The researcher thanks the parent for participating in the telepractice session and reminds him/her that the next session will be live in the clinic.
- The parent is reminded that they will receive a follow-up email with additional feedback.

Researcher Script Guide

- *Wow, that was a great session! Don't forget that you will receive an email from me talking about all the great things you and [child's name] did today. Please feel free to email me if you have any questions!*
- *Thank you so much for working with me on-line. This is our last session, and we will now switch to being totally online. I know you and [child's name] are ready to take what you have learned and use it without me!*

APPENDIX G: TELEPRACTICE FEEDBACK FORM

[greeting],

It was great to connect with you and [child's name] [temporal marker]. [positive statement regarding child's progress].

While I was watching, I was taking notes on some of the great things you and [child's name] were doing. There are even more than I have listed below! Also, I was taking note of some aspects of the program to remember and work on at home. We will continue to refine the storybook reading during our sessions in the clinic. These are details of the program that will help increase [child's name]'s communication.

Positives:
-explicit positive statement
-explicit positive statement
-explicit positive statement
-explicit positive statement
-explicit positive statement

Sample explicit positive statements:

-You did a great job remembering to read and model the device on every page. Nice!
-You used the turn page button on each page. Great!
-Excellent use of the adjectives on each page. This will help to expand [child's name]'s language to include those rich descriptive words.
-Wonderful job sticking with the book reading and engaging [child's name] during [book title]. He communicated numerous times during the story!
-Fabulous responding to each of [child's name]'s attempts to communicate. You did great remembering to respond every time he expressed himself.
-Your wait time increased on the second book. Awesome!

Things to remember:
-direct improvement statement
-direct improvement statement
-direct improvement statement

Sample direct improvement statements:

-Remember to wait after you read each page. This gives [child's name] the opportunity to formulate his message and communicate if he would like. The waiting is very important. You did a great job adding this piece on the second book!
-After [child's name] communicates a message, you can pair your response/reaction to his message with modeling using the iPad. For example, if

he points at Mickey, you then follow up his comment with modeling Mickey on the device. This gives [child's name] one more model on the device.
-Start to model the "open flap" button when reading the books with the flaps. The button is right above the turn page button for the book files with the flaps.

You and [child's name] both did a great job during the session [temporal marker]. [positive statement regarding the book reading session]. [reminder about next session date and time].

[closing],

Erika Timpe

APPENDIX H: FIDELITY CHECKLISTS

Assessment Session

Dyad #:_____	**Session #:_____**
Video #:_____	**Reviewer:_____**

Directions: Check the box next to each indicator if observed during the session.

Step	Components	Implementation of Step	
		Correct	**Incorrect**
Assessment of Skills	Assessment administrator obtains parent assent for participation.		
	Assessment administrator follows all published assessment protocols.		
	Assessment administrator does not give the child undue assistance with assessment items.		
	Assessment administrator administers all assessment items as required by the assessment manual.		
	No instruction occurs during assessment administration.		

Calculations:

Total # Correctly Implemented Components/ Total # Correctly Implemented Components +

Total # of Incorrectly Implemented Components

_____ / _____ = _____

Baseline Session

Dyad #:_____	**Session #:_____**
Video #:_____	**Reviewer:_____**

Directions: Check the box next to each indicator if observed during the session.

Step	Components	Implementation of Step	
		Correct	**Incorrect**
Baseline shared storybook reading	Parent is asked to read the book to child in their typical manner.		
	Researcher does not prompt the parent or child to use the mobile AAC technology.		
	Researcher does not indicate correctness of storybook reading.		
	Storybook reading session is recorded for a minimum of 10 minutes.		
	No instruction occurs during baseline session.		

Calculations:

Total # Correctly Implemented Components/ Total # Correctly Implemented Components +

Total # of Incorrectly Implemented Components

_____ / _____ = _____

Introductory Session

Dyad #:_____ **Session #:**_____

Video #:_____ **Reviewer:**_____

Target Component Skill:

Read + Model Ask + Model Answer + Model

Directions: Check the box next to each indicator if observed during the session.

Step	**Components**	**Implementation of Step**	
		Correct	**Incorrect**
Strategy Description	Researcher describes the strategy component skill to the parent.		
	Researcher engages child in play.		
Strategy Demonstration	Researcher demonstrates the use of the strategy component skill while engaging the child in storybook reading.		
	Researcher talks aloud during the demonstration.		
Supported Practice with Feedback	Parent practices the component skill with their child.		
	Researcher provides prompts and/or feedback.		

Calculations:

Total # Correctly Implemented Components/ Total # Correctly Implemented Components +

Total # of Incorrectly Implemented Components

_____ / _____ = _____

Guided Practice Session

Dyad #:_____ **Session #:**_____

Video #:_____ **Reviewer:**_____

Target Component Skill:

Read + Model Ask + Model Answer + Model

Directions: Check the box next to each indicator correctly implemented during the session.

Step	**Components**	**Implementation of Step**	
		Correct	**Incorrect**
Strategy Demonstration	Researcher demonstrates the use of the strategy component skill while engaging the child in storybook reading.		
	Researcher talks aloud during the demonstration.		
Supported Practice with Feedback	Parent practices the component skill with their child.		
	Researcher provides prompts and/or feedback.		

Calculations:

Total # Correctly Implemented Components/ Total # Correctly Implemented Components +

Total # of Incorrectly Implemented Components

_____ / _____ = _____

Telepractice Session

Dyad #:_____	**Session #:_____**
Video #:_____	**Reviewer:_____**
Target Component Skill:	

Read + Model Ask + Model Answer + Model

Directions: Check the box next to each indicator correctly implemented during the session.

Step	**Components**	**Implementation of Step**	
		Correct	**Incorrect**
Independent Practice	Parent practices the component skill with their child.		
	Researcher provides prompts and/or feedback.		

Calculations:

Total # Correctly Implemented Components/ Total # Correctly Implemented Components +

Total # of Incorrectly Implemented Components

_____ / _____ = _____

APPENDIX I: DATA COLLECTION FORMS

Parent Data Coding Form

Child Initials:_____

Legend:
1 = Read **2**= Model **3** = Expectant Delay **4** = Ask

5= Model **6** = Expectant Delay **7** = Answer

Session #:_____

Notes:
**Most simple case – child says nothing throughout steps 1-6 & parent answers own question (step 7)*
**Parent only completes as many steps as is necessary for the child to communicate*
**Accurate implementation= no more than one error in implementing those steps necessary for the child to communicate*

Book	**Double Page Spread #**	**RAA NOT Imple-ent-ed**	**Implementation of Communicative Interaction Strategy**				
			Time	**Steps Correctly Imple-mented**	**Incorrectly Implemented Step(s) & *Omitted Steps***	**Accurately Implemented (Yes/No)**	**Notes**
	(1)			(1)			
	(2)			(2)			
	(3)			(3)			
	(4)			(4)			
	(5)			(5)			
	(6)			(6)			
	(7)			(7)			
	(8)			(8)			
	(9)			(9)			
	(10)			(10)			
	(11)			(11)			
	(12)			(12)			
	(13)			(13)			
	(14)			(14)			
	(15)			(15)			

Calculations
Correctly Implemented Strategies:_____ # Incorrectly Implemented Strategies: _____
Correctly Implemented Strategies/ (Total # Correct + Total # Incorrect) _____ / _____ = _____% Accuracy

Child Data Coding Form

Child Initials:_____ Session #:_____

Book	**Double Page Spread #**	**Time**	**Multimodal Communicative Turn**	**Mode of Turn**	**Spon. (S) OR Imitative (I)**
			(1)		
			(2)		
			(3)		
			(4)		
			(5)		
			(6)		
			(7)		
			(8)		
			(9)		
			(10)		
			(11)		
			(12)		
			(13)		
			(14)		
			(15)		

Calculations	
# of multimodal communicative turns:_____	# of DIFFERENT multimodal communicative turns:_____
# spontaneous turns:_____	# imitative turns:_____

APPENDIX J: SOCIAL VALIDITY

Thank you for your participation in the iCan Communicate Fall Research Program. We appreciate your dedication to helping your child continue to learn to communicate. Please complete the following brief questionnaire about the program. Your responses are anonymous and will be used to help us continue to refine the program for future families.

Please complete the following information. Your responses are anonymous, and the information will be used for descriptive purposes only.

Age:

Occupation:

Marital Status:

Please indicate the extent to which you agree or disagree with each statement about the iCan Communicate Fall Research Program.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I have noticed positive changes in my child's communication since starting this program.					
I feel confident that I can continue to help my child learn to communicate.					
The iPad was					

easy to use for communication during storybook reading.					
I am likely to use the iPad and Read-Ask-Answer strategy during storybook reading in the future.					
I believe I will be able to use some of the strategies I learned during other activities at home to help support my child's communication.					
I am satisfied with the instruction I received.					
I would participate in a similar program again if given the opportunity.					
I would recommend this program to other parents.					
I think it would be beneficial for my child's teachers and/or other therapists					

to receive components of the instruction I received.					
I believe this program benefited my child overall.					
I would like to learn more about how to help my child communicate effectively during different activities and situations, such as play, arts and crafts, and during mealtimes.					

What changes have you noticed in your child's communication since starting this program?

What did you like most about this program?

What did you like the least about this program? What changes would you make to this program?

Do you feel the digital sessions (Skype/FaceTime) were beneficial? Did this session format help alleviate family stressors (e.g., childcare for siblings, travel time to UCF, scheduling conflicts)?

What would you want others, such as other families with children with communication needs, community leaders, or potential financial donors, to know about this program?

Please share any additional comments that you have about the iCan Communicate Fall 2015 Research Program in the box below.

APPENDIX K: ANONYMOUS WRITTEN PARENT FEEDBACK

Question	Parent Feedback
What would you want others, such as families with children with communication needs, community leaders, or potential financial donors, to know about this program?	• "That the program is beneficial to your child. It is a nice bonding time with your child while reading the books, encourages ownership of his/her reading, visually sees the word and hears it. The program can't hinder your child only benefit him/her./ Encourages a back and forth conversation." • "That they will notice a huge change with communication after, at least with my child, 3 sessions." • "I would LOVE for my child and I to have more opportunities to participate in these types of program, it really is wonderful to receive help from professionals who are trained and knowledgeable in helping children or adults with special needs. When parents are given the tools and support to help their kiddos out it makes a world of a difference. Thank You!"

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