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PARENT-IMPLEMENTED COMMUNICATION INTERVENTION FOR PRESCHOOL-AGED CHILDREN WITH AUTISM

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PARENT-IMPLEMENTED COMMUNICATION INTERVENTION FOR PRESCHOOL-AGED CHILDREN WITH AUTISM

A dissertation submitted in partial fulfillment of the requirements of the degree of Doctor of Philosophy at Virginia Commonwealth University.

by

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Abstract

PARENT IMPLEMENTED COMMUNICATION INTERVENTION FOR PRESCHOOL AGED CHILDREN WITH AUTISM

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Exploring the interventions that promote expressive, verbal language for preschool-aged children with autism is essential. When a child is lacking the ability to communicate, parents express that they would like their child to speak. B.F. Skinner (1957) proposed that the mand repertoire (communicative requests) should be an initial focus of language training. Mand training has been shown to be effective for teaching children with autism to communicate. However, many studies exploring mand training utilize highly trained instructors for intervention implementation. Early childhood best practices recommend the use of family-centered interventions and teaching within the natural environment. This study followed these recommendations.

This research utilized a single subject multiple baseline across participants design

with two parents and their preschool aged children with autism. The purpose of this dissertation study was two fold: (1) to examine the effects of a verbal mand with direct trial instruction intervention on the verbal communication skills for children with autism, and (2) to investigate if a parent can reliably implement the intervention. Using written instructions, role play, video models, and performance feedback, the researcher taught parents how to implement the intervention with their child. The goal of the intervention was to increase verbal communication skills, specifically the production of independent verbal mands. The intervention under question involved verbal mand training using direct trial instruction (DTI). During DTI the parent taught the child to use mands utilizing a time delay, verbal prompting, and sign language. The researcher collected data during the baseline, intervention, and maintenance phases. In addition to the intervention results, the researcher collected and analyzed social validity, treatment fidelity, and parent competence data.

Results from the intervention effects did not show a functional relation between the treatment and the target behavior. However, both participants increased their ability to use verbal and sign language communication. The parents were able to implement the intervention with fidelity and gained high competence scores related to intervention delivery expertise and behavioral responsiveness. The parents also reported that the intervention was extremely useful for their family. The parents generalized the intervention procedures and their children communicated more throughout their daily routines.

Chapter I

Introduction

Statement of the Problem

Autism, defined by its effect on social communication and social interaction, encompasses restricted, repetitive patterns of behaviors (American Psychiatric Association [APA], 2013). The Center for Disease Prevention and Control (CDC, 2014) reported the number of children identified with autism has significantly increased over the past ten years. The most recent wave of Pre-Elementary Education Longitudinal Study (PEELS) shows the percentage of young children receiving preschool special education services account for the third largest disability category (Carlson et al., 2008).

Young children with autism have more difficulty acquiring language when compared to their typically developing peers. This can be stressful for caregivers because when children exhibit language delays they often also exhibit challenging behaviors (Petersen, Bates, & Staples, 2015; Roben, Cole, & Armstrong, 2013). Further, language delays can significantly affect important areas of functioning in children, including social interactions and learning (Duncan et al., 2007; Kent, Wanzek, Petscher, Al Otaiba, & Kim, 2014; Petersen et al., 2015; Roben et al., 2013; Roth, Speece, & Cooper, 2002; Yew & O'Kearney, 2015). Approximately 65% of toddlers with autism are not able to verbally communicate (Lord & Risi, 2004). The ability to verbally communicate affects how children learn and because young children with autism have such difficulty using

language, language training should be a major focus of their education planning (Sundberg & Michael, 2001).

Scholars emphasize the necessity to begin language instruction early (Sundberg & Michael, 2001; Yoder & Stone, 2006). Interventions designed to increase verbal communication should be a priority in early childhood special education. Exploring how to use a communicative request, a mand, should be the initial focus of instruction (Skinner, 1957) and research is needed to explore what intervention packages are effective. Further, exploring how families can be involved in intervention implementation is essential and is a recommended priority by the Council of Exceptional Children Division for Early Childhood (2004) and the National Research Council (2001). However, there is a lack of family involvement in the literature on verbal communication intervention research for preschool aged children with autism (Carbone, Sweeney-Kerwin, Attanasio, & Kasper, 2010; Drash, High, & Tudor, 1999; Jennett, Harris, & Delmonico, 2008; Kodak & Clements, 2009; Plavnick & Vitale, 2016; Thomas, Lafasakis, & Sturmey, 2010).

Rationale for the Study

This study aimed to increase the ability of children with autism to use verbal communication in natural settings. Early intervention for all children experiencing language delays is imperative. When intervention is implemented earlier in life it can foster children's cognitive and social emotional development (Bornstein, Hahn, & Putnick, 2016; Corsello, 2005).

Typical language development. In typical language development, generally children develop language skills in a developmental pattern. The first instance of

vocalizations are seen at birth when babies engage in reflexive vocalizations, including cries, coughs, and hiccups. Between six and eight weeks, vocalizations begin to be more purposeful, referred to as nonreflexive vocalizations. These nonreflexive vocalizations include babbling and cooing with the production of vowel sounds, *ooo*, *ahhh*. Around four to six months of age, babbling occurs when infants begin to string together consonant-vowel sounds, *ba-ba-ba*. When infants are first developing this early language, the family and caregivers reinforce their speech by face-to-face interactions and imitations. Further, these early instances of speech are used in a communicative context. For example, when a baby cries or fusses they are expressing their emotional state, being upset (Otto, 2014).

Beginning at one year of age, infants begin to use units of speech that are meaningful and stable. They begin to use distinct vocal units to represent different actions or objects; for example, /ba/ to mean sheep (Otto, 2014). Between 12 and 24 months, children establish two-word utterances. These utterances can include reflexive semantic functions ("more milk"), locative utterances ("doggie bed"), and attributive utterances ("blue book"). During this stage of development, toddlers also begin to request that their caregivers label their environment, stating "Whadat?" meaning, "What's that?" Children between the age of one and two years, most likely use between 20 and 170 words and they understand many more (Otto, 2014). When half of the child's language contains two word utterances, they begin to use longer utterances, three to four words (Owens, 1996).

Preschool-aged children, three to four years of age, rapidly develop language that is understood by outside members of the child's family and care unit. Their utterances and sentence structures become more complex and begin to mimic adult speech. During

this age of development, children expand their mean length utterances (MLU) to include three or more words. A MLU is simply the calculation of the number of words and grammatical markers used in an utterance (Otto, 2014). For example, when a child says, "Mommy I want milk," the MLU is calculated to be 4 and when a child says, "Mommy eats chips," the MLU is 5 because the *–s* on *eats* indicates third-person singular and the *–s* on *chips* indicates plurality. Preschool-aged children also use negation in their statements by the use of *no*, *not*, or *don't*.

Preschool children learn language from their environments and the learning contexts that are created in their home and childcare settings (Otto, 2006). Caregivers expand and scaffold the child's learning through questioning, expansion, and extension. For example, Parent: "What did you do today?" Child: "Go to park." Parent: "What did you see at the park?" Child: "A bird" (Otto, 2014).

Language development and autism. Children with autism have difficulty learning language and often develop language later than their typically developing peers (APA, 2013). While typical language development follows a developmentally pattern, language development for children with autism varies widely. Many young children with autism seem to be unaware that communication occurs between two, or more, individuals and communication can be helpful in getting your wants and needs met. These children do not recognize the importance of speech sounds or even gestures for communication. Before typical developing children use verbal language, non-verbal gestures (pointing, reaching, or eye gaze) are used as a way to communicate (Otto, 2014). As a child's verbal communication develops, these non-verbal gestures are slowly replaced with speech sounds and words. However, many times when a young child with autism wants

something they will not use non-verbal gestures or verbal communication to communicate their needs; they often move their caregivers' hand towards the requested item or action; fuss, cry, or become upset; or fail to provide any signals for communication (Rogers, Dawson, & Vismara, 2012).

Even though the language development of children with autism varies widely, there are some common language development difficulties seen in many young children with autism. Commonly seen in the language development of young children with autism is echolalia, or the inappropriate repeating of words and phrases (Scheuermann & Webber, 2002). Children with autism will often repeat lines they have heard from television shows or the direct language of an adult. For example, an adult may say, "How are you?" and the child will repeat, "How are you?" instead of producing an appropriate answer. Children with autism also usually develop large vocabularies, many different tacts. However, they have trouble using these words in context (Scheuermann & Webber, 2002). For example, a child may know how to tact (label) "apple" when shown an apple, but will not mand (request for) "apple" when he wants to eat it. Last, young children with autism often do not engage in reciprocal speech or take turns in conversation.

The importance of verbal communication. Communication skills are critical to forming social relationships, learning, and functioning independently (Scheuermann & Webber, 2002). While most communication is expressed verbally, some children with significant language impairments rely on augmentative and alternative communication (AAC) systems to express themselves. AAC systems for children who are not able to learn how to verbally communicate are imperative and important, and can be effectively introduced early in life (Cress & Marvin, 2003).

The ability to use language for communication is critical for developmental, academic, and social success for young children. When preschool-aged children exhibit delays in language, they are more likely to exhibit behavioral challenges, and difficulties involving academic work, and social exchanges later in life (Yew & O'Kearney, 2015). Further, young children's ability to use verbal language contributes to their early reading (Roth, Speece, & Cooper, 2002), writing (Kent et al., 2014), and mathematic skill development (Duncan et al., 2007). When a child is referred for an autism diagnosis, parents often express their concerns with speech delays and communication (Lord & Risi, 2004), and express that they would like their child to verbally communicate (Greenberg, Tomaino, & Charlop, 2013). Thus, exploring the specific interventions that promote expressive, verbal communication for preschool children with autism is essential.

For most individuals, verbal communication is the most efficient and most widely understood way to communicate. The speaker does not need to rely on pictures, symbols, or gestures to supplement their communication, and it is considered more efficient than other pre-verbal or non-speech communication (Yoder & Stone, 2006). Under the Verbal Behavior approach, children can learn how to mand using a variety of different tools or AAC aids, e.g. gestures, sign language, pictures, Speech Generated Devices (SGD), or iPads. AAC aids and tools are effective for increasing functional communication (Carbone et al., 2010; Carré, Grice, Blampied, & Walker, 2009; Ganz, Lashley, & Rispoli, 2010; Ganz, Parker, & Benson, 2009; Jurgens, Anderson, & Moore, 2009; Park, Alber-Morgan, & Cannella-Malone, 2011; Yoder & Layton, 1988). However, the literature provides inconsistent evidence concerning the development of verbal communication while using AAC for preschool-aged children with autism (Carré et al.,

2009; Ganz, Simpson, & Corbin-Newsome, 2008; Ganz et al., 2009; Ganz et al., 2010; Jurgens et al., 2009; Park et al., 2011). Further, compared to interventions that directly target verbal communication, speech takes longer to develop when using an AAC intervention (Rogers, 2006). Looking specifically at the use of the Picture Exchange Communication System (PECS), preschool-aged participants did not begin to use verbal communication until the fourth PECS phase, after 20 or more intervention sessions (Ganz et al., 2008; Jurgens et al., 2009).

Overview of the Study

This study examined the effects of a parent-implemented mand training intervention intended to increase children's ability to verbally mand for a desired reinforcement. The intervention utilized verbal mand direct trial instruction (supported by Jennett et al., 2008; Kodak & Clements, 2009; Reichle, Dropik, & Alden-Anderson, 2008). The body of literature supporting this intervention demonstrates that it is effective for increasing verbal mand production; however, the studies have not yet explored the use of a parent as the interventionist (Carbone et al., 2010; Jennett et al., 2008; Kodak & Clements, 2009; Reichle et al., 2008).

Brief Review of the Literature

Preschool-aged children often display delays in the ability to use language. In fact, the majority of children aged three to five who receive special education services are served under the Speech or Language Impairment disability category (Carlson et al., 2008). When individuals struggle with verbal language development, it is more likely that they will struggle in other developmental areas, including social emotional development,

adaptive/independence skills, and academics (Rogers et al., 2012; Roth et al., 2002; Scheuermann & Webber, 2002; Yew & O'Kearney, 2015).

Communication interventions. Language intervention is especially important for children with autism because these delays also severely affect their ability to engage socially, access learning, and participate independently in their natural environments (Rogers et al., 2012; Scheuermann & Webber, 2002). Rogers (2006) examined empirical literature surrounding communication interventions for young children with autism and summarized the major approaches to intervention: development, naturalistic, and behavioral.

Developmental approach. The developmental approach focuses on varying communicative skills, including speech and non-verbal skills (e.g., eye contact, gestures, shared attention during play and social activities). The focus of this approach is on using activities that are meaningful and interesting to the child to build independent social communication (Rogers, 2006).

Naturalistic approach. Naturalistic approaches to language intervention occur in the child's 'natural environment.' Natural environments are environments in which the learner spends the majority of their time and where the learner engages in daily/common routines. For preschool-aged children, these environments typically include: the home, school, child care settings, or community environments often visited by the child and their family (e.g. playgrounds, church childcare, or play groups). Naturalistic intervention approaches vary; however, the key elements involve the child directing the teaching (i.e., the child selects the toys/activities and the interventionist follows the child's lead, rather than directing the intervention [Rogers, 2006]).

Behavioral approach. The behavioral approach to language intervention involves discrete trial instruction (DTI) and massed-trial teaching. Interventionists utilizing this approach teach new behaviors by using reinforcement to strength target/positive behaviors, and extinction or punishment to decrease non-target/negative behaviors. The interventionist sets up the learning environment to elicit multiple practice opportunities and the intervention is often adult-directed. The behavioral approach to intervention commonly uses Verbal Behavior approaches (Skinner, 1957) and teaching practices that involve shaping, prompting, and time delay (Rogers, 2006).

Mand interventions. Referencing Verbal Behavior (VB), Skinner (1957) proposed four components (or operants) of expressive language: mand, tact, echoic, and intraverbal. Skinner (1957) explained that the mand repertoire (the ability to request; e.g., "I want apple.") should be the initial focus of instruction for young children. Common effective mand interventions involve DTI that uses verbal prompting and time delay-providing time for the child to independently request (mand) for the reinforcing item (Jennett et al., 2008; Kodak & Clements, 2009; Reichle et al., 2008).

Parent involvement. Regardless of the approach, parent involvement is essential for language intervention (Rogers, 2006). The *Division for Early Childhood Recommended Practices* (DEC-RP, 2014) provides the standards for working in the field of Early Childhood Special Education and Early Intervention (ECSE/EI). DEC-RP (2014) state that practitioners, along with the child's family, identify interventions and all members of the child's life implement the interventions to engage the child in active learning. Thus, teachers, specialized therapists, and family members should all implement the interventions in order to provide consistency for the child. The National Research

Council (2001) further recommends the involvement of families when teaching children with autism. Parents should be fully involved in intervention work and learning should occur in the child's natural environment. Despite this recommendation, studies that utilize mand training to increase verbal communication most often involve researchers as interventionists and clinical settings (Carbone et al., 2010; Drash et al., 1999; Jennett et al., 2008; Kodak & Clements, 2009; Plavnick & Vitale, 2016; Thomas et al., 2010).

It is essential to provide children with autism with consistent interventions that occur in various environments and training parents to complete language interventions has shown to be effective (Kaiser & Roberts, 2011; Kashinath, Woods, & Goldstein, 2006; Lafasakis & Sturmey, 2007; Patterson, Smith, & Mirenda, 2012; Roberts & Kaiser, 2011; Shire et al., 2015). Parent-implemented communication interventions can help children learn to communicate without resorting to challenging behaviors (Kaiser & Roberts, 2011). They are effective for reducing parental stress (McConachie & Diggle 2007) and have shown to be effective for language outcomes, including increasing the ability to use verbal communication (Kaiser, Hancock, & Nietfeld, 2000; Kashinath et al., 2006; Roberts & Kaiser, 2011; Schopler & Reichler, 1971). However, many of the studies that were completed in the area of parent-implemented intervention work have inadequate research methods and lack treatment fidelity information (McConachie & Diggle 2007; Shire et al., 2015). When treatment fidelity data were provided, the researchers rarely discussed quality of treatment implementation and how competent the parent was when delivering the intervention (e.g., how comfortable the parent was when delivering the intervention and responsiveness he/she was to the children's behavioral cues [Lafasakis & Sturmey, 2007; Kaiser et al., 2000; Kashinath et al., 2006; Shire et al.,

2015]).

Parent coaching is often utilized in early childhood (Rush & Shelden, 2005). When using a parent-implemented intervention under the coaching model, the family is in more control of the intervention procedures. Early childhood professionals follow the family's lead, and do not direct a specific intervention. When professionals use a coaching method, they do not tell families what to do. Instead, professionals allow the family to examine their current practices, and help the family enhance these practices to teach their child using a naturalistic approach (Rush & Shelden, 2005). Parent coaching and parent-implemented interventions often utilize natural language instruction (Kaiser & Hancock, 2003; Kaiser, Hancock, & Nietfeld, 2000; Kashinath et al., 2006; Roberts & Kaiser, 2011). However, professionals serving young children with autism and their families may need a more direct approach when helping parents enhance language development in the home.

Parent-implemented intervention work has been studied in the field of early childhood and autism; however, the intervention method has varied over the years. For example, Schopler and Reichler (1971) described an intervention that utilized a clinical setting. Parents of children with autism were actively involved in the therapy sessions. They watched the therapist complete the sessions with their child; then, the parents completed the intervention work. The intervention procedures described in Schopler and Reichler (1971) were vague and varied depending on the child's skills. However, Schopler and Reichler (1971) did discuss the concerns regarding a highly structured intervention (a DTI approach) compared to an intervention that provided more "freedom from structure" (a NET approach; p. 98). The researchers found that optimal learning

occurs for children with autism when instruction is varied, providing DTI when learning new skills and NET for practicing mastered skills (Schopler & Reichler, 1971).

Kaiser and colleagues (2000) completed a study that involved parent coaching using a NET intervention, the Enhanced Milieu Training (EMT) for preschool-aged children with autism. EMT involves the use of: (1) environmental modifications to increase communicative responses, (2) reciprocal interactions between caregiver and child to increase social communication, and (3) EMT procedures that involve verbal prompting and modeling, time-delay, and incidental teaching. Kaiser et al. (2000) utilized a concurrent multiple baseline design (the intervention phases were not staggered between the participants) to test the effectiveness of a parent-implemented EMT intervention in the clinical setting. The researchers took data on the parent's ability to implement the intervention with fidelity and the children's ability to meet their targeted communication goals, most of which included the ability to use two and three word mands. The parents completed the intervention twice a week for 45 minutes per session. The parents completed the EMT intervention with their children for 15 minutes per session and the remaining 30 minutes consisted of conversation with the coach, role-play, and demonstration activities. Generalization probes were completed in the home setting, and follow-up sessions were completed once a month for six months.

Overall, the results were very positive (Kaiser et al., 2000). All parents increased their use of the EMT practices and during the last five sessions gained high fidelity scores ($\overline{x}$ = 82.7%). Five of the six parents also continued their use of the EMT practices during follow-up; however, fidelity score decreases were seen during the fifth and six-month follow-up sessions. Further, five of the six parents utilized EMT practices during the

generalization sessions in the home when measured in the post-intervention sessions and follow-up generalization sessions. Five of the six children consistently increased their ability to use mands and similar gains were seen during the follow-up sessions. The data for one of the children showed high variability and the level reported on the last six data points was close to the baseline level. Further, generalization was seen in the home sessions for the five children. The sixth child that did not show gains corresponded with the sixth parent that was not consistently implementing the intervention with fidelity (Kaiser et al., 2000).

Several language development theories are proposed and these underline the differing interventions used to target verbal communication for children with and without autism, including: the behavioral, naturalistic, and developmental models; interactive models; learning with AAC systems; and the parent-implemented and coaching method (Rogers, 2006; Rush & Shelden, 2005; Scheuermann & Webber, 2002). Regardless of the method and theory, instruction should be varied, and individually and culturally appropriate. Consistent with sociolinguistic theory and the coaching model, many children learn in their natural setting, as learning occurs through modeling and interaction from caregivers. However, for children with autism, learning in a more structured way is often needed before a target skill is generalized to natural settings (Scheuermann & Webber, 2002; Schopler & Reichler, 1971). This may involve behavioral principles to teaching children with autism, including: the antecedent, behavior, consequence model (A-B-C model), reinforcement, and prompting (Scheuermann & Webber, 2002). The A-B-C model explains that individuals exhibit behaviors in response to events that occur in their environment, either before the behavior occurs (antecedents), or after

(consequences). Behaviors can also be increased using positive and negative reinforcements. Reinforcements are delivered immediately after a behavior occurs to encourage the individual to elicit the same behavior in the future. Reinforcements can be internal or external. Examples of internal reinforcement include praise or attention; however, children with autism are usually not motivated to exhibit a target behavior if internal reinforcements are provided (Scheuermann & Webber, 2002). Thus, it is recommended to provide external, or tangible reinforcements to increase behaviors for children with autism (e.g., toys, food, or other items [Scheuermann & Webber, 2002]). Prompting is also used to shape behaviors for children with autism. Prompting involves providing extra help to elicit a response. For example, if a therapist wants a child to say "popcorn," the therapist might prompt by saying, "say popcorn," or use nonverbal prompts, such as sign language or holding up a picture of popcorn. Verbal Behavior (VB) techniques are also used to shape behaviors, specifically the ability to communicate. VB techniques may include discrete trial training or teaching discrete behaviors in a structured one-on-one, massed repetitive trial format (Scheuermann & Webber, 2002).

Theoretical Foundations

Sociolinguistic theory (Halliday, 2004; Owens, 1996) and B.F. Skinner's VB theory are the theoretical views that guided this dissertation project. Under the sociolinguistic theory, when referencing typical development, children learn in a variety of natural environments (Halliday, 2004; Owens, 1996). Children with autism may not naturally pick up on cues from their environment to learn language. Thus, they may require a more structured approach to learn how to communicate with others.

Sociolinguistic theory. The sociolinguistic theory of language development suggests that, "children learn language within the context of every day events as they interact with parents, siblings, and peers" (Owens, 1996, p. 56). Language is used as a way to communicate and individuals communicate for a variety of underlying reasons or as a function of the social/communicative aspects of language. Sociolinguistic theorists are less concerned with grammatical rules and more concerned with how effective the speaker is in gaining the listener's attention and fully communicating intention. Additionally, language is categorized under two functions: intrapersonal and interpersonal. Intrapersonal language is used for memory, problem solving, and the ability to understand one's world. Interpersonal language is the ability to communicate and is defined by speech acts. Speech acts convey the speaker's intentions. For young children, social linguistic theorists explain primitive speech acts that are sorted into nine categories: labeling, repeating, answering, requesting action, requesting answer, calling, greeting, protesting, and practicing (Owens, 1996).

Sociolinguistic theory suggests that language is acquired through socialization between the child and their caregivers (Halliday, 2004; Owens, 1996). Through joint attention activities, like "peekaboo," children learn turn-taking and social language skills. A child's earliest words are functional in nature; for example, children learn to say "hi," "bye-bye," or the name of the listener. Caregivers can support this language by expanding the utterance. They may offer a reply, imitate, or give feedback (Owens, 1996). Reinforcement for language development is naturally occurring and is derived when a caregiver offers a caring relationship.

Verbal behavior theory. B.F. Skinner introduced the theory of VB (1957) to teach language. Similar to sociolinguistic theory, VB theory avoids the traditional language categories: expressive and receptive language; instead Skinner proposed the idea of several verbal operants: mand, tact, echoic, and intraverbal.

When initiating language instruction, B.F. Skinner (1957) suggested that interventionists focus on mand training first. Mands are requests for unconditioned or conditioned reinforcers. For example, when a child says "apple" to indicate that he/she would like to eat the apple, he/she is using a verbal mand. When an infant cries when he/she is hungry, he/she is using a mand for an unconditioned or for strong conditioned reinforcer (Sundberg & Michael, 2001).

Tacts are the second verbal operant Skinner (1957) discussed. Tacts are labels, e.g. when a child points to an apple and says "apple." In this example, the child may not want to eat the apple; they are simply labeling the apple. Individuals use tacts to gain the joint, social attention of another. Intraverbals are also used to gain and participate in social contexts. Intraverbals are seen during back-and-forth language exchanges and in conversation. When individuals use intraverbals they are responding meaningfully to the language of others (Goldsmith, LeBlanc, & Sautter, 2007). An example occurs when a child says "dog" after hearing their parent say "animal" (Skinner, 1957). Intraverbal responses are the most diverse group of VB responding. In intraverbal training, very young children simply learn the concept of responding to others' language. For example, a child states "star" after hearing a teacher sing "Twinkle, twinkle little…" or answers a simple question, "What is your name?" As a child gets older, intraverbals are seen in conversation, social interchanges, word associations, translation, behavior chains, and

question answering (Goldsmith et al., 2007). Thus, intraverbals are controlled by an antecedent verbal stimulus.

Echoics are also controlled by an antecedent verbal stimulus; however, they involve point-to-point correspondence. Simply, echoics are imitations. An example occurs when a child says "dog" after hearing their parent say "dog" (Skinner, 1957). The echoic response is generated when the speaker sounds identical to another speaker's model (Sautter & LeBlanc, 2006). However, in young children echoics may not sound identical to the speaker's model. Thus, Skinner (1957) stated that parents can reinforce their child's language approximations and imperfect responses to shape their behavior.

VB therapy helps preschool children with autism develop language (Oah & Dickinson, 1989; Sautter & LeBlanc, 2006; Sundberg & Michael, 2001). Language is acquired through modeling and external reinforcement provided by caregivers. Reinforcements can include soothing and holding children, feeding, and attending to the child's wants and needs (Owens, 1996). Children with autism have difficulty connecting with others and may not be motivated by the attention of a caregiver (Rogers et al., 2012). Further, they often require increased extrinsic motivation to complete tasks and to learn (e.g. the opportunity to play with a favorite toy or eat a favorite food after they complete a task; Koegel, Singh, & Koegel, 2010).

When utilizing a VB approach, it is essential to train each verbal operant separately (Oah & Dickinson, 1989). Alternative linguistics theories suggest that all verbal operants will emerge spontaneously in the child's language when she/he has mastered the acquisition of one operant. After acquisition of one operant it is assumed that the child now knows what the word means and is able to apply this meaning in other

contexts (Skinner, 1957). In contrast, Skinner (1957) emphasized the necessity of training each verbal operant separately. He explained the functional independence of the verbal operants by suggesting that the ability to request "ball" when wanting to play with a ball (mand) is different than the ability to say "ball" when asked the question "What toy bounces?" (intraverbal).

In regards to teaching children with autism, Sundberg and Michael (2001) further validated Skinner's emphasis of the functional independent teaching of the verbal operants. Generalization of skills is one of the weaknesses seen in children with autism; therefore, spontaneous acquisition of many skills in different environments or with different people is rarely seen in children with autism (Janzen, 2003). Further, children with autism often display "splinter skills," meaning their development in one area of language may greatly outweigh another area of language. For example, children who have limited verbal communication abilities often have decent receptive language skills and a large vocabulary (tact repertoire); however, they lack the ability to functionally communicate their wants and needs, mand or use intraverbals for social communication (Sundberg & Michael, 2001). Thus, VB therapy is widely used to teach language development for children with autism.

Research in the field of VB primarily focuses on the training of a single verbal operant or the combination of two verbal operants (Carr & Firth, 2005; Goldsmith et al., 2007). Alternative language training programs emphasize the words and meaning of words. However, this may underestimate the complex nature of verbal language training for children with autism (Sundberg & Michael, 2001). The literature indicates that with independent training of the verbal operants, young children with autism significantly

increased their cognitive, receptive, and expressive skills (Carbone et al., 2010; Drash et al., 1999; Jennett et al., 2008; Kodack & Clements, 2009; Plavnick & Vitale, 2016; Sundberg & Michael, 2001; Thomas et al., 2010). Furthermore, a significant decrease in problem behaviors was seen (Stock, Mirenda, & Smith, 2013).

Several studies have supported the effectiveness of VB therapy for children with autism (Sautter & LeBlanc, 2006; Sundberg & Michael, 2001). Further, the VB approach to early childhood has gained popularity among researchers and therapists interested in preschool autism following the work of Sundberg and Partington. Sundberg and Partington developed a training manual and assessment titled *The Assessment of Basic Language and Learning Skills* based on Skinner's work (Partington, 2006). This was also followed by another training manual and assessment titled *VB Milestones Assessment and Placement Program* (Sundberg, 2008).

The importance of mand training. Children with autism often have trouble generalizing skills and behaviors learned in one situation/setting and applying it to another (Henry & Myles, 2007, p. 117). Henry and Myles (2007) recommended that we first teach children with autism skills in a direct teaching method. Consistent with sociolinguistic theory, children with autism can be taught in the natural environment to ensure generalizability (Henry & Myles, 2007; NRC, 2001). Teaching within a generalizable, community setting allows children to transfer knowledge learned through repetition and recall to applicable knowledge within the natural environment (De Arment, Reed, & Wetzel, 2013). As stated earlier, mand training should be the initial and main focus of language training for children with autism (Skinner, 1957; Sundberg & Michael, 2001). Mands are important to language training because they are the only verbal operant

used to gain specific reinforcement and from the child's perspective; mands give children the ability to control their environment for their benefit (Skinner, 1957; Sundberg & Michael, 2001). Further, this is the one verbal operant that benefits the child directly (e.g. a child asks for candy and immediately gets the candy).

Hypothesis and Research Questions

Based on the above mentioned literature, the hypothesis of this study was two-fold. *First*, the researcher hypothesized that a verbal mand DTI intervention for preschool-aged children with autism will improve their ability to use independent verbal requests for preferred items (toys, activities, and/or food). *Second*, the researcher hypothesized parents will be able to reliably implement the verbal mand DTI intervention with their child. As the child begins to use verbal mands, it was hypothesized that he/she will first begin to use prompted mands (e.g., requiring prompts from their parent to mand). As the intervention progresses, the child's use of prompted mands will decrease and their use of independent mands will increase. This hypothesized relationship between independent and prompted mands is consistent with the findings across the literature (Carbone et al., 2010; Gutierrez et al., 2007; Jennet et al., 2008; Kodak & Clements, 2009). To test these hypotheses, this study attempted to answer the following research questions:

1. What is the effect of a parent-implemented verbal mand direct trial instruction intervention on verbal communication skills for preschool-aged children with autism?
2. How can parents reliably implement the verbal mand direct trial instruction intervention with their preschool-aged child with autism?

Research Design

A single subject multiple baseline across participants design was used to evaluate the effects of the intervention. Further, a maintenance phase was implemented to assess maintenance of skills learned after the intervention was removed. The *Autism Diagnostic Observation Schedule- Second Edition* (ADOS; Lord et al., 2012) and the *Assessment of Basic Language and Learning Skills, Revised* (ABLLS; Partington, 2006) were used to gain background information on the child participants' language abilities and their autism related behaviors and characteristics. To gain further background information, the children's parents and teachers were interviewed prior to intervention. A formal preference assessment (Bondy & Frost, 2002) was conducted for each child to determine which items were used for intervention. The two parent participants were trained to implement the verbal mand DTI intervention using written instructions, video models, role play, and performance feedback. The study was conducted across two parent/child dyads twice a week in a staggered pattern across 12.5 weeks. Each dyad began the baseline phase at the same time and data were collected for five sessions before the intervention was introduced to the first participant. The intervention phase lasted for four weeks for participant one before the intervention was introduced to participant two. Similarly, the intervention phase lasted for four weeks for participant two before the maintenance phase was introduced to both participants. The researcher collected data on the different mands that the children used. The researcher also collected data on treatment fidelity using a protocol adapted from Tincani (2004). Social validity information was gathered through detailed field notes and semi-structured interviews. Visual analysis, including level and trend change across phases, variability within phases, and Percentage

of Non-overlapping Data (PND), was used to analyze the intervention results. Social validity information was used to examine the social and practical significance of the intervention. The researcher analyzed the social validity data by searching the data for common themes and disconfirming evidence. The participants' quotes and experiences were reported to assure the study was socially important for each participant (See the detailed description in Chapter 3).

Definition of Terms

Verbal Behavior Approach: B.F. Skinner introduced the Verbal Behavior (VB) theory in 1957 to describe linguistics and language. Now, the VB Approach is a therapy used to teach communication that emphasizes the meaning of words and the purpose of communicating (*why* individuals communicate). It typically involves the therapists using immediate and frequent prompts to facilitate communication responses.

Verbal Operants: Verbal Behavior classifies expressive language into several verbal operants: mands (requests), tacts (labels), echoics (imitations), and intraverbals (conversational words).

Mand: A mand is a request, e.g. a child will say "cookie," to request a cookie. During VB therapy, it is recommended to begin teaching mands prior to other operants.

Verbal Mand Training: An approach that instructors use when teaching language. When instructors teach a child to use a mand, they are using verbal mand training.

Direct Trial Instruction: A direct teaching method that involves massed trial instruction and a one-to-one child to instructor ratio.

Chapter II

Literature Review

The purpose of this section is to discuss the results of a systematic literature review performed to synthesize research studies targeting the ability to acquire verbal mands of children with autism. The information gained from this review established the need for this dissertation research and guided the methodology (presented in Chapter III). This review revealed that verbal mand intervention research literature reported inconsistent use of formal measures to assess participants' prerequisite knowledge, social validity, and treatment fidelity. Further, most of the literature examined did not incorporate parents and family members or use the home as the intervention setting.

Method

Study identification procedures. Studies for this systematic review were identified using a four-phrase process. First, the author searched the following computer databases: *Educational Resources Information Center (ERIC) via ProQuest*, *Educational Research Complete* (*EBSCO)*, and *PsychINFO* using the following search terms: autis* AND preschool OR early childhood AND mand or request* AND (one of the following) **"**verbal communication," "vocal communication," "speech," "spoken language," "spoken communication," "communication intervention," "language intervention," "picture exchange," "sign language," "echoic to mand," "mand training," "total communication," "simultaneous communication," "mand model," or "verbal prompting." Each search term

was placed on a separate line in the database and all variations and combinations were utilized.

After the initial search, the author read the titles and abstracts in RefWorks to determine which studies met the criteria for review. Next the author read the full-text studies to determine if they met the inclusion/exclusion criteria. Once the studies were identified through the full-text search, the author searched the reference sections of the selected studies for additional articles.

Inclusion criteria. Studies published in English, in peer-reviewed journals were eligible for this review. Further, studies that investigated the use of a communication intervention to increase verbal mand production were included in this review. Thus, these studies contained quantitative experimental designs that demonstrated the effects of an intervention on the production of verbal mands. Studies published after 1997 were chosen for the review since the Preschool Grants were established under the 1997 Individuals with Disabilities Education Amendments Act (IDEA). IDEA (1997, § 619) describes states' eligibility to receive money through Preschool Grants if they provide free appropriate public education to all children with disabilities aged three to five years.

The studies identified focused on participants who were preschool-aged children, between the ages of three and five years with an educational or medical diagnosis of autism. To be included in this review, the dependent variable was the production of pure verbal mands, defined as the participants' ability to use a verbal noun to request a preferred item. Interventions targeting pure verbal mand production were reviewed. The targeted interventions in this review included low-tech materials (non-electronic communication options, e.g., pictures) or an unaided form of intervention communication

(sign language, gestures, or verbal imitation [American Speech-Language-Hearing Association, 2016]).

Exclusion criteria. A study was excluded from this review if it did not include a quantitative methodology that demonstrated experimental control; thus, correlational studies, reviews, case studies, and qualitative studies were excluded. Further, if all of the participants in a study reviewed were outside of the specified age range or if they were described as an "elementary student" (not enrolled in a preschool setting), the study was excluded. However, if the study involved participants inside and outside of the age range, only the information about the preschool participants with autism was discussed in the review.

The target dependent variable was the production of pure verbal mands; thus, studies reporting solely other operant scores (tact, echoic, intraverbals) were not included in this review. Interventions targeting mands for information, mands for removal of stimuli, yes/no mands, and mand frames (examples: "I want…" or "Can I have…") were excluded. The study was excluded if the author only reported results about functional communication, i.e., not specific verbal language. Further, studies were excluded from the review if they were only targeting maintenance of skills learned previously. The focus of this review targeted interventions that included low-tech materials or an unaided form of communication; thus, a study was excluded if the target intervention utilized a high-tech device (electronic communication option), such as an iPad or a Voice Output Communication Aid (VOCA).

Study screening and coding procedures. After completing the initial search with the identified keywords, study citations were imported into the citation manager

RefWorks and duplicated studies were eliminated. After Phase 1 of the search, 357 study citations were identified. During Phase 2 all titles and abstracts were reviewed in RefWorks to determine which studies met the criteria for review, resulting in 54 studies. Studies were excluded for the following reasons: not relevant to current review (n = 135); participants were outside of the age range specified (n = 5); case study (n = 1); non-quantitative source that demonstrate intervention effects or quantitative studies without experimental control (e.g. correlational study, reviews, or qualitative research) (n = 13); non-peer reviewed journal articles (e.g., book chapters, dissertation and/or thesis (n = 134); intervention using a high-tech device (n = 15); and the dependent measure identified was not mand (n = 5).

During Phase 3 the author read the full-text studies to further determine if they met the inclusion/exclusion criteria, resulting in 10 studies. Studies were excluded from review for the following reasons: case study (n = 1); participants were outside of the inclusion criteria (n = 7); focused on practitioner training (n = 2); the dependent measure identified was not mand (n = 4) (words, vocalizations, approximations, communication repairs); and the dependent measure was not pure vocal mands, including: extension to mand training (n = 12) (mand frames, manding for information or missing items, maintenance or extension training of previous learned mands); and non pure mand training (n = 2) (yes/no manding or mand for removal of stimuli); non-verbal mand training (n = 14). During phase four, after identifying the studies for review, the author searched the reference lists to determine if any more studies would qualify. No more studies were identified during the reference list search. There were 10 studies identified for review.

Coding. Five coding categories were developed to organize the details of the identified studies: (a) research methodology; (b) participants; (c) intervention; (d) measures; and (e) setting. The participant category was coded by age of the participants. The intervention category was coded by the intervention type and the level of the intervention (e.g., how often the intervention was implemented by the administrator: "intensively" or "non-intensively"). The measures category described the assessments used to measure the dependent variable. The setting category was coded as: home, school setting (private or public school for children with and without disabilities), or clinic. Figure 1 includes a description of the categories and codes.

Results

Figure 1 displays the characteristics of the ten studies, including participants (number of, age, and diagnosed disability), intervention, dependent variable and measures, and setting. All 10 studies reviewed used single subject research as the methodology, including: multiple baseline across participants (n = 4), multiple baseline across behaviors (n = 1), multiple probe across participants (n = 2), multiple probe within participants (n = 1), changing criterion (n = 1), and adapted alternating treatment (n = 1). Each study utilized event recording as their data collection method; six of the studies displayed the results using frequency and four displayed the results using percentage of opportunities.

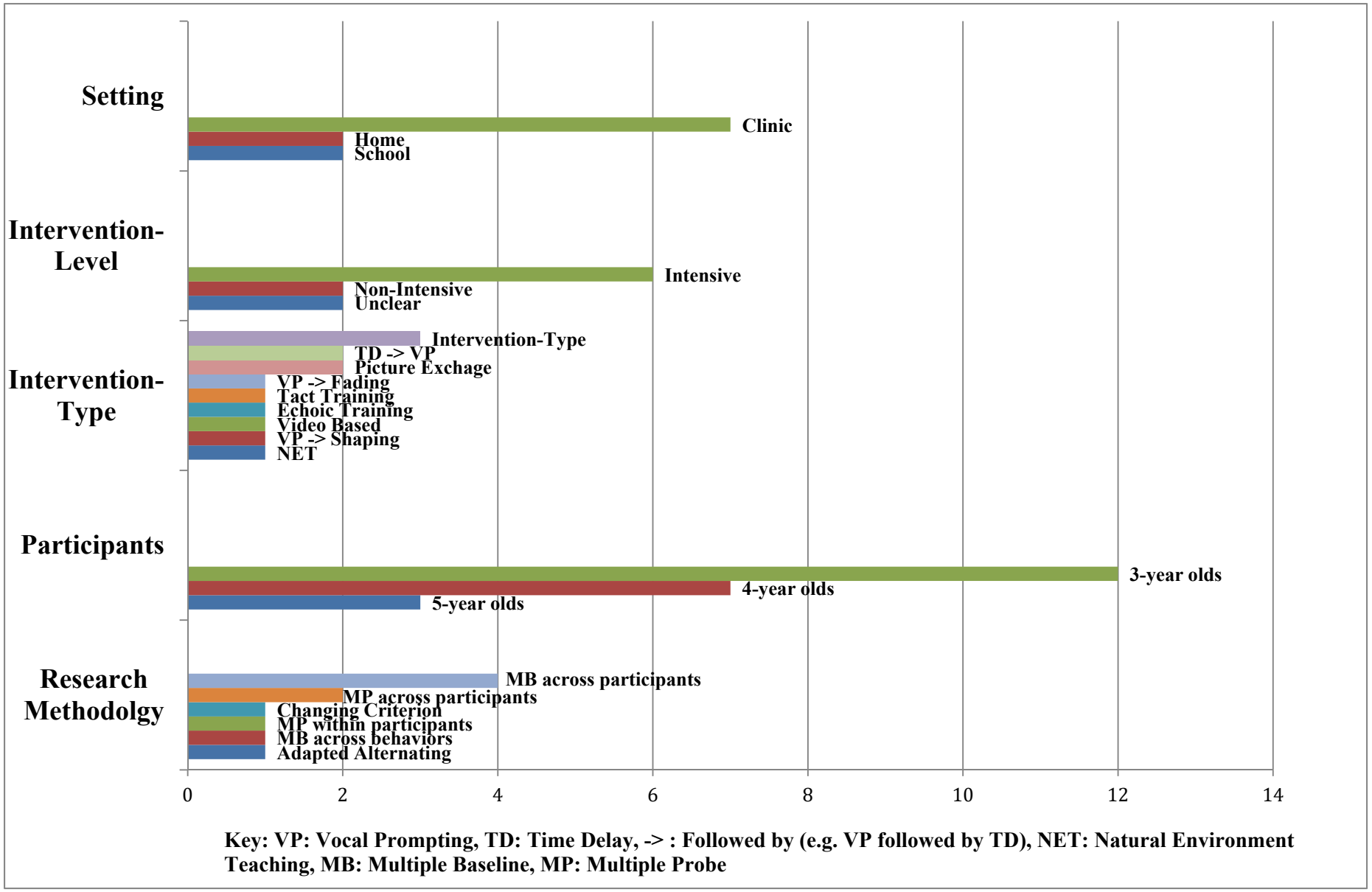

Figure 1. Categories and corresponding codes included in the literature review.

There were 29 children with autism and other developmental delays included in the studies reviewed. The results from seven participants were not utilized because the participants did not meet the criteria for the review; five were outside of the specified age range, one did not have a diagnosis of autism, and one did not participate in verbal mand training. Of the remaining 22 participants identified, most of the participants were male (n = 17), aged 3 years (n = 17; see Figure 1). The settings in the identified studies included two school settings (general education school for children with and without disabilities), seven clinical settings (private school/center for: (1) children with disabilities [n = 2], (2) autism [n = 2], (3) applied behavior analysis [n = 2], or (4) intensive Early Intervention [n = 1]), and two home settings. For the purpose of this review the child's school setting was explored to determine whether the child's school was a natural environment or not. For instance, if the child attended a school solely for children with special needs, the setting was coded as "clinic." If the child attended an inclusive school for children with and without special needs, the setting was coded as "school."

Different measures were utilized in the studies to report participants' language, behavioral/developmental, academic skills; participants' autism characteristics; preference and reinforcement; social validity; and treatment fidelity. All of the measures are listed in Table 2. Half of the studies (n = 5) used a formal assessment to measure participants' language, behavioral/developmental, and academic skills; and half of the studies used anecdotal reporting only. Seven of the studies did not report data on the participants' interfering, disruptive behaviors. The three studies that did report information concerning participants' interfering, disruptive behaviors reported anecdotal

information only. Five studies utilized six different formal language/communication assessments to examine the children's abilities. Two autism assessments were used: the *Childhood Autism Scale* (CARS) and the *Autism Diagnostic Observation Schedule* (ADOS). However, the majority of studies (n = 8) did not use a formal autism related measure to assess participants' autism characteristics. Eight studies did not use an autism assessment and merely reported that the children had autism or an autism diagnosis. Prior to language training, the majority of studies (n = 8) delivered a preference assessment. These assessments were obtained from an assessment manual or a previous research study. One of the studies, Carbone et al. (2010), used a preference assessment; however, they did not specify which assessment was used. Further, another study established preferred items for language training by speaking to the participants' parents (Drash et al., 1999).

Table 1

Description of Studies Reviewed with Accompanying Results

First Author & Date	Methodology & Setting	Participants	Intervention, Level, & Implementer	Dependent Variable and Measures	Results
Carbone (2010)	MB-P Clinic	*n* = 3 Tony: age 4, male, autism Ralph: age 4, DS Nick: age 6	DTI: Sign Language with TD then VP 2x a day, 50 trials Therapist	Prompted (echoic) and unprompted vocal responses Event recording, frequency data	-3x increase in unprompted and verbal responses -Used 5 different word approximations
Drash (1999)	MB-P* Clinic	*n* = 3 P 1: 2 years P 2: 2 years P 3: 3 years, male, PDD	DTI: VP, Shaping 1-2 hours per week Therapist	Vocal responses, error, no response/inappropriate behavior Event recording, % of opportunities	-No increase in mands; began with 95% mand response rate and stayed here
Gutierrez (2007)	CC* School	*n* = 4 Mario: 13 years Millie: 4 years Will: 5 years Malcom: 6 years	1) DTI: Picture request intervention, 2) DTI: VP then fading 30min sessions, 3-5 days per week, 10-15 trials Therapist	Picture, vocal requests (prompted and independent)-recorded for Millie only Event recording, % of opportunities	Millie did not learn how to discriminate between 2 desired pictures for communication; thus she received verbal mand training. Learned to request for "chip" independently
Jennet (2008)	2 MP Clinic	*n* = 6, five boys, 1 girl, between 3 to 6 years, autism	Compared: 1) DTI: VP then TD and 2) NET: VP then TD 20min sessions, 8-10 sessions per week	Prompted (echoic) and unprompted verbal requests (correct responses or approximations) Event recording, frequency data	-All participants increased verbal requests -5 of 6 participants produced more mands with NET -1 participant: no noticeable

			Therapist		difference between the 2 interventions -All participants requested more items in DTI
Jurgens (2009)	CC Home	*n* =1 Tom: 3 years	DTI: PECS with generalization observations at home and school 3 to 5 times per week Mom and researcher	Picture mand, verbal mand, Verbal initiation other than mand, MLU, functional play Event recording, frequency data	-Free play: mands increased during phase 4, School: no mands -Functional play increase
Kodak (2009)	MB-B Clinic	*n* = 1 Hal: 4 years, autism	1) DTI: TD then VP, 2) DTI: Echoic Training 2 to 5 sessions per week Therapist	Prompted (echoic) and unprompted vocal requests (correct responses or approximations) Event recording, percentage of opportunities	For all participants: -Mand training improved prompted mands -Paired with echoic training: increased unprompted mands at high levels
Pistoljevic (2006)	MP-P School	*n* = 3 males, autism P A: 3 years P B: 4 years P C: 4 years	1) DTI: Tact Training (Echoic Trails, TD, then VP) 2) NET Probes Presenting 100 tacts each day Therapist	Unprompted verbal tacts and mands during 3 sessions of 15 minute probes during bus transition, lunch, and free play Event recording, frequency data	-2 of 3 increased mands
Plavnick (2016)	AAT Clinic	*n* = 4, 3 years, autism Trish: female Paula: female Corey: male Marcus: male	Compared: 1) DTI: Receptive Language Training, Contriving EO, TD, then VP with Prompt Fading, and 2) DTI: Video-based Mand Training 1 hour intervention- level	Prompted (item held directly in front of child) mands, independent mands, incorrect responses, no response Event recording, frequency data	-All participants increased mands in both methods -More mands produced in video-based for *n* = 3, Paula acquired the same in each intervention

			unclear Paraprofessional		
Reichle (2008)	MP Home	*n* =1 Peter: male, 5 years, autism	1) DTI: VP and TD with Maintenance and Generalization 2) Task Completion Intervention 7 teaching opportunities per 4-5 days each week Therapists and Paraprofessionals	Spoken approximation for the word "help" Event recording, percentage of opportunities	-Targeted the mand for "help" -Increased from zero -During time delay: 94% of the time -Continued in maintenance probes
Thomas (2010)	MB-P* Clinic	*n* = 3, 3 years Isaac: male, PDD-NOS Lindsey: female, autism Shawn: male, PDD-NOS	DTI & Generalization/ Maintenance probe: 1) Non-verbal replacement mand (pointing) 2) Eye contact 3) Oral motor training (VP then TD [word approximations or similar oral-motor/lip movement]) 4) Vocalizing (VP then TD) 5 trials per session- 20 sessions-level unclear Therapist	Independent Mands, Immature Mands (reaching, grabbing, yelling, or leading), Appropriate Responses (Independent Mands and pointing, looking, oral motor approximations, or echoic approximations) Event recording, percentage of opportunities	-All participants increased their ability to independently mand while decreasing immature mands (reaching grabbing, yelling, or leading) -Results maintained and generalized over time/settings

Note. * Indicates the design was not stated and determined by the review author. P: Participants, B: Behavior, AAT: Adapted Alternating Treatment, MB: Multiple Baseline, MP: Multiple Probe, DS: Down Syndrome, PDD-NOS: Pervasive Developmental Disorder Not Otherwise Specified, DTI: Direct Trial Instruction, TD: Time Delay, VP: Vocal Prompting, PECS: Picture Exchange Communication System, NET: Natural Environment Teaching, %: Percentage

Table 2

Description of Measures Included in the Studies Reviewed

Areas of Assessment	Measuring Tool	Study (First Author and Date)
Participants' Prerequisite Measure: Language, Behavioral/ Developmental, and Academic Skills	Anecdotal Report Only	Carbone (2010), Gutierrez (2007), Kodak (2009), Drash (1999), Thomas (2010)
	Peabody Picture Vocabulary Test 3rd Edition, Scales of Independent Behavior-Revised	Jennett (2008)
	Vineland Adaptive Behavior Scales-Interview and Classroom Edition	Pistoljevic (2006), Reichle (2008)
	The CABAS International Curriculum and Inventory of Repertoires for Children from Pre-School through Kindergarten	Pistoljevic (2006)
	Preschool-Language Scale 4th edition (PLS-4)	Plavnick (2016), Reichle (2008)
	Mullen Scales of Early Learning	Reichle (2008)
	Australian Development Screening Test (ADST) & *Critical Skills Assessment* (Frost & Bondy, 2002)	Jurgens (2009)
Participants' Prerequisite Measure: Autism Characteristics	Not Specified	Carbone (2010), Drash (1999), Gutierrez (2007), Jennett (2008), Kodak (2009), Pistoljevic (2006), Plavnick (2016), Thomas (2010)
	Childhood Autism Rating Scale (CARS)	Jurgens (2009)
	Autism Diagnostic Observation Schedule (ADOS)	Reichle (2008)

Preference Assessment	Not Utilized	Pistoljevic (2006), Reichle (2008)
	Not Specified Parent Report	Carbone (2010), Drash (1999), Jurgens (2009)
	Procedures from Fisher, Piazza, Bowman, Hagopian, Owens, & Slevin (1992)	Jennett (2008), Kodak (2009), Plavnick (2016)
	Procedures from Roane, Vollmer, Ringdahl, & Marcus (1998)	Thomas (2010), Gutierrez (2007)
Social Validity	Not reported	Carbone (2010), Drash (1999), Gutierrez (2007); Kodak (2009), Pistoljevic (2006)
	Research developed	Jennett (2008), Thomas (2010)
	Caregiver's Acceptance of Treatment Survey (Sathupathy, 2005)	Jurgens (2009)
	Usage Rating Profile-Intervention (Chafouleas, Briesch, Riley, Tillman, & McCoach, 2009)	Plavnick (2016)
	Treatment Acceptability Rating Form-Revised (Reimers & Wacker, 1988)	Reichle (2008)
Treatment Fidelity	Not reported	Carbone (2010), Drash (1999), Gutierrez (2007), Kodak (2009), Thomas (2010)
	Researcher developed	Jennett (2008), Plavnick (2016), Reichle (2008)
	PECS Implementer Skills Assessment (Frost & Bondy, 2002)	Jurgens (2009)
	Teacher Performance Rate Accuracy Protocol (Ingham & Greer, 1992)	Pistoljevic (2006)

Half of the studies reported results for social validity and treatment fidelity. Of those, two studies utilized a researcher-developed measure and the others used three different standardized measures: *Caregiver's Acceptance of Treatment Survey*, *Usage Rating Profile-Intervention,* and *Treatment Acceptability Rating Form-Revised*. Treatment fidelity was reported by five studies; three utilized a researcher-developed measure and the others used standardized measures: *PECS Implementer Skills Assessment* and *Teacher Performance Rate Accuracy Protocol*. However, Jurgens et al. (2009) did not report treatment fidelity results although they mentioned that treatment fidelity was measured using the *PECS Implementer Skills Assessment*.

Communication interventions. Table 1 describes the communication interventions used in each study, with the accompanying results and participants' characteristics. There were 13 different interventions studied in the 10 articles reviewed, 12 of which utilized DTI and one utilized natural environment teaching (NET). There were multiple interventions used, including: NET, picture exchange, echoic training, tact training, receptive language training, a video-based intervention, time delay followed by vocal prompting, vocal prompting followed by time delay, and vocal prompting following by shaping.

Carbone et al. (2010) described the vocal prompting and time delay procedures seen in the majority of the studies reviewed (Drash, et al., 1999; Gutierrez et al., 2007; Jennett et al., 2008; Kodak & Clements, 2009; Pistoljevic & Greer, 2006; Plavnick & Vitale, 2016; Reichle et al., 2008; Thomas et al., 2010). During a time delay procedure, if the participant displays motivation for the targeted item, the instructor does not deliver the item right away; she/he waits for the child to display a higher order request. For example, Carbone et al. (2010) utilized a multiple baseline across participants design to examine the effect of the vocal prompting and time delay intervention. The researchers also incorporated sign language training. Thus, if the

participant displayed motivation by using a sign, the instructor implemented the time delay procedure, waiting five seconds before delivering the verbal prompt (a verbal model of the target word that corresponded with the preferred item). Of the three participants in the study, one fit in the inclusion criteria for this review. After receiving the intervention twice a day for 50 trials, the participant demonstrated a threefold increase in both unprompted and prompted vocal responses, defined as any independent use of a speech sound, word approximation, or full word (unprompted) or vocal response occurring after the vocal prompt (prompted).

Similarly, Jennett and colleagues (2008) used two concurrent multiple probe designs to compare the effects of DTI mand training or natural environment teaching on producing prompted and unprompted vocal mands. The therapists used toys and materials that were made up of two parts (examples include: Set A: juice and Set B: straw, Set A: computer and Set B: game). During DTI, the therapist used immediate vocal prompting. The time delay procedure was implemented after the participants reached an 80 percent accurate responding rate. During NET, the targeted items were placed around the therapy room. Set A materials were placed within the participants' reach and the participants were allowed to freely walk around the room to access them. Set B materials were placed in an opaque container. When a participant displayed motivation for the targeted item, the Set B materials, the instructor implemented vocal prompting followed by the time delay procedure. Regardless of the intervention, all participants increased their ability to produce verbal requests. Five of the six participants produced more mands in the NET condition, one participant exhibited no noticeable differences between the two interventions, and all participants requested more items in DTI.

Pistoljevic and Greer (2006) employed a multiple probe across participants design to study the effects of tact training on the ability to verbalize unprompted tacts and mands. During

tact training, the therapist provided the participants with a pictorial representation of the targeted tacts. The therapist asked the participants to repeat each tact after displaying the picture. For example, the experimenter held up a picture of a "watermelon" and encouraged the child to say "watermelon." This was completed for four tacts and then the participant was shown the picture and a time delay was implemented followed by a vocal prompt procedure to elicit independent tacts. Probe sessions were implemented in three settings (free play, lunch, in the hallway) to determine if the participant emitted tacts or mands in these settings. The three participants involved in the study did not use any mands prior to intervention implementation. Following tact training, two of the three participants increased their use of independent mands across all three settings. One increased from zero to an average of three mands, and one increased from zero to an average of three and a half. The last participant received significantly less training and did not increase his ability to use mands.

Technology based interventions. Four of the reviewed studies used assistive technology or augmentative communication to assist with language training. As discussed above, Carbone et al. (2010) used sign language paired with mand training. Plavnick and Vitale (2016) applied a video-based intervention, and Jurgens et al. (2009) and Gutierrez et al. (2007) conducted a picture request intervention. Using an adapted alternating treatment design, Plavnick and Vitale (2016) compared video-based mand training with a mand training that involved receptive language training, time delay, vocal prompting, and prompt fading. During the video-based intervention, the therapists: (1) prompted the child to complete one-step directions (receptive language training), (2) showed the participant a video of a young child verbally manding for the targeted item, receiving it, and playing with it, and (3) contrived an establishing operation to evoke the mand (e.g., therapist provided the train track when the target mand was "train").

During both interventions, the therapist began fading the prompts when the participant produced the prompted mand during three consecutive trials. All four participants increased their use of mands regardless of the intervention condition. However, for three of the four participants, more mands were produced during the video-based interventions. One participant acquired the same number of mands regardless of the intervention.

Similarly, Jurgens et al. (2009) and Gutierrez et al. (2007) applied technology to increase the use of mands; however, the materials were low-tech. Jurgens et al. (2009) utilized a changing criterion design to study the effects of the Picture Exchange Communication System (PECS; Bondy & Frost, 2002) on functional and verbal communication. The researchers utilized PECS phases one to four (picture exchange, distance increasing, picture discrimination, and sentence formation) to teach one preschool-aged child with autism, Tom, in his home. Verbal mands were recorded during the generalization probes, taken during free play in the home and school. Tom developed the ability to use PECS during phases one to three; however, he did not consistently use PECS mands during the generalizations probe. It took 23 sessions before Tom consistently used more than one verbal mand during an intervention session. He slightly increased his use of verbal mands during phase four. However, he only produced an average of 2.6 mands across the four sessions included in phase four. His ability to use verbal mands decreased across phase four.

Gutierrez and colleagues (2007) also conducted a picture exchange intervention. After teaching picture exchange, only one participant, Millie, did not learn how to discriminate between two desired pictures for communication; thus she received verbal mand training. Data collection on verbal mands was not taken until Millie received verbal mand training in the form of verbal prompting and prompt fading. After verbal mand training, Millie learned to request for "chip" independently.

Maintenance, generalization, and implementer. Similar to the Jurgens et al. (2009) study, four other studies reported the use of a natural environment, maintenance, or generalization probes. For example, Reichle et al. (2008) conducted their study in the home. The researchers utilized a multiple probe design to evaluate the effects of a task completion and mand training intervention on the use of a verbal mand for help. During the mand training, the therapists and paraprofessionals implementing the intervention used a vocal prompt followed by a time delay procedure to teach the participant to request for help during several activities. Maintenance probes were conducted after three, six, and seven months. Generalization probes were implemented during novel settings in the home (e.g. during free play or snack). Prior to intervention, the participant was not able to request for help. During the intervention, after a time delay was added, the request for help was recorded across multiple intervention phases, and the child appropriately produced the verbal mand for help approximately 90% of the 120 teaching opportunities presented. The participant also requested help during the maintenance and generalization probes.

When compared to the other studies reviewed, the Reichle et al. (2008) study was unique in that the researchers utilized the home environment generalization and maintenance probes, and a paraprofessional to implement the intervention. The majority of the studies reviewed (n = 7) utilized a therapist, a highly trained experimenter with experience implementing DTI for children with autism and other developmental disabilities. Plavnick and Vitale (2016) also trained paraprofessionals to implement the intervention. The two interventions were implemented with 94 and 92 percent fidelity across a minimum of 25 percent of the intervention sessions. Jurgens et al. (2009) was the only study that utilized a parent as the intervention implementer.

Intervention intensity. Six studies implemented interventions "intensively," defined as implementing the intervention more than once per day, more than three days a week, or eight or more sessions per week. Two of the studies implemented the interventions "non-intensively," defined as no more than once per day, and in the remaining two studies it was unclear how often the intervention was implemented.

In the Carbone et al. (2010) study the therapists implemented the intervention twice a day, with each session consisting of 50 trials. As described above, the participant with autism was successful in increasing the number of verbal responses. Jennett et al. (2008) implemented the intervention eight to ten times per week with 20-minute teaching sessions. All participants in this study were also successful in increasing the number of verbal responses. Drash et al. (1999) utilized a less intensive intervention, implementing one to two hours per week by therapists in a clinical setting. Similar to the Carbone et al. (2010) and Jennett et al. (2008) study, Drash and colleagues (1999) used vocal prompting to teach verbal mands; however, they also incorporated shaping. During the intervention, the therapist first held the preferred toy beyond reach to elicit motivation. If the child vocalized anything (other than a scream or a cry), the therapist provided the reinforcement. The shaping began next by reinforcing higher-order responses (e.g., "ah" for apple and "mmm" for M&M). Prior to the reinforcement being provided, the therapist also repeated the child's vocalizations and prompted the child to imitate. After the child correctly imitated a variety of sounds and words, the therapists began to shape theses mands and echoics into a tact repertoire. As stated, the researchers implemented this intervention one to two hours per week and the three-year old participant with autism did not increase his ability to verbally mand. Prior to the intervention, during an intake session, the participant emitted a prompted mand during 95 percent of the trials. This accuracy was seen throughout the intervention.

Similar to the Drash et al. (1999) study, Kodak and Clements (2009) also used an intervention that was less intense compared to the other studies. These researchers implemented their interventions two to five sessions per week. They employed a reversal design embedded in a multiple baseline design across verbal operants. The participant in the study was taught to mand or tact for juice, music, or cookie using two different interventions: (1) mand training using time delay followed by vocal prompting, and (2) echoic training. During the echoic training the targeted item was not present. The therapist provided the prompt, "say music" for example, and provided reinforcement (praise and 20-second access to a preferred food or toy not associated with 'music') if the participant verbalized "music." During mand training alone, the participant increased his ability to emit prompted mands; however, when the echoic training was implemented immediately prior to the mand training sessions, the participant increased his ability to emit unprompted, independent vocal mands.

Relevant secondary findings. As stated earlier, most of the interventions were effective in increasing the production of verbal mands. However, when exploring spoken communication the picture exchange intervention was not as successful for the participants in the Jurgens et al. (2009) and Gutierrez et al. (2007) studies. It took the participant longer to acquire verbal mands in the Jurgens et al. (2009) study and the participant in the Gutierrez et al. (2007) study required verbal mand training to learn to mand for different objects and verbally mand. The developers of PECS, Bondy and Frost (2002), state their "goal is to teach the child to communicate in some manner (or modality) while continuing to address development of speech" (p. 31). In the Jurgens et al. (2009) study, the participant did develop the ability to use pictures for communication and to mand with pictures; however, his verbal mand skills did not increase until phase four. This finding is consistent with previous research and there is inconsistent evidence

supporting the ability to use verbal communication following picture exchange intervention (Carré et al., 2009; Ganz et al., 2010; Ganz et al, 2009; Park et al., 2011).

Previous literature suggests that VB therapy has an impact on social emotional development (Stock et al., 2013). The results of this review further support this claim. The participants in the Jennett et al. (2008) study increased their ability to verbally mand following the vocal prompting, time delay and NET teaching interventions. Further, the researchers explored how often the participants engaged in challenging behaviors. When comparing the two interventions, DTI and NET, 33 percent of the participants engaged in more challenging behaviors during the DTI and other participants engaged in challenging behaviors at approximately equal rates across interventions. Thus, preschool-aged children that exhibit fewer challenging behaviors when utilizing NET. Additionally, Jurgens et al. (2009) found that following PECS training, the participant engaged in more functional play during free play in the home and at school. Further research should explore how differing VB therapies affect social emotional development.

Limitations

Several limitations should be kept in mind when interpreting this literature. First was the lack of treatment fidelity information and social validity information. These components are essential in single subject research methodology (Gast, 2010; Kratochwill et al., 2010; What Works Clearinghouse [WWC], 2011). Only half of the studies reported social validity and treatment fidelity results. Treatment fidelity is imperative to report to ensure that the implementer is accurately and consistently delivering the intervention. Further, assessing and providing data for social validity is essential for understanding whether the dependent variable and the effects of the intervention are socially important (Gast, 2010; Horner, Carr, Halle,

McGee, Odom, & Wolery, 2005). It is important to know if the parents find it meaningful to increase the child's ability to verbally mand. Further, social validity in this study assessed whether the intervention was practical for the family.

Second, only one of the reviewed studies included a parent in the intervention (Jurgens et al., 2009). The NRC (2001) and the DEC-RP (2014) both emphasize the need to include families in the education of children with autism. Caretakers can learn how to teach communication and family-centered intervention "maximizes the child's learning, improves the quality of family life, and may enable parents to sustain their efforts with their child over time" (NRC, 2001, p. 35). Third, few studies reported results from generalization or maintenance probe. The NRC (2001) emphasizes the need to ensure generalizability when educating young child with autism. Children with autism often have "difficulty generalizing skills and behaviors learned" (Henry & Myles, 2007, p. 117). Generalization or maintenance probes will allow the researchers to explore whether the skills learned are being transferred into other environments.

In addition, there were also several errors within the single subject designs in the studies reviewed. The Drash et al. (1999) and the Thomas et al. (2010) studies did not report the design utilized and several of the studies did not display the results accurately according to WWC single case standards (Kratochwill et al., 2010; WWC, 2011). For example, when examining the graphs presented in the Drash et al. (1999) study, all the constructs were presented on one graph for each participant and the graphs did not include phase lines to portray the different conditions. Thus, the intervention effect was not demonstrated at three different points in time or in three different phases (WWC, 2011). Pistoljevic and Greer (2006) displayed the results in a bar graph. Thus, each phase did not contain a minimum of three data points.

Finally, the lack of diagnostic and assessment information provided for the participants made it difficult to compare the studies reviewed. As discussed earlier, several studies did not use a formal language, development, or autism related assessment to report background characteristics for the child participants. Thus, it was difficult to compare participant characteristics within and across the studies reviewed. This inconsistent and unclear reporting was also seen when speaking about the intervention levels. For example, the Thomas et al. (2010) study reported the level in sessions/trials (5 trials per session and 20 sessions for each participant) and Drash et al. (1999) reported the level in minutes/hours (one to two hours per week).

There were also limitations that could have affected this literature review search. For example, several studies were excluded because the dependent variable under review was another form of communication (e.g. another verbal operant) and several studies were not included because verbal mands were not listed an independent variable. For example, a study by Greenberg et al. (2013) would have been interesting to review because this study adapted the PECS intervention to elicit vocalizations. Greenberg et al. (2013) added two conditions to PECS training: a time delay and a time delay plus verbal prompt. With the addition of these conditions, the authors reported improvements in the children's ability to use vocalizations during PECS training.

Research Gap

Research presented here establishes the effectiveness of verbal mand training to increase verbal requests for preschool-aged children with autism. However, there were several research gaps in the literature that this dissertation project addressed.

Participant characteristics. The author reviewing these studies sought to compare the participants' characteristics based on the interventions utilized. However, it was impossible to compare the intervention effects between the studies because they did not report similar participant characteristics and the studies used differing measures to identify participants' language skills, interfering behaviors, and autism-relevant behaviors and characteristics. The inconsistent reporting of participants' characteristics continued when exploring how interfering/disruptive behaviors affected the participants' ability to participate in the interventions. This study employed formal autism-related assessments to determine language abilities, explore information related to interfering/disruptive behaviors, and common behaviors associate with an autism diagnosis. When researchers employ consistent or similar assessments, they will gain consistent participant characteristic information; thus, allowing researchers to explore which interventions are most effective for children with similar characteristics.

Family involvement. The majority of the studies utilized a therapist, a highly trained experimenter with experience implementing DTI for children with autism and other developmental disabilities, and did not include parents and classroom teachers. Only Jurgens et al. (2009), Plavnick and Vitale (2016), and Reichle et al. (2008) utilized paraprofessionals and parents to implement the interventions. Treatment fidelity data from the Plavnick and Vitale (2016) and Reichle et al. (2008) studies demonstrate that the paraprofessionals were able to implement the interventions with high fidelity (fidelity scores were over 90% for both studies). The Plavnick and Vitale (2016) and Reichle et al. (2008) studies were successful, with all participants increasing their ability to verbally mand and request for "help." Thus, it appears possible for individuals without formal educational training to implement a mand intervention with fidelity. Unfortunately, Jurgens et al. (2009), which utilized a parent as the intervention

implementer, did not report results on treatment fidelity. This study utilized parents to implement the intervention and reported treatment fidelity results and concerns.

Intervention in the natural environment. Another DEC-RP (2014) principle states, "Practitioners embed instruction within and across routines, activities, and environments to provide contextually relevant learning opportunities" (p. 11). Thus, it is recommended that instruction be provided in the child's natural environment. While the majority of the reviewed studies used a clinical setting, this study explored the intervention effects in the home setting.

Theoretical Framework

The theoretical framework for the current study derives from the sociolinguistic theory of language development, verbal behavior therapy, and direct trial instruction (see Figure 2). Based on the overarching sociolinguistic theory of language development, young children learn language through interactions with their parents in natural settings (Halliday, 2004; Owens, 1996). However, for children with autism, language instruction needs to be more direct and behavioral in nature. Thus, Verbal Behavior (Skinner, 1957) principles are used to further explain language instruction. Direct trial instruction (DTI) is often required when teaching difficult, new skills and it is recommended to teach children with autism in a direct teaching method (Henry & Myles, 2007). DTI is recommended because it is difficult for children with autism to learn communication skills without explicit instruction.

Verbal behavior therapy helps preschool children with autism develop language (Oah & Dickinson, 1989; Sautter & LeBlanc, 2006) and is becoming more common among researchers and therapists interested in pre-school autism. When implementing the VB approach, the mand repertoire should be the initial and major focus of language training (Skinner, 1957). However, in the literature explored, highly trained personnel in a clinical setting are the main implementers

of verbal mand interventions (Carbone et al., 2010; Drash, et al., 1999; Jennett et al., 2008; Kodack & Clements, 2009; Plavnick & Vitale, 2016; Thomas et al., 2010). Research has shown that paraprofessionals can reliably implement effective verbal mand interventions (Plavnick & Vitale, 2016; Reichle et al., 2008). Thus, considering this interactive, multi-level relationship with sociolinguistic theory as the larger context, the verbal behavior theory as the guiding principle, and the direct trial instruction as the focused strategy, one would expect that a parent implemented mand training intervention would also be effective. This dissertation study attempted to demonstrate that parents can reliably implement a verbal mand direct trial instruction intervention in the home setting and their child would increase his/her ability to verbally communicate in a natural setting.

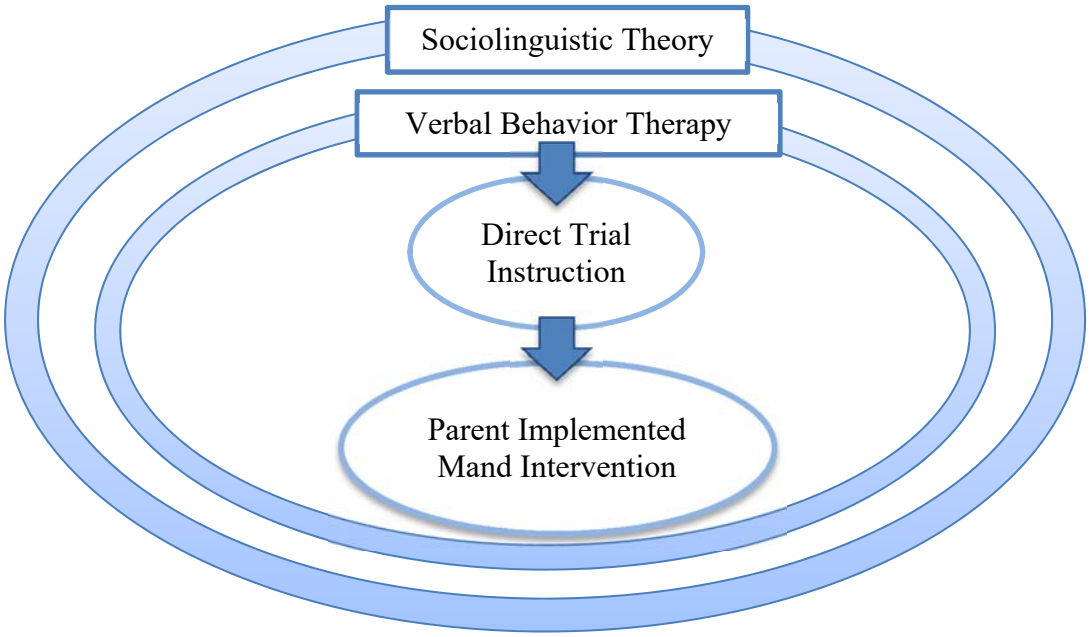

Figure 2. Theoretical framework.

Chapter III

Methodology

Young children with autism have trouble learning and using language to express their wants and needs. Given that many children with autism require intensive intervention to address their communication deficits, research is needed to determine what interventions are effective. For preschool-aged children with autism who have very limited verbal skills, the verbal mand should be the initial focus of communication training. It is recommended that parents of young children be involved in intervention work; however, when exploring verbal mand intervention research, very few studies include information related to parent involvement. Thus, this study focused on increasing verbal mand skills for preschool-aged children with autism, using a parent-implemented intervention. The purpose of this dissertation study was two fold: (1) to examine the effects of a verbal mand with direct trial instruction intervention on verbal communication skills for children with autism, and (2) to investigate if a parent can reliably implement the verbal mand with direct trial instruction intervention. Specific research questions include:

1. What is the effect of a parent-implemented verbal mand direct trial instruction intervention on verbal communication skills of preschool-aged children with autism?
2. How can parents reliably implement the verbal mand direct trial instruction intervention with their preschool-aged child with autism?

Pilot Study

A pilot study related to this dissertation project was completed during spring of 2017 with one parent and one child, using an ABA single subject reversal design, where A was the baseline and B was the intervention. The pilot study tested the same treatment using parent-implemented verbal mand direct trial instruction intervention that will be discussed in full detail in the following sections. Results from the pilot study helped shape decisions for this dissertation study. The child participant in the pilot study, Lucas, did not use any prompted or independent mands during the first baseline phase (see Figure 3 for the graph displaying Lucas' ability to use verbal mands). The results show an immediacy of effect between the last data point of the first baseline (A) and first data point of the intervention phase (B). Lucas began to immediately use both prompted and independent mands during the first session of the intervention phase (session 7). Further, although the target skills did not emerge during the first baseline, an accelerating trend was observed and calculated for independent mands and decelerating trend for prompted mands in the intervention phase. Thus, the intervention effects were seen when exploring the relationship between the first baseline condition and the intervention phase, the intervention seemed to help the child learn to use mands to request for the items. However, to display a functional relation between the treatment and the target skill, the intervention effects must be displayed across three conditions (Gast, 2010; WWC, 2011). When exploring the second baseline phase of this pilot, while the intervention was withdrawn, the trends for the independent and prompted mands stayed flat; however, the independent mands were stable at a high level, and the prompted mands were stable at a low level (with the exception of session 15, where more prompts were needed because the child was exhibiting interfering behaviors). From a practical perspective, the results are meaningful; Lucas was able verbally communicate following the

intervention and when the intervention was removed the skills were maintained. It would be meaningful for a teacher or a parent to teach a skill that is non-reversible using an AB design (i.e., a case study); however, from a research prospective, a functional relation needs to be established to demonstrate intervention effects. In the pilot the intervention effect was not established on three different occasions and the results did not demonstrate a functional relation because the trend in the second baseline did not decelerate for the independent mands and the level remained high. A functional relation between the intervention and the target skill was not established because the observed behavior did not reverse to the original baseline level. In other words, the behavior taught, the ability to verbally communicate, may not be a reversible behavior. Therefore, when the intervention was removed the child still displayed the targeted skill, independent mands. This pattern is consistent in previous communication literature. For example, in a study completed by Koegel, Camarata, Valdez-Menchaca, and Koegel (1998), the researchers taught children with autism to verbally ask questions. The children improved their ability to verbally communicate and these effects were seen when the intervention was removed.

The procedures for establishing treatment fidelity, Interobserver Agreement (IOA), and parent and IOA data collector training were also tested during the pilot intervention. IOA was collected during 50% of the first baseline sessions with an average score of 89.57% agreement (range 82.35-100%), 28.57% of the intervention trials with an average score of 96.30% agreement (range 95.60-97%), and 60% of the second baseline sessions with an average score of 96.30% agreement (range 88.89-100%). Thus, the IOA data collector training procedures were effective (see the "Interobserver Agreement and Treatment Fidelity" subsection for a full description of the IOA data collector training procedures). Results revealed that the parent (Mom, Mrs. Smith) was able to implement the intervention reliably. Treatment fidelity data were

collected during 33.33% (2 out of the 6 sessions) of the first baseline session with an average score of 98% agreement (range 96-100%), during 28.57% (20 out of the 70 trials) of intervention trials with an average score of 95.97% agreement (range 82.86-100%), and 40% (2 out of the 5 sessions) of the second baseline sessions with an average score of 94.72% agreement (range 94.44-95%). Thus, the parent training procedures were effective for teaching Mrs. Smith how to use the intervention and she was able to implement the intervention consistently with high reliability (see the "Parent Training" section for a full description of the procedures).

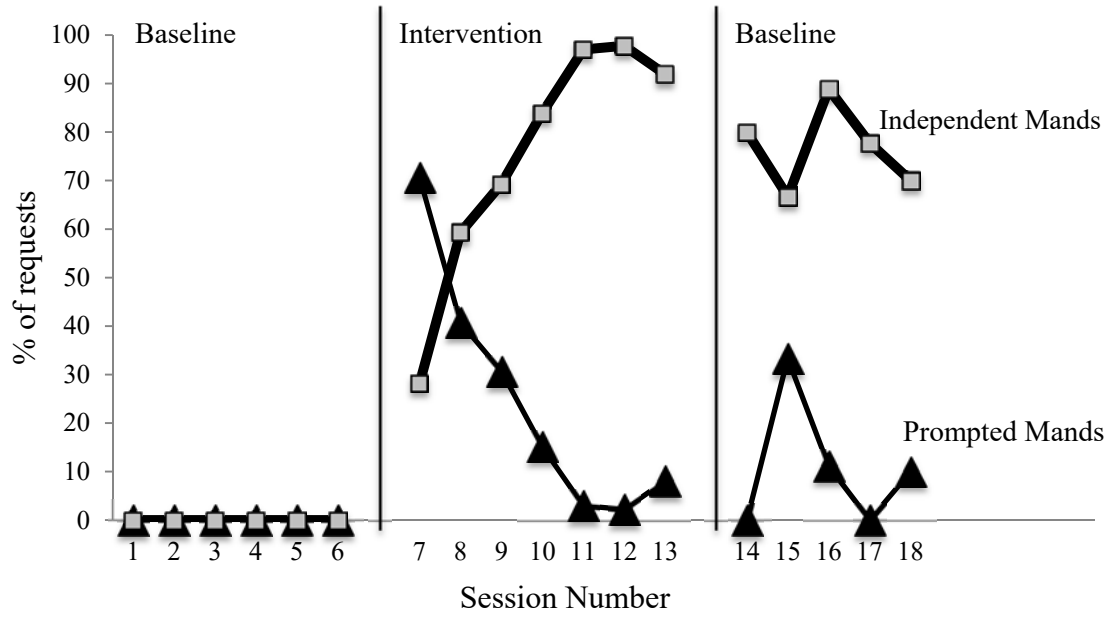

Figure 3. Lucas' ability to use verbal mands.

Mrs. Smith provided useful information about the intervention training procedures and the intervention effects seen outside of the intervention sessions as a measure of social validity. Mrs. Smith reported that Lucas was speaking a lot more outside of the intervention sessions. Prior to the intervention, he rarely used words to express his wants and needs. During the social

validity interview, Mrs. Smith explained several examples describing how Lucas is now using words, both prompted and independently. Mrs. Smith expressed that the Lucas' teacher also noticed communication gains at school. Referring to the intervention itself, Mrs. Smith expressed that it was feasible to implement after she fully understood the directions. She suggested that displaying the directions in more simple form would have been beneficial. Further, she stated that she would have liked the researcher to follow up with their family after the intervention was completed (e.g., provide the family with "next steps" and a plan to move forward). These suggestions were incorporated during this dissertation project.

Research Design

A single subject multiple baseline across participants design was used to evaluate the effects of the intervention on verbal communication skills for two preschool-aged participants with autism. The parents' ability to implement the intervention reliably was measured using a treatment fidelity checklist.

The multiple baseline design across participants was chosen for several reasons. First, single subject research provides a practical method for assessing behavioral interventions for children with special needs (Horner et al., 2005). The multiple participants allowed for replication and provided external validity for the findings (Horner et al., 2005). Further, from a practical perspective, it may be unethical to withdraw an intervention if the treatment is effective in increasing the children's communication. The researcher's pilot study was also completed using a reversal design and the data did not reveal a functional relationship. To display a functional relation in a reversal design, researchers test the effects of an intervention on reversible behaviors (e.g., a behavior that will change in trend direction when the intervention is added or withdrawn). The ability to verbally communicate may not be a reversible behavior;

thus, a reversal design is not the best option. The use of a multiple baseline across participants design to increase verbal mand production is also supported by previous literature (Carbone et al., 2010; Thomas et al., 2010).

This study incorporated the single subject quality recommendations provided by Gast (2010) and the What Works Clearinghouse (Kratochwill et al., 2010; WWC, 2011): (1) a clear description of the participants, settings, intervention and training procedures; (2) measurable, observable, operational dependent variables; (3) a measure of treatment fidelity and interobserver agreement; and (4) social validity evidence.

Participants

The researcher attempted to recruit three (or more) participants to establish inter-subject replication through the multiple baseline design across participants (Gast, 2010). However, the researcher recruited participants from a private inclusive childcare program that provides educational services for children with autism aged two through six years. The program collaborates with two inclusive private preschool programs and includes two autism classrooms. Each autism classroom is staffed with a lead teacher and several instructional assistants with a maximum ratio of six adults to every eight children. The children with Autism Spectrum Disorder (ASD) receive individualized direct instruction, small group learning, and participate in inclusion opportunities with typically developing peers. The director of the program agreed to help with recruitment; thus, after obtaining University IRB approval, the director contacted parents in the program. The director emailed the researcher-developed recruitment flyer to parents in the program and interested parents contacted the researcher directly. From these efforts, only one parent contacted the researcher to express interest. Thus, the director emailed specific families in the program that met the inclusion criteria (specific details are included in the

"Inclusion Criteria" subsection). The researcher also expanded the recruitment efforts to include contacting: (1) families who were interested in participating in the pilot study, (2) several local Early Childhood Special Education teachers, and (3) staff in the Virginia Leadership Education in Neurodevelopmental Disabilities Program. After all of these efforts, four families contacted the researcher, and two were eligible to participate in the study. It took over two months to secure the two participant dyads (parent and child) for the study; thus, because of time constraints and under the advisement of the researcher's dissertation chair, the researcher completed the study with the two eligible families.

Inclusion Criteria. The researcher screened the participants to ensure they meet the inclusion criteria for this study. After a parent expressed interest in completing the study, the researcher spoke to the parent(s) (via phone and/or email) to discuss specific information about participation. To be included in this study, the parent provided consent for themselves and their child. The primary language spoken in the home was English and the parents were willing to provide intervention for their children, in their home, twice a week. Further, both families agree to allow the children to participate in formal language and autism related testing. The child participants were between the ages of three to five years with a diagnosis of ASD (which may include autism, Asperger's Syndrome, or Pervasive Developmental Disorder [Not Otherwise Specified]). The children also had trouble communicating his/her wants/needs (e.g., had a low mand repertoire). If children had a hearing delay/impairment or a motor impairment they were excluded from the study. After speaking to the parent via phone, if the child met the criteria, the researcher gained permission from the parent to observe the child at school and speak to the child's teacher. The researcher observed the child at school and spoke to the child's teacher to ensure that they met the inclusion criteria. After the researcher screened the potential

participants, two dyads were identified for the study. Before signing consent each parent received the "Anticipated Timeline" document to ensure they are fully aware of the time commitments and the proposed timeline for the study (see Appendix A).

Gathering participant background information. Once the dyads were selected for the study, the researcher interviewed the children's parents and teachers to gain relevant background information, information regarding previous intervention participation, and information related to the children's interests (favorite toys, foods, and activities; see Appendix B "Oral History Interview Questions" for a full description of the interview questions). The parents were also asked to share any relevant documents from teachers, therapists, and medical personnel. The researcher completed formal observations, and the child participants were assessed using several formal assessments. Once all of the background information was gathered, the researcher wrote a formal summary report of the participants' skills and shared this with their parents to ensure accurate information.

Formal assessments. The child participants' behaviors related to their autism diagnosis were assessed with *Autism Diagnostic Observation Schedule- Second Edition* (ADOS; Lord et al., 2012). The ADOS provides a standardized measure of behaviors that are associated with the diagnosis of ASD. Thus, the examiner (a licensed psychologist who has gained ADOS researcher reliability) observed behaviors related to communication (both verbal and nonverbal skills), social interaction, play, restricted and repetitive patterns of behavior, unusual play interests and sensory interests, and other abnormal behaviors. The ADOS is designed to assess individuals between the ages of 12 months to adulthood using five different modules (Toddler Module and Modules 1 to 4). The psychologist assessed each participant using module one. Module one is designed for children 31 months or older who are not yet consistently using "phrase speech"

(e.g., spontaneous, meaningful, non-echoed, three-word combinations used to socially communicate or communicate wants/needs). The researcher also observed the ADOS assessment.

The *Assessment of Basic Language and Learning Skills, Revised* (ABLLS; Partington, 2006) was also be used to gain background information about the children participants. The ABLLS (Partington, 2006) is a criterion-referenced assessment used in the field of autism instruction to assess skills related to social interaction, self-help, academics, motor skills, and language. The assessment of expressive language skills is based on Verbal Behavior principles (Skinner, 1957). The ABLLS can be used to assess children from birth to 12 years. Selected sub-scales were used, including: cooperation and reinforce effectiveness, vocal imitation, requests, labeling, intraverbals, and spontaneous vocalizations. The remaining sub-scales were not used as this information is irrelevant to this study.

Formal observation. Prior to intervention the researcher also completed a formal observation at home and at school. The researcher recorded the following information on the "Formal Observation Data Sheet" (Appendix C): the number of verbal and functional mands produced (AAC mands, e.g. sign language, gestures, picture exchange, mands with VOCA devices); the toys the child was choosing to play with; the words that the child used; and any relevant notes.

Preference assessment. Consistent with the recommendations and steps provided by Bondy and Frost (2002), the researcher completed a preference assessment to determine what the child was interested in and what items were used for intervention. To complete the assessment the researcher: (1) interviewed significant others (e.g., the child's teachers and parents, gathered during the "Oral History Interview"); (2) observed the child while he/she was engaging in free-

play (gathered during the "Formal Observation"); and (3) conducted the formal preference assessment.

The first step in completing the formal preference assessment (Bondy & Frost, 2002) is to determine a "reinforcer hierarchy" (i.e., determine what items the child likes more than others). This is determined by the following steps: (1) offer the child an item and record the behavior (e.g. Will the child reach for it and take it?), (2) if he/she takes the item, immediately take it back and record the behavior (e.g. Does the child protest or seem upset when the item is removed? Does the child try to take the item again?), and (3) record the behavior when the child has the item (e.g. Does the child show pleasure, play, or consume the item if it is food?).

Once the reinforcer hierarchy was established, the researcher listed the items that the student took, reacted negatively to or became upset about when the item was taken away, and consumed or played with when they were given back. The researcher then presented the child with a choice of two to four items from the list to determine the most preferred items. After given a choice, the researcher recorded what item the child reached for first and most often. These steps continued for all the toys on the list until three to five items had been determined to be the "most preferred." After the preference assessment was completed, the researcher noted which items are most preferred, preferred, or non-preferred (Bondy & Frost, 2002).

Background information for Amy. Mrs. Davis (Amy's Mom) provided consent for herself and Amy to be participants in this study when Amy was 4 years 4 months old. Amy is a Caucasian girl who lives at home with her mom and dad. The results from the formal assessments, interviews, and observations do not yield a clinical diagnosis. However, the results did confirm the clinical diagnosis of autism spectrum disorder that was reported in the documents that Mr. and Mrs. Davis provided. Mr. and Mrs. Davis provided: a recent

Individualized Education Plan (IEP) for speech services, progress report from Amy's school, an evaluation from a SLP, a brief 'after visit summary' from a medical institute for development and learning, and assessment summaries and treatment plans from a private Applied Behavior Therapy (ABA) company that used to provide services for Amy and her family in their home. According to this documentation, Amy is diagnosed with autism, a language impairment, and an intellectual disability (ID) that requires "very substantial support."

Prior intervention support for Amy. Amy began receiving Speech and OT in the home through Early Intervention (EI) at 18 months to address concerns with communication and general developmental delays. Amy was medically diagnosed with autism when she was approximately two years old and began receiving Applied Behavior Analysis (ABA) services shortly after. Amy and her family were provided 25 hours of ABA therapy in their home. The ABA services were discontinued when Amy began school when she was three and a half years old. Amy attended a full-time private school program designed for children with autism. The program provides educational and Applied Behavior Analysis (ABA) services for children with autism aged two through six years. The program collaborates with two private preschool programs and includes two autism classrooms. Each autism classroom is staffed with a lead teacher and several instructional assistants, who serve as the ABA therapists, with a maximum ratio of six adults to every eight children. The children with autism receive individualized direct instruction, small group learning, and participate in inclusion opportunities with typically developing peers. Amy received 60 minutes of speech and Occupational Therapy (OT) services per week in school through a private company. The speech and OT services began approximately one month after Amy began the intervention phase. Prior to this, Amy received one hour per month of speech services at school through the local public education system. The researcher

interviewed Amy's teacher twice and completed two 30-minute classroom observations, once to ensure that Amy met criteria for the study, and once to gain background information.

Amy's expressive language and communication skills. A recent evaluation report stated that a SLP completed the Functional Communication Profile to report sensory/motor, language, and pragmatic skills. At the time of the speech evaluation, Amy was spontaneously making the "aba-ba-ba-ba" sound repetitively. Amy also made this sound during the ADOS assessment. During the ADOS, vocalizations were rarely directed toward the examiner or Mrs. Davis, and the vocalizations did not appear to have a communicative function. Amy did not point at objects, but she did use a hand-clap as a communicative gesture for "more" during the bubble and snack activities. Mr. and Mrs. Davis reported that she consistently claps to request "more" and does so independently approximately 50% of the time. The SLP and Mr. and Mrs. Davis also reported that she would pull the communicative partner to what she wants or bring a toy or a bag of food to her parents to request help or open. Amy also gestured or reached towards an object that she wanted.

Amy's teachers reported that when Amy began school they were attempting to use verbal imitation and prompting to encourage communication. However, they did not have success; thus, they began using picture exchange. At school, Amy used picture exchange mostly during meal times because it was hard to find other items that were reinforcing. She was not using the picture exchange during inclusion opportunities or on the playground. Amy also has a picture exchange communication book at home that mostly held food pictures and pictures for Amy to request a walk outside. At home and school, the picture book was available at all times. At home, if Amy wanted something, she may grab a picture from the front of the book and hand it to her parents. Mr. Davis reported that the picture exchange was helpful because it was the only way Amy was

communicating her wants/needs. However, Mr. and Mrs. Davis and teachers reported that it was often hard to tell if Amy truly wanted the picture she is handing to her communicative partner. During picture exchange opportunities, Mr. Davis reported that Amy looked at her communicative partner about 50% of the time. At school, Amy was working towards discriminating between multiple pictures. The teacher reported that this was challenging because Amy often does not look at the picture she is choosing. Thus, teachers were teaching her to choose the picture and then match it to the object she was requesting. If she did not match it correctly, she did not receive the motivating object. Because Amy was not receiving the object immediately, she often lost motivation to request using the pictures.

Amy's receptive language and imitation skills. Mr. and Mrs. Davis reported that Amy would follow basic, common directions when the object in the direction was in view (e.g., "get shoes"). During the speech evaluation, Amy followed one-step directions when they were first modeled with hand-over-hand prompting and paired with a pointing model (e.g., "pick up"). During bath time, Amy would identify body parts when Mrs. Davis said, "give me [body part]." However, Amy would not identify body parts during other times. During the ADOS assessment, Amy did not imitate actions with toys. Teachers reported that they were working on imitation and it took Amy about a year to learn to imitate approximately five skills, including: pat lap, arms up, clap, stomp feet, and sake maraca. Mr. Davis reported that she also gave a high five.

Amy's play skills. During the ADOS and during observation, Amy showed very little functional and no pretend play. During the ADOS, she put many toys in her mouth. Mr. and Mrs. Davis reported that Amy does mouth toys; however, the mouthing behavior was decreasing. Amy was mainly interested in toys that made music or noise, and she could operate most cause and effect toys. She also loved jumping on her trampoline and swinging in her indoor cacoon

swing. Mr. and Mrs. Davis reported that it was hard to engage Amy in play with toys. She often did not play independently, and parents reported that she craves constant attention.

Amy's reciprocal social interaction skills. Amy usually responded to her name by turning towards the communicative partner. During the ADOS assessment, she made frequent eye contact with the examiner, which sometimes took the form of a fixed stare at the examiner's face. At times she brought her face close to the examiner's, sometimes with eye contact and sometimes looking past the examiner's head. She smiled often and used a smile to indicate shared enjoyment during a peek-a-boo game. Outside of the assessment, Amy typically used a fixed stare and big smile as a way of eye contact and social interaction, and as a way to avoid directions and work. Amy also often displayed a worried expression while gazing at her communicative partner's face, and it was sometimes unclear what the expression meant. During the ADOS, she did not give or show objects to the examiner or her mom as a way to socially communicate, nor did she try to direct another's attention to an object.

Amy's stereotyped behaviors and restricted interests. Amy exhibited some stereotyped behaviors. During observation, the researcher noted that Amy would repeatedly flip items in her hands or bang items on the table or wall. Further, Amy rocked her body back-n-forth. Sometimes this behavior seemed to mimic a dance when music was playing, and sometimes Amy did this when music was not playing. During the ADOS, she occasionally displayed a complex mannerism (pacing from wall-to-wall and tapping on the wall) and showed a strong and unusual interest in the examiner's pen.

Amy's cooperation, motivation, and reinforcer effectiveness. During the SLP evaluation and the ADOS assessment, Amy did not stay seated for more than a minute and her attention was fleeting. For example, she visually attended to preferred toys after verbal

prompting; however, she quickly turned away. Mr. and Mrs. Davis reported the same behavior at home. It was difficult to keep Amy seated and interested in an activity unless it involved food. When Amy did not want to participate in an activity, she would walk away, drop to the ground, or lay down to avoid. Teachers reported that at school she sat at a table to complete one-to-one tasks for up to five minutes. Teachers typically sat beside or behind Amy and 'blocked' her exit from the table. Amy usually accepted hand-over-hand prompting to complete a task.

When demands are placed on Amy to participate in an activity or complete a task, she often exhibited avoidant behaviors- laying down or trying to walk away from the table. It was very challenging for Amy's teachers and parents to keep Amy engaged in activities because of the avoidance behaviors and lack of motivation for toys/activities. Amy was motivated by food; however, even when food was used as a reinforcer, and demands got difficult, she avoided eye contact and tried to elope. Mr. Davis also reported that Amy could be very impatient when a preferred item was not available right away. For example, she often cried and engaged in self-injurious behaviors when she was hungry and food wasn't provided immediately.

Amy's disruptive and challenging behaviors. According to the school and parent reports, Amy engaged in self-injurious behaviors (hit hard surfaces or hit and scratched self/others) when she was not provided food when she was hungry or if she wanted something that she could not have. Mr. and Mrs. Davis reported that sometimes they are unsure why Amy engaged in some self-injurious behaviors. Mr. Davis reported that when Amy was upset, it typically took about five minutes for her to calm down. Amy has a favorite blanket that she held when upset.

Background information for Mark. Mrs. Richards (Mark's Mom) provided consent for herself and Mark to be participants in this research study when Mark was approximately four and

a half years old. Mark lived at home with his parents and two older sisters. Mr. Richards is Venezuelan and Mrs. Richards is Persian; thus, Mark was exposed to different languages in the home (when extended family visits), but his parents only speak English to him and his sisters. The results from the formal assessments, interviews, and observations do not yield a clinical diagnosis. However, the results did confirm the existing clinical diagnosis of autism that was reported in the documents that Mrs. Richards provided. She provided: an Individualized Education Plan (IEP), a progress report from Mark's school, and a report from Mark's Speech and Language Pathologist (SLP). The researcher also interviewed Mark's teacher to learn more about his educational programming.

Prior intervention support for Mark. Mark began attending the same private school program that Amy attended when he was approximately three and half years old. When the researcher interviewed Mark's teacher, the researcher asked questions related to Mark's typical school day, his ability to complete one-to-one work with a teacher, and was asked to describe any negative behaviors that Mark exhibited in the classroom. The researcher also observed in Mark's classroom for 30 minutes to gain information about how Mark followed teacher's directions and to observe any negative behaviors demonstrated. The researcher planned to interview the teacher and observe in the classroom once more respectively; however, Mark left this school. After Mark left the private school (a month before beginning the baseline procedures), he began attending a local private child-care center. His au pair accompanied him to the child-care center each day and helped him participate in the activities with his typically developing peers. Approximately two weeks after beginning the intervention procedures, Mark began receiving ABA therapy in his child-care center and home. He received approximately three to four hours of ABA in the child-care setting and four hours at home per day. Further,

Mark received OT and speech therapy in a clinical setting. Approximately five months before beginning the study, Mark began receiving speech therapy twice a week.

Mark's expressive language and communication skills. A recent report stated that Mark's SLP completed the Expressive One Word Picture Vocabulary Test-Revised (EOWPVT-R) and Mark displayed an age equivalency score of 1 year 9 months (raw score = 17, standard score = 63). According to the SLP report, standardized assessments, teacher and parent interview, and observation, Mark displayed strong echoic, verbal imitation skills and upon request from a parent or familiar adult, he was able to imitate many single words and two- and three-word utterances. Mark's use of echoic language (verbal imitation) and mands (requests) were a relative strength compared to his ability to use tacts (labeling objects in the environment) or interverbals (conversational skills). Most of Mark's verbal language was prompt dependent and he was not yet holding conversations with others, responding to or asking questions for the purpose of information gathering or conversation, and rarely spontaneously labeled items in his environment. His SLP reported that he often depended on a model from the therapist to communicate his wants. Further, it was often difficult to understand Mark's language and his vocalizations were sometimes very loud, with an unusual intonation, e.g., they seem scripted or echolalia (repeating phrases previously heard). For example Mark would often say, "buy me [item]," to request. In context, when Mark labeled or requested items in view or repeated words/phrases, the listener was typically able to understand. However, spontaneous vocalizations were harder to understand. Mark often tried to speak fast and "scrolled" through words in an attempt to answer correctly (e.g., when a popsicle was presented, Mark said: "I want skittles please, [pause], I want skittles please, [pause], I want popsicle please.").

Mark produced some spontaneous verbalizations: “go,” “drink,” and “buy coke,” to request items during the home observation and ADOS assessment. Mrs. Richards reported that he often said, “buy [item]” to request items. At school, Mark’s teachers reported that he spontaneously emitted 10 different mands per day when the highly preferred items were present or absent, e.g. edible items, physical play with staff (tickles), and requests to go outside or to the bathroom. When communicating these wants, he often used rote phrases, “I want [item] please”. When prompted in a one-to-one context, Mark was able to label many common objects and pictures. However, he rarely spontaneously labeled objects in his natural environment. This behavior was also observed in the home observation. When Mrs. Richards prompted Mark to label, he did so on most occasions, he did not label spontaneously. Other spontaneous and prompted verbalizations were difficult to understand because of articulation difficulties. When Mark vocalized to request, he did so without eye contact. During the ADOS assessment, he did pair eye contact with vocalizations when he directed vocalizations towards his parents as a form of protest (i.e., a brief scream to indicate he did not want to stay in the assessment room or participate in the activity). During the assessment, Mark did not point at objects or use any other non-verbal gestures to indicate communication. At home, Mrs. Richards consistently encouraged Mark to communicate by providing verbal prompts to imitate. The SLP reported that she uses a total communication approach including the Picture Exchange Communication System, a visual choice board, and verbal speech.

Mark’s receptive language and imitation skills. Mark’s teacher and SLP reported that Mark is able to follow some one step directions that are related to the classroom routine and when prompted in a playful, one-on-one context (e.g., “clap your hands,” “stomp your feet,” “sit down,” and “come here”). It was often difficult for Mark to imitate and follow directions because

he did not look at or focus on the teachers. Often when provided a prompt, “clap your hands,” Mark would say, “clap your hands” and turn away from the teacher instead of following the direction or imitating the motor task. During the ADOS assessment, the examiner provided multiple prompts before Mark imitated actions with materials (e.g., the frog jumping). When the examiner pretended to drink from a block, Mark somewhat imitated this action by holding the block up to the examiner’s mouth and making drinking noises.

Mark’s play skills. During the ADOS assessment, Mark produced some play with cause-and-effect toys; however, his engagement and persistence was fleeting during play. For example, he quickly lost interest in the jack-in-the-box toy when the clown did not pop out right way. While sitting at the table, Mark placed the birthday candles in the playdough cake (an example of functional play), but did not engage in any pretend play with other toys. In an informal setting, during free play or play at home, Mark did not play with toys. Instead, he continually walked or jumped around his environment. At school, when prompted to play with a toy in an informal setting, Mark ignored the teacher or took the toy, walked away from the setting, and dropped the toy. At school, Mark engaged in play with toys if they were placed at a table, or if a teacher held Mark in her lap.

Mark’s reciprocal social interaction skills. Throughout the ADOS assessment, Mark’s use of eye contact was fleeting (e.g., he sometimes made brief eye contact with the examiner). Mark did look at the examiner when his name was called and followed the examiner’s point to draw attention to a toy. He seemed to enjoy singing and physical play. For example, he smiled and giggled when the examiner pretended to be an alligator and used his hand to “bite” Mark’s arm. When the examiner sang to Mark, Mark provided unusual eye contact (an intense stare with close proximity to the examiner), touched the examiner’s face, and smiled. He also smiled at

Mrs. Richardson when they played peek-a-boo. Other than these examples, Mark did not direct his smiles or enjoyment in the activities toward the examiner or his parents to express a communicative attempt. Thus, he displayed little shared enjoyment; he did show some pleasure in his own actions. When interacting with toys, Mark did not give any toys to the examiner or his parents to show them the toys as a form of social interaction. At school, Mark did not display parallel play with peers and sometimes got upset and aggressive towards peers. Teachers reported that, unprovoked, he sometimes walked up to and pinched peers.

Mark's stereotyped behaviors and restricted interests. Mark frequently produced complex mannerisms (hard jumping with loud vocalizations) and frequently engaged in self-injurious behaviors by biting his hand. Mark engaged in self-stimulatory behaviors by holding and ripping plastic bags and paper. According to his SLP, he seemed to crave gross motor activities, as he frequently jumped around and enjoyed swinging and jumping. Teachers reported that Mark was often provided sensory breaks. He was provided three to five minutes of free play access with a variety of sensory toys: chewy tubes, slinkys, bendy tubes, play dough, and pipe cleaners. They also provided an extra recess time for Mark as a sensory break.

Mark's cooperation, motivation, and reinforcer effectiveness. At school, Mark was able to independently complete mastered tasks at a table for approximately 30 minutes while the teacher stood three to five feet away. He was also able to sit at the table for a full meal or snack. During the school observation, the researcher observed Mark sitting at (or standing near) a table for 30 minutes. During this 30 minute observation, he worked independently to complete various puzzles, shape sorters, and matching games, and followed teachers' directions to complete imitation tasks ("Mark touch head"), and pointed to pictures when named. Mark was constantly rewarded with iPad play during the teacher directed tasks. During the 30-minute observation,

Mark only got up from the table once as an attempt to leave and avoid work. He immediately followed directions to sit back down and he was not upset when doing so.

This behavior was not seen in other environments and Mark often reacted differently to unfamiliar adults. For example, throughout the ADOS assessment, Mark was very active and did not remain seated. When Mark was allowed to play on the floor or walk around freely, it was difficult for the examiner to maintain proximity and engage Mark in the tasks. Mark would not approach the examiner when prompted and would frequently walk away from the examiner when he was trying to engage Mark in play. Mark displayed disruptive behaviors by making loud vocalizations and moving away from the examiner. When the examiner prompted Mark to sit at the table and blocked Mark's path to leave the table, Mark responded much better to the examiner's directions and bids to engage in the activities. However, Mark only briefly sat at the table (2 to 4 minutes) before trying to stand up and leave again. Mr. and Mrs. Richards also continually prompted Mark to participate during the assessment and provided him with candy when he requested it and the candy was also sometimes used as a reward for participating. Mark did respond to most of his parents prompts for communication and approximately half of the prompts for direction following. He also allowed hand-over-hand prompting when his parents provided it.

At home, Mrs. Richards reported that Mark does not play with toys; he continuously walks around the house, tries to open doors to go outside, and needs constant supervision for safety concerns. During the formal observation, Mrs. Richards held Mark in her lap to get him to play with toys or label items. Mrs. Richards reported that Mark had a hard time staying at the table for meals and snacks, and frequently walked around the house while eating. The family used a high chair for meals. Mrs. Richards also reported that Mark was very motivated by edible

rewards and there are very few toys or activities (other than tickles and touch) that motivated Mark to follow directions or communicate.

Mark's disruptive and challenging behaviors. According to the school and parent reports, when Mark was upset he frequently bit his hands and banged his elbows and fists on the walls and table tops. He also displayed aggressive behaviors towards teachers and therapists when told "no," or when told a preferred task was "not available." When mad at adults, Mark has hit, bit (himself and others), pulled hair, punched, and/or scratched. During the ADOS assessment, it was hard for the examiner to engage Mark in the tasks because he frequently ignored or tried to avoid the examiner. These avoidant behaviors are also seen at school and home. For example, when Mark first entered the ADOS testing room he was very upset and continually asked to leave by saying he needed to go to the bathroom. Mom reported that he often asks to go to the bathroom at home and in therapy, and she was unsure if he really needed to go or if he was avoiding an activity.

Settings and Materials

The preferred items determined by the preference assessment were used for the intervention. Table 3 displays the items used in the intervention for Mark and Amy. To ensure the children stayed interested in the materials and to help ensure the items are novel, the parents were asked to hide or put away the targeted items. The researcher asked the parents to only allow the child to have these items during the study sessions only.

Table 3

Preference Assessment Results

Preferred	Non-Preferred	Neutral
Amy		
*Chips		Giraffe
Keys		Pig
Dino		
*Cup (by observation)		
Mark's Initial Preference Assessment		
*Popsicle		Cookie
*Skittle		Monkey
*Egg		
Chocolate		
Marshmallow		
Mark's Second Preference Assessment		
Pipe Cleaner	Dinosaur	
Slinky	Whistle	
	Stickers	

Note. * Indicates that these items were preferred over the others in the list. See the "Results and Discussion" sub-section for a description of Mark's two preference assessment reports and Amy's use of cup beginning in session 11.

The intervention took place in the children's home, and the children and parents were seated at their kitchen tables for the sessions. The researcher was present at each session to take data on the intervention effects, treatment fidelity, and parent competency. The parent was seated next to the child and the researcher was seated across from the parent and the child. The researcher video-recorded each of Amy's session (Mrs. Richardson did not provide consent to video-record Mark's sessions). Since the researcher was present during all sessions (baseline,

intervention, and maintenance sessions), a 'researcher effect' may have caused a threat to internal validity. Thus, the social validity assessment helped account for this threat. The social validity information assessed whether the intervention and effects are useful for the family. Thus, the parents participated in the study because the intervention was meaningful, and they are performed the procedures to help their child communicate, not just for the purpose of pleasing the researcher. Further, IOA data was collected to ensure that the researcher was collecting data in a non-biased manner.

Parent Training

Prior to the baseline phase, the researcher taught the parents how to implement the baseline procedures. To ensure that the parents do not implement the intervention procedures prior to the intervention phase, the researcher taught the parents how to implement the intervention procedures immediately before the children began the intervention phase. The researcher provided the parent with training utilizing written instructions, the intervention protocol (see Appendix D), the visual diagram (see Figure 4), role-play rehearsal, video models, and performance feedback. The researcher trained the parent on how to implement the intervention utilizing the methods tested during the pilot study (modeled after the Nigro-Bruzzi & Sturmey, 2010 study).

Nigro-Bruzzi and Sturmey (2010) explain how to effectively train staff members (teachers and Speech Language Pathologists) and this research replicated these methods to train two parents. The researcher provided two 60-minute training sessions for each parent prior to beginning the baseline phase, and one 60-minute training session before beginning the intervention phase. The parents were provided with detailed, written instructions on how to implement the intervention (see Appendix D for the intervention protocol). The researcher also

provided an abbreviated set of instructions that the parent was able to easily reference, very similar to the model provided by Tincani (2004; see the procedural fidelity checklists, Appendices E and F). A written list of the items that were targeted for use in the intervention with the corresponding sign language mand was also provided (see Appendix G). This list provides a picture of the corresponding sign language mand and a URL link to a video model. The researcher and parent reviewed all the signs and written instructions, and the researcher answered any questions that arose. These are the same procedures that were used in the pilot study. When interviewing Mrs. Smith about how feasible the intervention was, she stated that a simpler set of directions would have been helpful. Thus, a visual diagram of the intervention steps was created (see Figure 4) and used during this project.

After reviewing the written instructions, the researcher modeled role-play opportunities and provided performance feedback to further teach the parents how to implement the baseline and intervention. During the role-play opportunities the researcher pretended to be the child as the parent practiced the steps (referring to the written instructions and visual diagram as needed). The researcher provided performance feedback during these opportunities. The researcher and parent also watched video models of the intervention (created during the pilot study). The training sessions were concluded for both participants when they gained reliable treatment fidelity scores of 80% or more across at least three consecutive role-play trials. Mrs. Davis completed the baseline training after gaining an average of 94.45% (range 88.89-100%) across four consecutive role-play trials, and completed the intervention after gaining an average of 96.51% (range 96.30-96.67%) across four consecutive role-play trials. Mrs. Richardson completed the baseline training after gaining an average of 81.25% (range 75-87.5%) across four consecutive role-play trials, and completed the intervention after gaining an average of 95.58%

(range 95.24-96.30%) across three consecutive role-play trials. During the pilot session, Mrs. Smith struggled to remember how many trials were completed with each item; thus, the researcher developed a 'trial and item tracking data sheet' (Appendix H for an example) to help with tracking. This tracking data sheet was used during this study and the researcher and parents practiced with it during the parent training sessions.

Measures and Data Collection

The researcher served as the primary data collector and four research assistants were trained to serve as the second observers to record data for IOA. When recording data in the baseline and intervention phases, the researcher used the researcher-developed data sheets (Appendices I and J) to record the following: date/session number, duration of the session, trial number, target item, independent mand count, prompted mand count, sign language mand count, no mand count, percentage of independent mands, any relevant notes, and treatment fidelity and IOA data if applicable for that trial/session. Data on the independent, prompted, sign language, and no mands were collected using an event recording technique; every occurrence of the mand was recorded during the intervention and baseline sessions.

Dependent variables. This study focused on the ability to produce verbal mands. Thus, the researcher originally planned to analyze data for two dependent variables: independent mand and prompted mand. *Independent mands* were recorded when the child said the name of the targeted item to request without any prompting by the parent. *Prompted Mands* were recorded when the child said the name of the targeted item to request after a prompt was provided by the parent (e.g., after the parent said, "What do you want?" or "iPad," the name of the targeted item). The child participant did not have to say the name with perfect articulation. For example, if the child said "/p/-pad," this was recorded as a mand for the item "iPad."

Other variables were recorded, but they were not the original target skills of this intervention. These variables included: sign language mand and no mand. *Sign language mands* were recorded if the child used a sign language request for the targeted item. *No mand* were recorded if the child did not use a word or sign to request. Examples are also included in the "Procedure Section."

Procedures

Baseline conditions. The purpose of the baseline phase was to assess the child participant's ability to mand in a typical setting, without the treatment/intervention (Gast, 2010). The parent placed one to three preferred items (identified during the formal preference assessment) on the table, referring to the 'trial and item tracking data sheet' (Appendix H) that indicated the order of the item presentation. If the child was not attending when the items were placed on the table, the parent encouraged the child to attend by saying, "[Child's name] look," or "What do you want?" or "What do you want to play with?" After the child requested in any manner (pointing/reaching, sign language or independent mand), the parent gave the child access to the requested item and removed the other items. Following this brief period of access (10–20 seconds), the item was taken away from the child. When the parent took the item away, she said, "My turn" or "Mom's turn." The item stayed in view, but out of reach from the child. The researcher then recorded any request from the child, including the ability to sign the name of the item (sign language mand), say the name of the item (independent mand), or reach/point towards the item to indicate request. If the child used an independent mand, the child was allowed immediate access to the item by the parent. However, if the child pointed/reached for the object or used a sign language mand, the parent said, "What do you want?" and waited 3 to 5 seconds for a request. After this prompt, if the child requested the item using any modality, the parent

allowed the child access to the item for 10 seconds. If the child used a verbal mand after the "What do you want?" prompt, the mand was recorded as a prompted mand. If the child did not request, the next items (one to three items) on the 'trial and toy tracking data sheet' (Appendix H) were presented. The parent should not have used other verbal prompts to encourage the child to respond (e.g., said the name of any of the items present). The baseline session concluded when each targeted item was presented once. Each baseline sessions lasted approximately 10-15 minutes and were implemented twice per week.

Transitioning to the intervention phase. The participant order was randomly selected using the Microsoft Excel random number generator. The participants were assigned a random three-digit number in Microsoft Excel and the participant with the highest number was designated as participant one, and the participant with the lowest number was participant two. Consistent with multiple baseline design recommendations (Gast, 2010; Kratochwill et al., 2010; WWC, 2011), the two children began the baseline phase at the same time. Once a stable baseline was established across five data points for participant one, Amy, the intervention phase for Amy began.

The researcher planned for the intervention phase to be fixed and staggered for each participant. Ideally, the intervention would have been implemented with the subsequent participant, Mark, after Amy met the pre-established criterion: ability to produce an independent mand on 80% of opportunities across three intervention sessions. However, Amy did not reach the criterion in the established fixed time frame of four-weeks. Thus, the researcher implemented the intervention with Mark regardless. The researcher hypothesized that the participants would meet the criterion after four weeks because the pilot study data demonstrated that Lucas met the criteria after three weeks.

Intervention conditions. Consistent with previous effective verbal mand intervention studies (Carbone et al., 2010; Jennett et al., 2008; Kodak & Clements, 2009; Reichle et al., 2008), this intervention utilized Direct Trial Instruction (DTI). The DTI intervention included time delay, verbal prompting, and sign language paired with verbal prompting. The parents implemented the intervention and were seated beside the children at a table. The procedures for the intervention were adapted from the Tincani (2004), Jennett et al. (2008), and Nigro-Bruzzi and Sturmey (2010) studies (see Figure 4 for a visual diagram of the intervention). Consistent with the Tincani (2004) study, to begin each training session, the parent selected two to three of the reinforcing items referring to the trial and item tracking data sheet. The items were placed in front of, but out of the reach of the child. After the parent presented the items and the child requested in any manner (touching, reaching, pointing, speaking, or signing), the parent allowed brief access to the item (10 to 20 seconds). If the item was a food or drink, the child was given a small amount of the item (a small sip of a drink or one bite-sized piece of an edible) and was allowed access until finished. The child was allowed immediate access to the item to ensure the children wanted the item. If the child did not show interest in any item, the parent would choose new items for that trial. Once the child had access to the reinforcing item, the parent removed the remaining items from the child's view. After the child played with the toy for 10 to 20 seconds or consumed the food/drink, the parent gently took away the item from the child and began the intervention trial (Tincani, 2004; Jennett et al., 2008).

Intervention trial. To elicit an independent verbal mand, the parent initiated the time delay procedure immediately (e.g., waited for the child to request using a verbal mand for three to five seconds; consistent with Nigro-Bruzzi & Sturmey, 2010). While waiting, the parent played with the toy, poured more drink in the child's cup, or held the food item to entice interest.

The child gained access to the item immediately when he/she said the name of the preferred item, used the correct verbal mand, within three to five seconds. The amount of time elapse (3-5 seconds) allowed the child time to request while moving the intervention along quickly to keep the child's interest. Further, to avoid satiation, the parent only allowed quick access to the item (20 seconds or a small amount of food/drink). After the child independently requested, using the word for the targeted item, the researcher recorded the response as an *independent mand* (see Figure 4 for the visual diagram of the intervention with corresponding data prompts). If the child did not say the name of the preferred item, the parent implemented the time delay procedure (e.g., waited for 3 to 5 seconds before providing prompts) and began the Error Correction Procedures. If the child said a different word (e.g. "cookie," when ball is presented), the parent immediately began the Error Correction Procedures:

1. If the child did not use the accurate verbal or sign mand within 3-5 seconds, the parent provided the first verbal prompt, stated ''What do you want?'' and held up the name of the targeted item (consistent with Nigro-Bruzzi & Sturmey, 2010).
2. If the child did not use the accurate verbal or sign mand within 3-5 seconds of prompt #1 in Error Correction, the parent said the name of the item, "cookie."
3. If the child did not use the accurate verbal or sign mand within 3-5 seconds of prompt #2 in Error Correction, the parent simultaneously signed the name of the item and said the name of the item (Tincani, 2004).
4. If the child did not use the accurate verbal or sign mand within 3-5 seconds of prompt #3 in Error Correction, the parent physically prompted the child with hand-over-hand prompting to sign the name of the item and immediately allowed access (i.e., The parent gently took the child's hands and prompted him/her to make the sign [Tincani, 2004].).

If at any point during the error correction procedures, the child used a sign language request without the verbal mand, the parent said the name of the item and waited for three to five seconds before allowing the child access to the item. The researcher then recorded this as a *sign language mand*. The time delay is used in this procedure to further encourage the child to use verbal communication. If the child provided a verbal mand at any step during Error Correction, the parent immediately allowed access to the item. At any point during the error correction procedures, if the child used verbal communication to request, the request was recorded as a *prompted mand.* If the child used a sign language mand and a verbal mand simultaneously, both of these responses were recorded. If the parent had to provide the child with a physical, hand-over-hand prompt, the response was recorded as a *no mand* (see step four of the error correction procedures).

Hand-over-hand and sign language prompts are consistent with Tinanci (2004). These methods are used to encourage the child to use a sign to request if he/she is not yet using verbal communication. When the child allowed the parent to use hand-over-hand prompting, the child was allowed access to the item. The hand-over-hand prompt used in the intervention was to ensure that the child delivered a correct response and he/she was reinforced with access to item. Following the principle guiding errorless teaching (Green, 2001), the child was provided with a prompt that ensured that he/she was reinforced; thus, increasing the likelihood of the target behavior- the ability to request. Further, consistent with Tinanci (2004), the simplest form of American Sign Language was used. For example, one of Mark's items was 'skittles;' however, the sign language prompt that the researcher utilized was 'candy' because it was more simple to learn. The sign for candy consisted of touching the cheek near the back of the jaw and twisting the finger back-and-forth. Baby Sign Language.com (2018) explains that the movement

resembles the motion of a doctor drilling your tooth; i.e., the outcome of over-eating candy (see Appendix G for an example list of items with corresponding signs). To avoid confusion, the signs taught also did not resemble each other. After the child was provided access to the preferred item, the parent repeated the intervention trial steps and the Error Correction Procedures (as necessary).

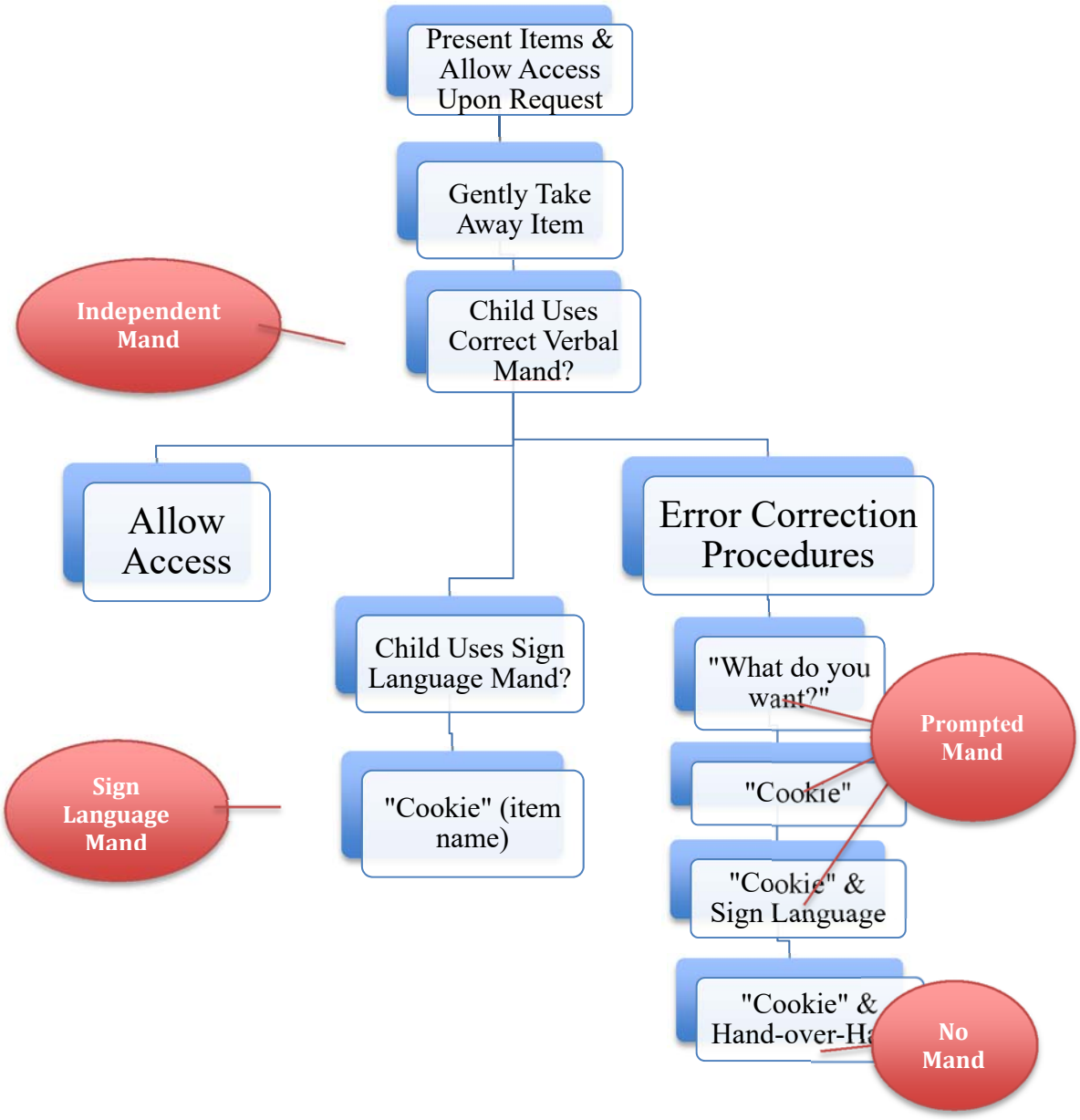

Figure 4. Visual diagram of the intervention procedures steps with data prompts.

Concluding intervention trials and sessions. During each intervention trial, one preferred item was used for instruction. The trial continued until one of two conditions was observed. *Condition one* consisted of the child achieving ten opportunities to access the preferred item. *Condition two* consisted of the child pushing the targeted item away, turning away, refusing to eat the targeted edible item, or displaying signs that he/she did not want the targeted item.

After the first trial was completed, the parent began the subsequent trials by following the same procedure described above. The parent began by presenting one to three new reinforcing items, dependent on the child's preferences and what items had been used in the session. The order of the targeted items was pre-determined by the researcher before each intervention session using a quasi-random selection. It is recommended to present the items in a random or quasi-random order, dispersing edible and highly reinforcing items to increase the likelihood that the child will stay engaged (Tinanci, 2004). The order was also determined by the child's preferences and behaviors when items were removed. Further, if there were six targeted items for instruction and two items are remaining, the parent would present two items. If three items are remaining and one was a "highly preferred item" (determined by the preference assessment), the parent and researcher determined that the highly preferred item would be presented at the end of the session. This example often occurred for Mark when presenting the egg. This was the most "highly preferred item," and Mark often got upset when it was taken away to begin a new trial with different items. Thus, the egg was presented alone and was the last item during most sessions.

At the start of the intervention, six different items (toys and edibles) were chosen for instruction during each intervention session (see the "Results" section for a discussion of Amy's

intervention adaptations). The intervention sessions concluded after one of the following conditions: *Condition one*- the child requested all the preferred items. *Condition two*- the child has requested 80 percent of the items and he/she continually pushed away the remaining items. If the child began to display interfering behaviors (e.g., crying, screaming, pushing away items) before 80 percent of the items are used in the intervention, the child was given a short break. When the children were given a break, they were allowed to leave the table or play with a toy or consume a snack that was not targeted for instruction.

Intervention level. Intervention sessions in the pilot lasted approximately 45 to 60 minutes. Ten items were targeted for the intervention sessions during the pilot. To shorten the time requirement for the child/parent, the researcher targeted six items per child. With this adaptation, the intervention sessions lasted approximately 20 to 30 minutes, with breaks built in as needed. The intervention sessions occurred twice per week. This intervention level (two sessions per week, 10 trials per item) was successful for Lucas in the pilot session. Lucas immediately started using prompted mands and during the fourth intervention session (after 2 weeks), he began to consistently using independent mands (see Figure 3).

Maintenance phase. A maintenance phase was implemented to determine if the skill learned, the ability to mand, was maintained when the intervention procedures were removed. After the intervention phase had concluded for each participant, a maintenance phase was implemented for four sessions per participant. During the maintenance phase, the baseline procedures were implemented and data was collected on the target behaviors.

Follow up. Social validity evidence from the researcher's pilot study revealed that Mrs. Smith was unsure how to proceed after the intervention had ceased. She explained that follow-up training from the researcher would have been beneficial. Thus, during this study, the researcher

provided two 30 to 60 minute follow-up sessions for each participant. These sessions occurred after each participant had completed the maintenance phase. During the sessions the researcher helped the parents learn how to generalize the intervention steps by helping them facilitate their child's communication during a naturally occurring time in the day (e.g., play-time with siblings). During the sessions, the parents (and Mark's siblings) were encouraged to use the same prompting strategies explained in the intervention procedures. The child was encouraged to play with toys in their natural environment or engage in a game with their family members. Mrs. Davis requested that the researcher complete one of the follow-up sessions at school and one at home. During the school follow-up session, the researcher observed the strategies that the teachers and therapist (OT and SLP) were using, and modeled the intervention procedures that Mrs. Davis was using in the home.

Threats to Validity

When conducting a multiple baseline design, threats due to history, maturation, and testing are controlled when the intervention is staggered (Gast, 2010). Other threats to internal validity were assessed through IOA and treatment fidelity calculations.

Interobserver agreement and treatment fidelity. Four research assistants were trained to collect IOA data. These research assistants were advanced doctoral level students with prior experience in single subject research, intervention work, and special education content. During a 60-minute training session, the researcher trained the assistants using the written instructions (explained in the "Parent Training" section), and the baseline and intervention video models (collected during the pilot study). After the training had been completed, each research assistant gained reliability by watching and coding video models using the researcher developed data collection sheets (Appendix I and J). The four research assistants gained an average IOA score of

86.34% (range 83.94-89.19%) across three baselines sessions and 100% across three intervention trials before collecting real-time IOA data at the children's homes. The IOA sessions were staggered throughout the study and IOA data was collected near the beginning, midpoint, and end of each phase. Further, the IOA sessions were not completed across consecutive days. IOA scores were calculated by using the point-by-point agreement percentage. This was calculated by dividing agreements by agreements plus disagreements then multiplying by 100 (Gast, 2010).

During each session treatment fidelity information was assessed during at least 30% of the intervention trials. The researcher observed the parent implementing the intervention and recorded treatment fidelity information on the "Procedural Fidelity Checklist" (see Appendix E for the baseline checklist and Appendix F for the intervention checklist). Fidelity scores were calculated by diving the number of correct responses by the number of correct and incorrect responses and multiplying by 100. Further, after each session, the researcher assessed the parents' competence of delivery related to delivering the intervention. The competency rating estimated the parents' ability to comfortably deliver the intervention as prescribed (intervention delivery expertise [IDE]) and their ability to read and respond to the child's behavioral cues (behavior responsiveness [BR]; scale adapted from Sutherland, McLeod, Conroy, Abrams, & Smith, 2014). IDE and BR were measured on a 5-point Likert scale, where scores of 1-2 reflected low competence and scores of 4-5 reflected high competence (see Appendix K for the full list of competency ratings).

Social validity. Social validity information was also gathered to determine if the dependent variable under investigation was socially important, the intervention was practical, and if the results were generalizable outside of the intervention sessions (Gast, 2010; Horner et al., 2005). Social validity information was gathered in two different ways. First, during the

intervention sessions, detailed field notes were taken to capture parents' perspectives, observations, and experiences during the study and parents were asked to reflect on their experiences if an opportunity naturally occurred.

After completion of the intervention, the researcher also interviewed parent participants to assess social validity and each interview lasted approximately 40 minutes. The semi-structured interviews took place at the family's homes and were audio-recorded. The social validity interview questions are adapted from Tincani (2004) and informed by pilot study results. During the pilot study, the researcher adapted the questions developed by Tincani (2004) and found that Mrs. Smith did not understand the intent of some of the questions. As a result, her answers did not yield the desired information. For example, Tincani (2004) posed the following question, "How important was this study to understanding communication training for children with autism and related disabilities?" (p. 156). To adapt this question to be more appropriate to the pilot, the researcher asked, "How important was the study to understanding your child's communication needs?" The researcher hoped Mrs. Smith would discuss her understanding of Lucas' communication needs. Instead, Mrs. Smith spoke more about the effectiveness of the intervention in increasing her Lucas' communication skills. Thus, during this dissertation study, the researcher further adapted this question to probe participants' perceptions of their understanding of the child's communication needs, instead of the effectiveness of the intervention: "After participation in this study, what do you now know about your child's communication needs? How is your understanding different from or in line with what you knew prior to this study?" Other interview questions were adapted to use more parent-friendly language and probes were added to clarify the questions and/or probe for more information. Further, because parents reported on their individual child's communication needs and

experiences with the intervention, additional probes were developed beyond those that are listed on the protocol (e.g., “Mrs. Davis, you previously stated that you taught Amy’s grandma how to use the prompting strategies. Can you explain this in more detail? Is Amy successfully using sign language to communicate with Grandma?). The social validity interview protocol is available in Appendix L.

Data Collection and Analysis

The researcher served as the primary data collector while the parent implemented the intervention. Event recording technique was used to collect data during each session on the researcher-developed data sheet (see Appendix I for the baseline/maintenance data sheet and J for the intervention data sheet). The count data for the independent and prompted verbal and sign language mands were computed to percentage of opportunities to display on the graphs presented in the “Results” section. For example, if Mark had 10 opportunities to respond: 5 responses were independent mands, 2 were prompted, and 3 were no mands, only the independent mand percentage (50%) and prompted (20%) were entered into a Microsoft Excel spreadsheet and displayed on the graph.

To analyze the data related to the verbal mand intervention effects, the researcher used visual analysis to determine the immediacy of effect using the absolute level of change between the adjacent conditions. Single subject researchers use the absolute level of change calculation to determine if the intervention quickly impacts the dependent variable (Gast, 2010). To determine the level of change between the phases, the researcher subtracted the last data-point value of the first phase under investigation from the first data-point value of the second phase under investigation (Gast, 2010).

The researcher analyzed the directionality of the trend to determine if the intervention had an effect on the ability to produce mands. To evaluate the trend, the researcher calculated and drew the trend lines for each phase. Using the quarter-intersect method (Gast, 2010), the researcher:

1. Determined the middle session number and drew a solid vertical line from the top of the graph to the x-axis (if there were an even number of data points, the researcher drew this line through the middle of the two middle session data points).
2. Determined the middle session number of each half of the data and drew a dotted vertical line from the top of the graph to the x-axis (repeated this step for the second half of the data).
3. Determined the median level of the data for each half and drew a horizontal dotted line from this number beginning on the y-axis.
4. Marked where the horizontal dotted line met the vertical dotted lines with an 'X,' this is called the 'quarter intersects.'
5. Starting at the y-axis, drew a straight solid line across the quarter intersects and extended the line beyond the last point in the data range. This line represented the trend line.

The researcher calculated stability and drew the stability envelopes to determine how much variability was seen in the data within the phases. If too much variability is seen in the data, it is difficulty to determine the direct effects of the intervention on the dependent variable. Thus, if the data presents low variability it is said to be stable (Gast, 2010). To calculate the stability envelopes the researcher utilized the trend line and the mean of the data within each phase. The researcher:

1. Calculated the mean of the data with the phases and multiplied the means by 15 percent.

2. Located the quarter intersect on the first half of the data, added 15 percent of the mean, and placed a dot.
3. Located the quarter intersect on the second half of the data, added 15 percent of the mean and placed a dot.
4. Drew a dotted line connecting these dots. This dotted line was placed above the trend line and paralleled the trend line.
5. Repeated steps 2 through 4; however, the researcher subtracted 15 percent of the mean to place the dots and connect them by drawing a line. This dotted line was placed below the trend line and paralleled the trend line. Both of these dotted lines drawn onto the graph represent the stability envelope for the data (Gast, 2010).

The percentage of non-overlapping data (PND) was calculated to determine the number of intervention data points that do not overlap between the phases. This analysis is utilized to determine the impact of the intervention on the dependent variables and it serves as an effect size estimate in single subject research design (Gast, 2010). To determine the PND calculations, the researcher:

1. Determined the range of the data-point values in the first phase under investigation.
2. Counted the total number of data points in the second phase under investigation.
3. Counted the number of data points in the second phase that fell outside of the range of the data-point values in the first phase.
4. Divided the number of data points in the second phase that fell outside of the range of the data-point values in the first phase (number found in step 3) by the total number of data points in the second phase (number found in step 4) and multiplied this number by 100 (Gast, 2010).

The researcher analyzed the social validity data (the field notes and interviews) by searching the data for common themes and disconfirming evidence between the participants (Brantlinger, Jimenez, Klinger, Pugach, & Richarson, 2005). The researcher provided detailed descriptions of the participants' experiences and direct quotes to provide evidence for the interpretations and conclusions (Brantlinger et al., 2005).

Chapter IV

Results

The purpose of this study was to increase verbal mand skills for preschool aged children with autism, using a parent implemented intervention. The study also sought to investigate if parents could reliably implement the verbal mand with direct trial instruction intervention.

Effects of the Verbal Mand Intervention.

During the intervention Mark began to use verbal mands; however, Amy did not. Thus, the researcher analyzed Amy's ability to use functional mands and Mark's ability to use verbal mands. The single subject multiple baseline graph (Figure 5) displays the data for Amy's sign language and Mark's independent mand production.

Amy's total sign language mands. During the baseline sessions, Amy reached for items to request and she did not use any verbal or sign language mands. She occasionally, without assistance, clapped her hands together to request for "more." During the initial intervention, Amy did not use verbal mands; thus, the researcher analyzed her ability to use sign language mands (see Figure 5). During the initial intervention phase, the results do not show an immediacy of effect. Referring to the trend line analysis, the target skills did not emerge during the baseline phase and there was a stable, slightly decelerating trend observed for the sign language mands. The stability envelopes were calculated based on 15% of the means. Further, zero percent of the data fell in the stability envelope. The level of Amy's use of sign language mands during the

initial intervention phase was low ($\overline{x}$ = 4.95%, Med = 9.90%). Table 4 displays the mean and median data for Amy's ability to use sign language mands.

Table 4

Mean and median calculations for Amy's total sign language mand percentage.

Phase	Mean	Median
Initial Intervention	4.95	9.90
Intervention (2 objects)	61.72	63.39
Intervention (More Chips)	94.11	91.67
Maintenance	67.38	69.05

Since Amy was not consistently using sign language to request, the researcher and Mrs. Davis adjusted the intervention procedures. Prior to session eleven, Amy was most interested in chips and her juice cup. Her juice cup was not originally chosen for the intervention, but it was in sight and when Amy was thirsty, she reached for it. Thus, these two items were most motivation. During session eleven, Mrs. Davis presented two items (chips and cup), instead of 6 items. The results between the initial intervention phase and the intervention-2 objects phase shows an immediacy of effect (calculated by the absolute level change). Amy began to immediately use sign language mands during the first session of the intervention-2 objects phase (session 11). An increase from zero percent to 64.29% was calculated between the last data point of the initial intervention and first data point of the intervention-2 objects phase. This skill remained at a moderate level ($\overline{x}$ = 61.72%, Med = 63.39%) and the trend remained flat and stable with 100% of the data within the stability envelope. Amy had not yet met the pre-established criterion

(ability to independently mand on 80% of opportunities across three intervention sessions) and since the trend was flat, the researcher and Mrs. Davis adapted the intervention procedures again to elicit more independent mands.

During session 17, Mrs. Davis and the researcher adapted the intervention procedures to include 'more chips.' Prior to session 17, Amy was using sign language to request for chips at a much higher rate when compared to her sign language requests for cup. Thus, during the remaining intervention sessions, when Amy requested chip, Mrs. Davis gave her a larger amount to eat to expect her to get thirsty; thus, increasing her motivation to request for cup. When implementing the new intervention phase (intervention-more chips), an immediacy of effect is seen. Amy increased her ability to use sign language request by 34.53%. This skill remained at a high level ($\overline{x}$ = 94.11, Med = 91.67%) and a slightly decelerating, stable trend was seen, with 100% of the data within the stability envelope. When analyzing Amy's maintenance phase data, an accelerating trend was observed for the sign language mands and there is no variability seen in the data, with 100% of the data falling within the stability envelopes. When referencing the level, Amy's ability to use sign language mands decreased when compared to the intervention-more chips phase ($\overline{x}$ = 67.38%, Med = 69.05%).

The PND calculations for Amy's ability to use sign language mands show that the majority of the data points in the preceding phases fall outside of the range of data points in the subsequent phases. The PND calculation between the baseline and intervention phase shows 60% non-overlapping data. The data between the remaining phases show 100% PND calculations.

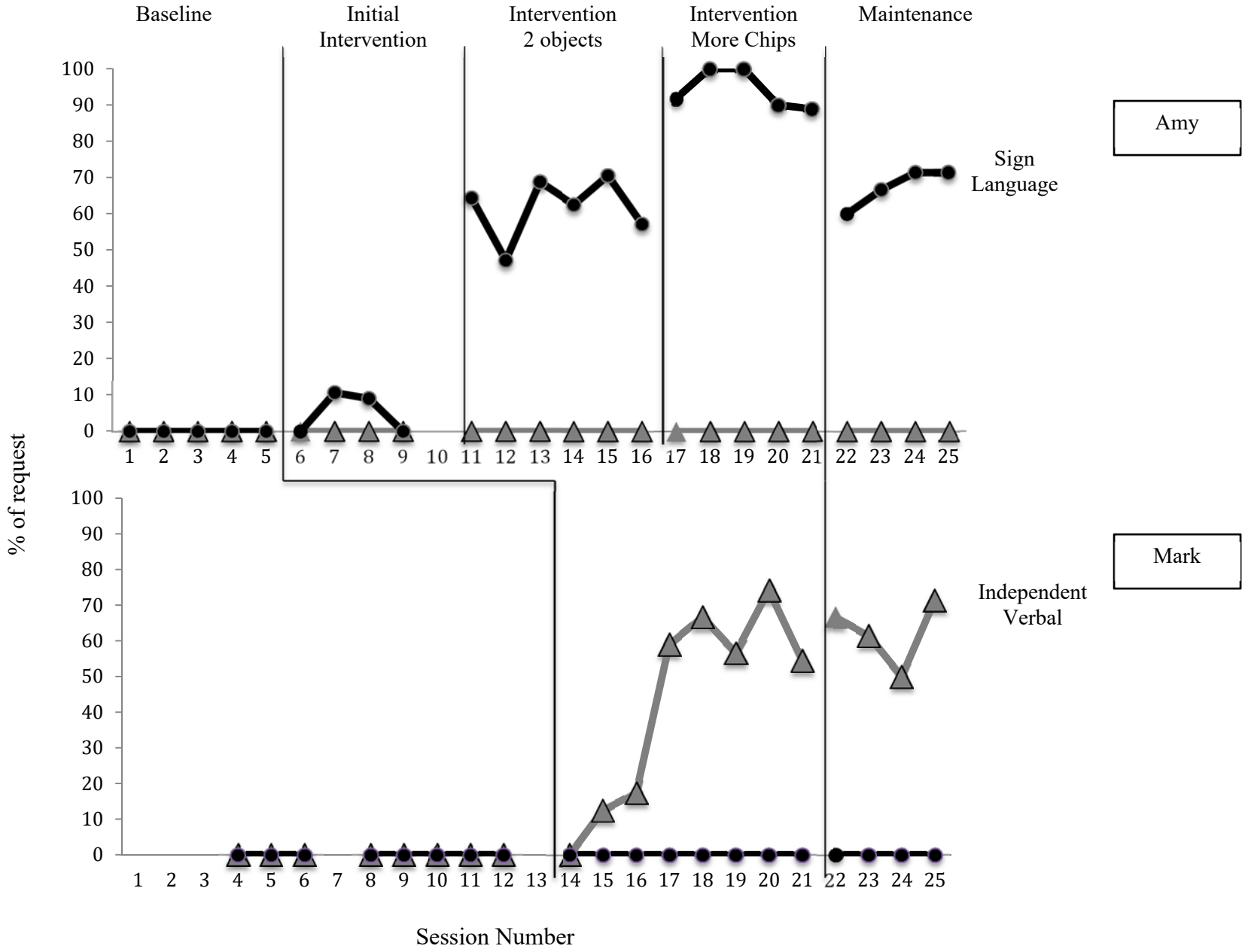

Figure 5. Amy's sign language mands and Mark's independent verbal mands.

Amy's independent and prompted sign language mands. During session seven within the initial intervention phase, Amy continually signed for "more" when asking for chips. Thus, she understood that she needed to communicate to receive chips. During this session, Mrs. Davis began to provide a partial physical prompt for chip; e.g. Mrs. Davis placed Amy's arms/hands in the position to do the sign language mand for chip, and Amy completed the rest of the sign herself. With this adaptation, Amy used three prompted sign language mands for chips for the first time. During the subsequent sessions, Mrs. Davis provided the partial physical prompt for chips to encourage Amy to use a *prompted sign language mand*. During session thirteen, Mrs. Davis noticed that Amy needed a very small physical prompt, e.g. Mrs. Davis barely touched her elbow and Amy did the sign for chip. Thus, she began to reach slowly to Amy's hands/elbows to provide the physical prompt. During one of the trials, when Mrs. Davis reached out to position Amy's hands for the partial physical prompt, Amy completed the sign for chip independently, before Mrs. Davis touched her arms or hands to position them. Thus, the researcher recorded this instance as an *independent sign language mand*. From this point forward, Amy began to use many more independent sign language mands for chips and data were recorded for prompted sign language mands (partial physical prompt) and independent sign language mands (without a physical prompt).

Figure 6 represents the data for Amy's ability to use prompted and independent sign language mands. During the baseline, Amy did not use any prompted or independent sign language mands. During the initial intervention phase, Amy used prompted sign language mands only. Thus, the analysis for the data in the intervention phase is presented in the section above, the 'Total Sign Language Mands.'

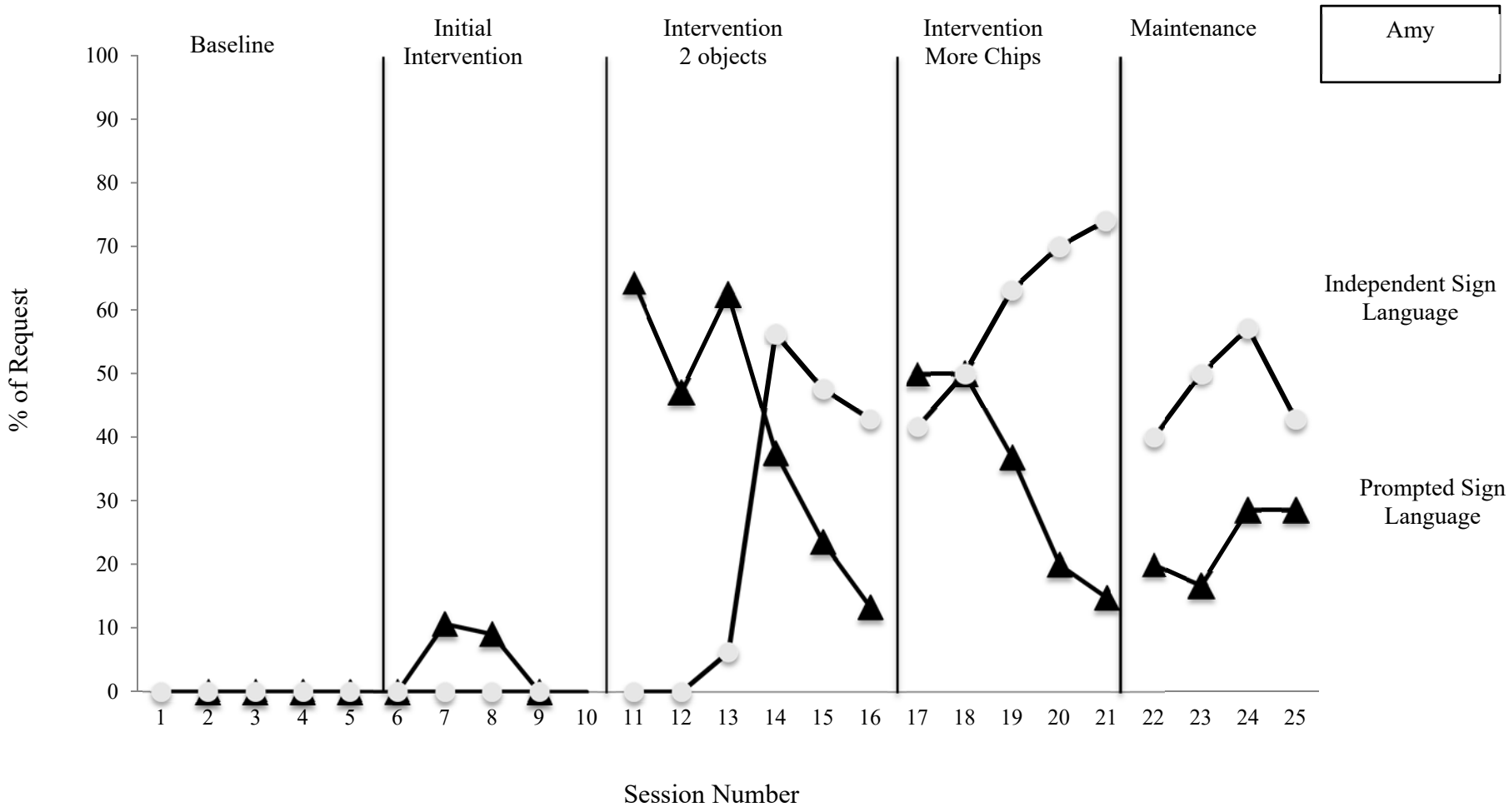

Figure 6. Amy's independent and prompted sign language mands.

During the intervention-2 objects phase, the results show an immediacy of effect for the prompted sign language mands, depicting a 64.29% increase. There was not an immediacy of effect seen in the independent sign language mand data. When analyzing the data for the absolute level of change between the intervention-2 objects and the intervention-more chips phases, there was no change between the last data point in the intervention-2 objects and the first data point in the intervention-more chips phases for the independent sign language mands. When analyzing the data for the prompted mands, there was an 36.67% incline seen between the last data point in the intervention-2 objects and the first data point in the intervention-more chips phases. Data between the intervention-more chips and the maintenance phases show a decline for the independent sign language mands (-34.07%), and a slight incline for the prompted mands (5.19%).

Referring to the trend line analysis, an accelerating trend was observed for independent sign language mands, and a decelerating trend was observed for prompted mands in the intervention-2 objects phase. Data for the intervention-more chips phase depicts the same trends, an accelerating trend for independent mands, and a decelerating trend for the prompted mands. Referring to the maintenance phase, the independent mand trend changed to a stable, slightly accelerating trend. The prompted mand trend changed in directionality to an accelerating trend.

The stability envelopes depict how much variability is seen in the data. The intervention-2 object phase data show slight variability with 60% of the independent sign language mands falling inside of the stability envelopes, and 50% of the prompted sign language mands falling inside of the stability envelopes. There is minimal variability seen in the intervention-more chips and maintenance phases (100% of the data fall inside of the stability envelopes for the independent and prompted sign language mands in the intervention-more chips phase and for the

prompted sign language mands in the maintenance phase. 75% of the data falls inside the envelope for the independent mands in the maintenance phase).

Table 5 shows the mean and median calculations for Amy's ability to use independent and prompted sign language mands. When referencing the level change between intervention-2 object and intervention-more chips phases, Amy's ability to use independent mands increased by 38.61% and her ability to use prompted mands decreased by 5.44%. In the maintenance phase, Amy's ability to use independent mands decreased by 16.73% and her ability to use prompted mands decreased by 12.56%.

Table 5

Mean and median calculations for Amy's independent and prompted sign language mands.

	Independent Mand Percentages	Prompted Mands Percentages
Intervention-2 Object Phase		
Mean	25.49	41.36
Median	24.55	42.28
Intervention-More Chips Phase		
Mean	59.78	34.33
Median	63.16	36.84
Maintenance Phase		
Mean	47.50	23.45
Median	46.43	24.28

The PND calculation for the independent sign language mand data between the initial intervention and intervention-2 object phases shows that 66.67% of the data is non-overlapping. Independent mand data between the intervention-2 object and intervention-more chips show that 60% of the data is non-overlapping. The data between the intervention-more chips and maintenance phases show that 0% of the data is non-overlapping. The PND calculation between the initial intervention and intervention-2 object phases for the prompted sign language mand data show that 100% of the data is non-overlapping. The PND calculations between the remaining phases show that all of the data falls inside of the range of data points in the preceding phases; thus, PND calculations are 0% between all of the remaining phases.

Mark's verbal mands. During the first baseline phase Mark exhibited interfering behaviors that affected his ability to complete the sessions. Mark did not participate in baseline sessions one through three because he refused to sit at the small child-sized table that Mrs. Richards originally chose for the setting. During session four, Mrs. Richards had success implementing the baseline procedures because she and Mark sat at the dining room table to complete the session, with Mark seating in his high chair. The remaining missing data points (session seven and thirteen) indicate a canceled session.

During the baseline sessions, Mark reached for items to request and he did not use targeted prompted or independent mands ("give me [object]"). He did independently say one word utterances to request; however, sometimes the request did not correspond with the item presented (e.g., said "popsicle," to request chocolate). On occasion, he also used rote phrases to request, "I want [object] please." The results show a slight immediacy of effect between the last data point of the baseline phase and first data point of the intervention phase, as evidenced by Mark beginning to immediately use prompted verbal mands during the first session of the

intervention phase (session 14; See Figure 7 for the graph that represents Mark's ability to use prompted and independent verbal mands.). Mark increased his ability to use prompted mands from zero percent in the baseline to 12.13% in the intervention phase. When analyzing the data between the intervention and maintenance phases, the effects remained consistent, with a slight incline for the independent mands (12.13%), and a moderate decline for the prompted mands (-32.12%).

Referring to the trend line analysis, the target skills did not emerge during the baseline phase, an accelerating trend was observed for independent mands, and a decelerating trend was observed for prompted mands in the intervention phase. Referring to the maintenance phase, when the intervention was withdrawn, the independent mand trend changed in directionality to a slight decelerating trend. The decelerating prompted mand trend remained relatively the same compared to the intervention phase.

When analyzing the data for level stability, there is very little variability in the independent mands. The researcher calculated level stability for the intervention and maintenance phases since the targeted behaviors did not emerge in the first baseline phase. The intervention phase data shows slight variability in the independent mand data with 62.5% of the data points falling inside of the stability envelopes. Referring to the data in the maintenance phase, minimal variability was seen for the independent mand percentage, with 100% of the data falling inside of the stability envelope. The prompted mand data in the intervention and maintenance phases show high variability, with 37.5% of the data falling inside of the stability envelope during the intervention phase and 0% of the data in the maintenance phase.

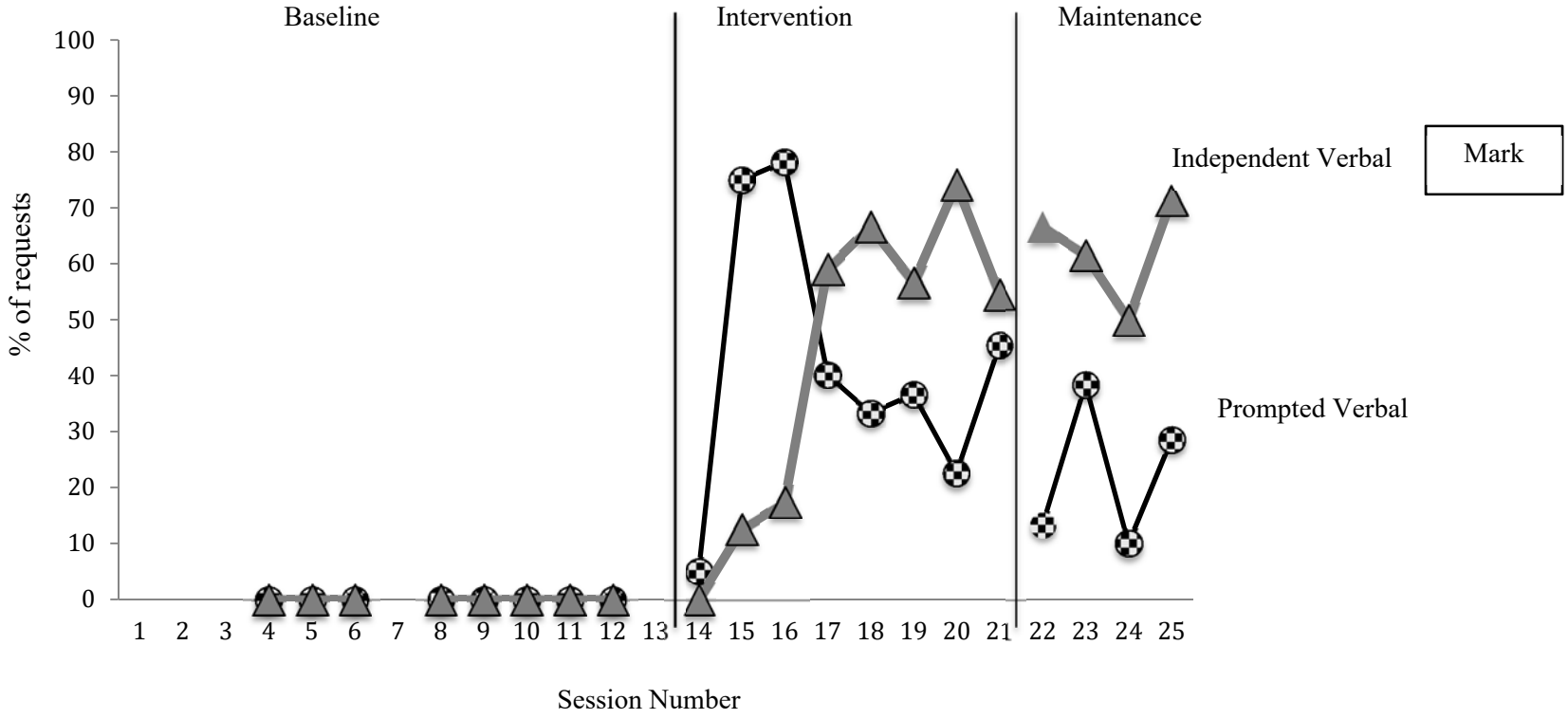

Figure 7. Mark's prompted and independent verbal mands.

The median level for Mark's ability to use independent and prompted verbal mands is also represented in Table 6 by the mean and median calculations. When referencing the level, Mark's ability to use independent mands increased from the intervention to maintenance phase by 8.5%. Mark's ability to use prompted mands decreased from the intervention to maintenance phase by 17.43%.

Table 6

Mean and median calculation for Mark's verbal mand percentage.

	Independent Mand Percentages	Prompted Mands Percentages
Intervention Phase		
Mean	42.63	42.05
Median	55.60	38.38
Maintenance Phase		
Mean	62.72	31.30
Median	64.10	20.95

The PND calculations for Mark show that the majority of the data points for the independent and prompted mands in the intervention phase fall outside of the range of data points in the baseline; thus, PND between these phases is 87.5% for prompted mands and 100% for independent mands. The PND calculation between the intervention and

maintenance phase was also calculated, with 0% of non-overlapping data for the independent mands and prompted mands.

Interobserver Agreement Results

IOA data were collected in each participants' home during at least 20% of the baseline, intervention, and maintenance phases. IOA data for Amy were collected during 2 out of the 5 baseline sessions with an average of 93.5% (range 87-100%), 1 out of the 4 initial intervention sessions with an average score of 100%, 1 out of the 5 intervention-2 object sessions with an average of 88.89%, 2 out of the 5 intervention-more chips sessions with an average of 100%, and 1 out of the 4 maintenance sessions with an average of 100%. For Mark, IOA data were collected during 2 out of the 8 sessions with an average of 93.75% (range 87.5-100%), 2 out of the 8 intervention sessions with an average score of 100%, and 1 out of the 4 maintenance sessions with an average of 90.91%.

Treatment Fidelity and Parent Competency Results

Treatment fidelity data for Mrs. Davis and Mrs. Richardson were collected during each session across all phases and on at least 33.33% of the trials. See Table 7 for the number and percentage of trials in which the data was collected, and the average and range for the fidelity scores. The Parent Competency Rating (PCR) scale was recorded during each session throughout all five phases. The parents' ability to deliver the intervention with expertise (intervention delivery expertise [IDE]) and the ability to respond to the children's behaviors cues (behavioral responsiveness [BR]) was assessed on a 5-poink Likert scale (see Table 8 for the PCR data results).

Table 7

Treatment Fidelity Results

Participant and Phase	Treatment Fidelity			
	# of DC trials/ total trials	% of trials	$\overline{x}$ score	score range in %
Mrs. Davis				
Baseline	11/30	36.67	97.50	87.50 – 100
Initial-I	8/21	38.09	96.84	95.24 – 100
Intervention-2O	6/12	50.00	96.34	90.91 – 100
Intervention-MC	5/10	50.00	97.43	93.95 – 100
Maintenance	4/8	50.00	86.61	75 – 100
Mrs. Richardson				
Baseline	15/35	42.57	79.26	60 – 100
Intervention	16/45	35.55	97.88	94.29 – 100
Maintenance	8/24	33.33	98.44	93.75 – 100

Note. # of DC trials = number of data collection trials. % = percentage. I = intervention. 2O = 2 object. MC = more chips.

Table 8

Parent Competency Rating Scale Results

	Parent Competency Rating			
Participant and Phase	IDE $\overline{x}$ score	IDE score range	BR $\overline{x}$ score	BR score range
Mrs. Davis				
Baseline	4.60	4 – 5	4.20	4 – 5
Initial Intervention	3.75	3 – 4	3.25	2 – 4
Intervention-2 Object	4.67	4 – 5	4.50	3 – 5
Intervention-More Chips	4.60	4 – 5	4.4	3 – 5
Maintenance	4.25	3 – 5	5	5 – 5
Mrs. Richardson				
Baseline	2.87	1 – 4	3.25	2 – 4
Intervention	4	3 – 5	3.87	3 – 5
Maintenance	4.25	4 – 5	4.25	4 – 5

Note. IDE = intervention delivery expertise. BR = behavioral responsiveness.

Social Validity Results

Amy. Mrs. Davis was interviewed on January 26, 2018, approximately two months after the last maintenance trial. Mr. Davis was also present during the interview and contributed to the responses throughout. Mrs. Davis reported that the intervention was effective for Amy. She stated that "any new form of learning different ways to communicate is effective," and especially for Amy because she learned new signs in only a few months. Prompting Amy to use sign language was really helpful, as "Amy seems to

pick up on the signs faster and is motivated to use them." This intervention also allowed Amy to "branch into learning new signs." Amy learned the signs for chips and cup through the intervention and she uses these signs outside of the intervention sessions. She is also now using the sign for please. Teachers and therapists reported that she is using the signs at school. However, Amy has missed a lot of school and therapy due to the Holiday Break, inclement weather, and sickness. Behaviorally, Mr. and Mrs. Davis reported that Amy is now more patient and willing to use a sign to communicate. For example, in the past Amy would take her parents' hands and lead them somewhere to communicate (e.g., the pantry to request food). Now, for the most part, she will lead them to the area and use a sign to communicate, or patiently allow her parents to prompt her to communicate without getting upset.

Mrs. Davis stated that it was easy to learn how to complete the intervention and easy to implement with Amy. Mrs. Davis said the only part that was hard was when she was originally using six objects and Amy was getting very frustrated. When the researcher and Mrs. Davis adapted the intervention to include two objects, Amy's frustration subsided. Mrs. Davis explained, "For Amy using sign language is effective and has always been easier for her to do when compared to the other interventions we have done in the past [picture exchange]. Using the signs for food was the most helpful because it is her biggest motivator."

Mr. Davis agreed with Mrs. Davis that the location of the intervention, being at home, was very effective. Being at home, when Amy got upset during the intervention, it was easy to calm her down. Mrs. Davis also found it convenient to complete the intervention at home and enjoyed being actively involved as the interventionist. She

found that sitting at the table was best because it allowed Amy to be "locked in and focused." The Davis family has set up the expectation that sitting at the table means it is time for Amy to eat or learn and Amy understands this and strives on this structure. Mr. Davis explained that when Amy is not seated, she is "always looking for a way to stall, sneak away, and get into something else." Thus, it is hard to interact with Amy and encourage her to learn if she is not seated at the table.

Mrs. Davis stated that Amy has learned the sign language mands for chip and cup; thus, she doesn't need to prompt Amy a lot to use the signs, she will do so independently. She also stated, "I am able to complete all parts of the intervention all the time, including allowing Amy to make choices, prompting her to communicate, and modeling and encouraging Amy to do the signs." Mr. Davis is also using the prompts and Mrs. Davis showed Amy's grandma how to prompt Amy to communicate using sign language. Specifically, Amy always has cookies at Grandma's as a treat and Mrs. Davis showed Grandma how to prompt Amy to use the sign language mand for cookie. Mrs. Davis also prompts Amy to use the sign for swing when they play outside. Mr. and Mrs. Davis reported that they will continue to use these prompts at home in the future and continue to encourage Amy to use sign language. During the follow-up sessions, Mrs. Davis asked the researcher to visit Amy's school to understand how school personnel and therapists were prompting Amy to communicate. She also asked the researcher to share a video of the intervention to show to Amy's teachers and speech therapist. Mr. and Mrs. Davis are planning to meet with Amy's teachers and therapists to share this video and request a similar intervention at school.

Mrs. Davis now feels more equipped to help Amy learn, stating that she now knows the best ways to teach her. In the past, Mrs. Davis stated that she wasn't sure how to prompt Amy to use a sign or communicate because no one had taught her to do this. She now feels confident to teach Amy new signs and communicate because she has learned a step-by-step process. Mrs. Davis stated, "Sometimes I am all over the place and I am not consistent with what I am doing to help Amy communicate, which confuses her. Thus, this consistent routine helped her a lot because she is very structured and routine." Mrs. Davis felt that the consistent steps and process helped Amy and allowed her to learn better.

When asked, "What would you want other parents, teachers, or speech therapists to know about this intervention?" Mrs. Davis stated that she highly recommended the intervention to others and, "It is best to try everything to help your child until you find what works best for your child." Mrs. Davis suggested that other families who have children with autism find a structured place in their home to teach their child. She stated that a structured place, "sitting at a consistent place for learning" is the best. Mr. Davis warned that other family members and professionals may need to be patient, "sometimes it doesn't work overnight and your child may need a little more time to learn."

Mark. Mrs. Richards was interviewed on January 12, 2018, approximately a month and a half after the last maintenance trial. Mrs. Richards reported that the intervention was overall effective for Mark and the family in several ways. She stated that Mark is now speaking more, utilizing slower speech patterns, and is more purposeful in his language attempts. Mrs. Richards reported that Mark is now consistently using the "give me" phrase to request many items around their home. She reported that Mark's

speech therapist, au-pair, and Mr. Richards also reported communication gains. Specially, his speech therapist reported that she could understand more of Mark's communication, that his speech was slower, and more purposeful. Behaviorally, Mrs. Richards reported that Mark is following instructions more and seems more aware of what his parents are saying. She also stated that previously Mark was very impatient when he was trying to communicate. For example, when he tried to communicate a request for an object, he would get extremely frustrated if his request was not honored immediately. Mrs. Richards reported that she understood this before the intervention and now knows how to help him communicate appropriately before his frustration turns into a tantrum. Further, he is much more willing to wait and respond to her prompts for appropriate communication.

Mrs. Richards reported that in the beginning of the study, the intervention protocol was easy to understand, but hard to implement with Mark. However, she stated, "After I wrapped my head around it, it was easy." For Mrs. Richards, it was extremely helpful to complete the study at home and to have Mark sit at the table in his high chair. He was used to sitting in his high chair and it allowed him to focus and participate in the intervention and "stay in one place." She explained that when she tried to complete the intervention at a child-sized table, which he was not used to siting at, he continually walked away, was very distracted, and was upset. Mrs. Richards stated, "I think that by having him seated in his high chair helped him focus and allowed him to focus on me, as opposed to running away and being distracted. Also, using the sequences of the protocol was helpful because I incorporated the protocol steps into our daily routine, but not as meticulously or as organized as we did in the session. The intervention has given me

more insight about how to communicate with Mark, and encourage him to express himself."

Mrs. Richards reported that she and other members of the household (father, sisters, and au-pair) were able to implement parts of the intervention outside of the sessions. For example, Mrs. Richards said that if Mark wanted a coke, the family would use the verbal prompts, "What do you want?" or might ask Mark to fill in the sentence, "Give me…" Mrs. Richards also reported that she encouraged him to use sign language if he wasn't vocalizing. Mark is more patient and responsive to the prompts. Mrs. Richards said that she still continues to use the verbal prompts and will continue to use them because she feels it is extremely helpful for Mark. Mrs. Richards also stated that the intervention was too short and narrowly focused, stating, "It would have been nice if it delved into other activities in the home."

Mrs. Richards saw growth in her abilities to respond to Mark's communication. She reported that the intervention taught her to be more patient with Mark's communicative attempts. She now "slows down" and prompts Mark to communicate in a more step-by-step manner, which Mark strives on. Mrs. Richards reported that she is now waits for Mark to respond or communicate appropriately, and she prompts Mark less; thus, encouraging more independent speech. Mark did not use sign language throughout the study; however, there were times when Mark did not respond verbally and Mrs. Richards had to prompt him to do the sign language mand. She reported that this stood out to her as an important step because she was prompting Mark to participate and use an appropriate form of communication to get what he wants, even if he was not talking. In the past, she did not use sign language to prompt Mark; thus, she felt that she would often

"not give in" to his inappropriate requests (e.g. reaching or grabbing for items instead of using words to communicate) and this would lead to frustration and a possible "temper tantrum." Other times, she felt that she "gave in when he didn't truly deserve it;" e.g. he did not use an inappropriate response and she gave him what he wanted regardless.

Mrs. Richards enjoyed being the interventionist in the study because it allowed her to follow a systematic protocol, practice the prompts, and then utilize them during the family's typical routine. She explained that she now understands how important it is to be systematic in prompting Mark to communicate, where before she was "winging it," and her responses were not consistent and frustrating for Mark and herself. Mrs. Richards stated that she didn't know how to help Mark communicate before the intervention and now she has a "plan" when Mark doesn't communicate or respond to her.

Chapter V

Discussion

This study is consistent with the literature examined on the effectiveness of DTI mand training to increase communication (Carbone et al., 2010; Jennett et al., 2008; Kodak & Clements, 2009; Nigro-Bruzzi & Sturmey, 2010; Reichle et al., 2008; Tincani, 2004). Even though the data does not show a strong functional relation for either of the participants, both participants did increase their ability to use functional communication (sign language and verbal communication) as supported by the trend level analysis and level changes. Further, the inverse relationship seen between independent and prompted mands for both participants is consistent in the literature (Carbone et al., 2010; Gutierrez et al., 2007; Jennet et al., 2008; Kodak & Clements, 2009). The researcher is confident with the relationship seen between the intervention and increase in communication because high IOA scores (greater than 88%) were gained across both participants and all phases and there was little variability seen within the data. There was only one session where the initial IOA score fell below 80%. During baseline session eight for Mark, the second observed initially scored many of Mark's utterances, "I want [item] please," as independent mands; however, this was not the phrase targeted. The researcher (first observer) informed the second observer about the issue and asked her to re-code the data based on this knowledge. Utilizing the re-coded data, the IOA observers gained 100% agreement during session eight.

The variability of the data was calculated based on stability envelope calculations, and a high score indicated low variability and stable data. For the majority of the phases for each participant, 60% or more of the data points fell inside of the stability envelopes. When the variability calculation was below 60% in a phase (e.g., Amy's intervention-initial phase, the prompted mand calculations for Amy's intervention-2 objects phase, and the prompted mand calculations for Mark's intervention and maintenance phases), the data points were only slightly outside of the stability envelopes and still followed the trend of the data. Some of the variability in the data for Mark and Amy was due to their lack of motivation and decreased interest for some of the items. This is very similar to the behaviors Lucas (from the pilot study) demonstrated. Both Mark and Amy's parents reported that they had very limited interest in toys and food items. This behavior was also observed during the formal observations. Thus, while the items chosen for the intervention were motivating during the preference assessment, both participants lost interests in the items quickly, especially when demands were placed on them to communicate before they were provided access. This was obvious for Amy, and led to the different intervention phases completed. To help ensure that Mark did not loose interest in the items, Mrs. Richardson only provided approximately 5-7 opportunities to access the items. For the majority of the sessions, this kept the items novel and increased motivation. However, during session 21, Mark lost interest in many of the items and his motivation to respond decreased. These behaviors most likely lead to the lower percentage in independent mand responses seen during session 21.

From a practical perspective, the results are meaningful. Both participants increased their ability to communicate, and the intervention effects were seen across four

phases for Amy. With each intervention phase, an accelerating trend was seen for the independent sign language mands, and a decelerating trend was seen for the prompted sign language mand percentage. Further, during the maintenance phase, the trend for the independent and prompted mands changed in directionality (from accelerating to flat for the independent mands, and from decelerating to accelerating for the prompted mands). Amy's ability to communicate with sign language did change in directionality when the intervention was removed (during the maintenance phase); however, the level observed in the maintenance phase did not return to the original baseline level. This finding may suggest that she did not immediately lose the skills learned; yet, the trends in the data indicate that she is likely to need additional intervention to maintain skills. When analyzing the data for Mark's ability to produce independent verbal mands, a change in trend directionality is seen between the intervention and maintenance phase (from accelerating to stable and slightly decelerating). The observed behaviors, the ability to communicate, did not reverse to the original behavior level for either participant. This finding suggests that both participants did not loose the skills learned. This is consistent with the results seen in the pilot study and in previous communication literature (Koegel et al., 1998).

Treatment Fidelity and Parent Competency

The fidelity results presented extend the literature on the effectiveness of parent-implement language interventions (Kaiser & Roberts, 2011; Patterson et al., 2012; Roberts & Kaiser, 2011). When provided with a visual model, written instructions, role-play opportunities, and performance feedback (Nigro-Bruzzi & Sturmey, 2010), both

parents were able to implement the intervention with fidelity, with the exception of Mrs. Richardson during the baseline phase.

The low fidelity scores during Mark's baseline sessions may have occurred for a number of reasons. During the baseline parent training sessions, Mrs. Richardson did implement the procedures with fidelity; however, she rushed through the role-play trails, often fumbled when presenting the prompts, and did not seem comfortable with the intervention procedures. Further, she did not have all the targeted items available; thus, she practiced with "filler items" (e.g., pencil instead of chocolate). During the baseline sessions, Mrs. Richardson was often not prepared for the session, e.g., she did not have all of the targeted items prepared and available. To help Mrs. Richardson ensure that she had all of the targeted items prepared, the researcher provided her with a box to store all of the items in a consistent location. This system did not consistently work. Therefore, during session nine, the researcher began to bring the targeted items for each session to ensure their availability.

Mark exhibited challenging behaviors (screaming and attempting to elope) during the baseline sessions and because of the behaviors exhibited, there was a large time elapse between the baseline parent training sessions (August 7th and 14th) and the first baseline session that Mark completed (session four, September 6th). When items were not available and Mark exhibited behavioral challenges, Mrs. Richardson struggled to implement the procedures as described and received low fidelity scores. For example, during sessions four to six Mark exhibited behavioral challenges, and these were the only sessions that Mrs. Richardson gained unacceptable treatment fidelity scores (below 80%, $\overline{x}$ = 63.65). After each of these sessions, the researcher provided performance feedback,

and reviewed the written instructions with Mrs. Richardson. After session six, the researcher also introduced a new, simpler, procedural prompt sheet (see Appendix M) and reviewed this with Mrs. Richardson. During the remaining baseline sessions (8 to 12), Mrs. Richardson referred to the new procedural prompt sheet, and Mark exhibited very few behavioral challenges. During session eight, Mrs. Richardson gained an acceptable treatment fidelity score (83.33%) for the first time, and the fidelity scores for sessions eight to twelve did not fall below 81% ($\overline{x}$ = 88.63).

During Mark's baseline sessions, the following six items were targeted for the sessions because they were highly motivating and Mark displayed high interest for these items through the preference assessment: popsicle, chocolate, monkey (jack-in-the box monkey toy), egg (a plastic egg with a piece of candy inside), marshmallow, and skittle. However, during baseline session six, Mrs. Richardson asked to discontinue the use of the popsicle due to dietary reasons. Further, throughout the baseline sessions, Mark did not seem interested in the monkey toy and was not motivated to request it. For example, he did not reach for it to request and when Mrs. Richardson placed it in front of Mark, he required hand-over-hand assistance to play. With the deletion of these two items (popsicle and monkey), Mrs. Richardson asked that we find two more items to target. Thus, before session nine, the researcher completed a preference assessment with new items and chose two new targeted items: slinky and pipe-cleaner.

Since Mrs. Richardson had trouble implementing the baseline procedures, the researcher ensured that the parent training session for the intervention procedures was of higher quality. For example, the researcher suggested that they complete more role-play rehearsals before testing for fidelity. Mrs. Richardson's cousin also participated in the

role-play opportunities. Thus, the researcher had a chance to provide more performance feedback, and Mrs. Richardson had the opportunity to teach her cousin the procedural steps. This most likely was the reason for the high fidelity scores and improved PCR ratings in the intervention phase.

When Mrs. Richardson gained a low fidelity score, she was also likely to gain a low PCR score. For example, during sessions four to six, Mrs. Richardson gained $\overline{x}$ = 1.67 IDE scores and $\overline{x}$ = 2.67 BR scores, and during sessions eight through twelve the PCR scores were much higher (IDE $\overline{x}$ = 3.6, BR $\overline{x}$ = 3.6). This is also true for Mrs. Davis. Amy exhibited similar challenging behaviors during the initial intervention phase (sessions 6 to 9) when she was not responding to the intervention. While Mrs. Davis received acceptable treatment fidelity scores ($\overline{x}$ = 96.84) during the initial intervention phase, she received lower PCR scores (IDE $\overline{x}$ = 3.75, BR $\overline{x}$ = 3.25) when compared to the different baseline, intervention, and maintenance phases (other scores did not fall below 4.2).

Further, when Mrs. Richardson gained low PCR scores, the intervention data for Mark varied. For example, on session 19 Mark's ability to produce independent mands decreased when the trend of the data was accelerating. During session 19, Mrs. Richardson also gained lower PCR scores, receiving a 3 in IDE. She also was reluctant to provide prompts when Mark was not responding. Therefore, she caused minor unnecessary time delays during the session. Mrs. Richardson did not want to prompt Mark because she stated, "I know he can do this." The family was also 30-minutes late to this intervention session, flustered during the beginning of the session, and Mark had a low motivation to participate. He continually asked for items that were not available.

Mrs. Richardson did a great job responding to Mark's behavior (For example, she stated, "First, you can have these items, then coke."), achieving a 4 in the BR rating. During session 21, Mark's ability to produce independent mands also decreased, and Mrs. Richardson received a 3 in BR. Mark was very unmotivated to complete this intervention session; he displayed a lack of interest in many of the targeted items by ignoring prompts to communicate, and displaying a lack of enjoyment when he obtained access to the items. Mrs. Richardson was unsure about how to motivate Mark and keep him engaged; thus, the researcher often needed to give Mrs. Richardson advice on how to keep Mark engaged.

The relationships seen between parents' fidelity, PCR scores, and the children's performance related to the intervention seem transactional in nature, meaning that the parents' and children's behaviors affect each other in a reciprocal manner. This transactional relationship is seen in previous literature related to parent stress and behavioral problems. Neece, Green, and Baker (2012) assessed parent stress and children's behavioral problems across six years and found that parents' stress levels correlated with children's behavioral problems. Stress and behavioral problems affected each other in reciprocal directions. For example, if a parent displayed high stress levels, the child was most likely exhibiting problem behaviors; and if the child was exhibiting problem behaviors, the parent was displaying high stress levels. Future research can explore this hypothesized transactional relationship between parents' fidelity, PCR scores, and child performance.

Sign Language Influence

The purpose of this study was to explore the effectiveness of the intervention on verbal communication. The addition of sign language and hand-over-hand prompting as a way to incorporate errorless teaching (Green, 2001) was imperative in this study for both participants. Amy did not use verbal language in the study; thus, the addition of sign language and hand-over-hand prompting provided her a way to learn and use sign language as an alternative to verbal communication. According to Amy's background information provided by her parents, SLP, and teacher, Amy takes a long time to learn new tasks. Teachers at Amy's school focused on imitating, and it took approximately a year for her to learn the five imitation skills. Referring to her expressive language instruction, for eight months, her teachers tried to get her to communicate using verbal prompting alone. For six months after this, her teachers utilized picture exchange. Amy did not respond to either method of intervention. Amy has a medical diagnosis of autism, a language impairment, and an intellectual disability that requires "very substantial support." Thus, her complex diagnosis may be one of the reasons she requires extensive practice and time to learn new skills. During the intervention, she learned to sign for "chip," and "cup," and has been using the sign for "please." Thus, in approximately four months, using the intervention described, Amy learned three signs (one of which was not specifically targeted for instruction). Her parents reported that she seems to respond best to sign language interventions, e.g., she learned to sign "more" before she was two years old. However, her therapists have not utilized a sign language intervention since. Thus, children with similar characteristics as Amy may learn communication best through an intervention that has a sign language component.

While Mark did not use sign language during the study, Mrs. Richardson did occasionally need to provide him with hand-over-hand prompting to encourage him to use a form of functional communication. Further, Mrs. Richardson discussed the importance of using the sign language prompts to help Mark communicate. Outside of the sessions, when Mark was not using verbal communication to communicate, Mrs. Richardson stated that he would allow her to use hand-over-hand prompting; thus, encouraging him to use functional communication, instead of communicating through a "tantrum." Mrs. Richardson stated, "Typically Mark does verbalize his wants, but on the occasions that he is getting frustrated or is being stubborn, I will use sign language to prompt him to communicate."

The Importance of a Structured Intervention in the Home

Both of the participants received Applied Behavior Analysis (ABA) and speech therapy in school and clinical settings. Further, Mark received ABA instruction at home. Neither parent was actively involved in the ABA or speech instruction, and they often felt that they were "winging it" when trying to teach their children communication. Their therapists had not provided them with training on how to complete interventions in the home. Thus, both parents stated that their involvement in the study and the location of the study, being at home, was vital. They expressed that because they were the interventionists, they now have the tools needed to complete this type of effective intervention with their children. Further, they both expressed that they used the prompting strategies outside of the study and they taught other family members to complete the prompting as well. Involving multiple family members and completing similar intervention strategies throughout the child's day ensures the child is receiving

consistent intervention and is engaging in active learning throughout their daily routines and activities (DEC, 2014).

The DEC-RPs (2014) and the NRC (2001) recommends the use of parent-implemented interventions occurring in the natural environment. Further, DEC-RPs (2014) state that early childhood professional should utilize coaching strategies with families to enhance development. This study demonstrates how to use a parent-implemented communication intervention in the natural environment; however, it builds on common DTI mand training approaches that are effective for young children with autism (Carbone et al., 2010; Drash, et al., 1999; Jennett et al., 2008; Kodack & Clements, 2009; Plavnick & Vitale, 2016; Thomas et al., 2010). This parent-implemented DTI communication intervention differs from common coaching methods and natural environment teaching seen in early childhood (DEC, 2014; Rush & Shelden, 2005) because it is a structured intervention that was taught to the parents by a researcher, and involves sitting a table as opposed to floor time.

In this study, both parents reported that the structured DTI intervention was imperative for their child's learning. They stated that they are not able to effectively teach their children when their children are allowed to freely move around the environment, or engage in play on the floor. Parents reported that sitting at a table was helpful because it provided structure that their children needed. Further, the parents stated that their children lacked interest in many toys and often needed prompting to engage in play. The children also tried to elope or engage in self-injurious behaviors when parents prompted them to communicate in an unstructured setting. Both parents reported that the structured intervention, the step-by-step directions, was very important to increase communication

skills and keep their children engaged in a learning experience. The DTI intervention provided a framework for the parents on how to prompt communication in a structured way, instead of the "winging it" approach that they both mentioned. Mrs. Richardson stated when she was trying to prompt communication, she expecting a response from Mark that she was not receiving. She said this was frustrating for both her and Mark. Now that she has a "protocol" to follow, she knows that if Mark doesn't respond to one prompt, she can use the next prompts on the list to elicit communication. Both parents also reported that they would continue to use the intervention procedures in the future and their natural environment. They felt confident to be able to adapt this structured prompting sequence into their daily routine.

Limitations and Implications

Research design. From a practical perspective, this study was meaningful in that the child participants increased their functional and verbal communication, and the parents were able to reliably implement the intervention. According to the WWC standards for rating single-case designs (WWC, 2011), this study would not meet standards for a multiple baseline across participants design. There were only two participants in the study; thus, the intervention effects were not replicated across six phases. However, when completing visual analysis on Amy's data, the intervention effects were seen across four replications (Gast, 2010) of the intervention (intervention-initial, intervention-2 objects, and intervention-more chips) and maintenance phases before Amy met with final criterion, using sign language mands on 80 percent or more of the opportunities across five sessions. The intervention procedures and criterion changes were implemented after a stable response rate was reached in the preceding phase (Gast,

2010). The small sample size is a limitation; thus, the results will not generalize to differing children.

In order to ensure that the parents involved did not implement the intervention procedures prior to the intervention phase, the researcher trained the parents immediately prior to each phase. Being the second participant, Mrs. Richardson and Mark began the intervention phase after a prolonged baseline, and Mrs. Richardson was annoyed with the delay. During the baseline, Mark was using one-word utterances to request. Mrs. Richardson immediately wanted to prompt him to use a longer phrase to communicate. Future research may want to consider the use of a different baseline procedure method, e.g., a more "business as usual" approach to determine how the parent is currently prompting communication and how effective this method is. Mrs. Richardson also stated that she wished the intervention utilized multiple activities. Thus, the use of a multiple baseline across activities or behaviors might be a better design to use for a parent-implemented communication intervention. These designs would allow the parent participants to begin prompting quicker (e.g., not implementing a long baseline phase for the second or third participant), and allow for the intervention to carry across multiple activities to help ensure generalizability across the child's day.

Considerations for parent training. Both parents were able to conduct the intervention with fidelity. Mrs. Richardson and Mrs. Davis both had trouble completing the intervention and responding to their child's behavioral cues when their child was engaging in challenging behaviors. These challenges often led to the inability to complete the intervention procedures. Thus, targeted parent coaching on how to handle challenging behaviors may need to occur before communication training can begin. Future research

may also want to explore the possibility of allowing multiple caregivers to participate in the parent training sessions. When Mrs. Richardson's cousin completed the training with her, Mrs. Richardson felt more comfortable and gained higher fidelity scores. Training more family members may also help ensure that all family members are consistently implementing intervention procedures in the child's daily routine. Further, it may help the child maintain and generalize the learned skills across people and other natural settings.

Fixed intervention length. The researcher planned to allow for a fixed intervention phase length of four weeks. However, Amy did not reach the established criterion (80% or more accurate responses across three sessions) until week seven. Thus, she received 8 weeks of intervention. Intervention was concluded for Mark after four weeks; however, it finished before stable data was seen. For example, during sessions 19 and 21, Mary's ability to use verbal communication changed in directionality; e.g., the independent mand percentage decreased and the prompted mand percentage increased. Recommendations for single subject studies suggest that data should be stable, following the directionality of the trend, across at least 3 data points before moving to the next phase (Gast, 2010; Kratochwill et al., 2010; WWC, 2011).

Generalization. Maintenance was assessed when the intervention was removed. However, formal generalization data were not collected. Both parents reported that their child was using the targeted communication skills outside of the intervention sessions. Mrs. Davis also reported that therapists and teachers were reporting similar communication gains and Amy was using the sign for 'please' in the home and school environments. The first time Mark used the "give me" phrase outside of the intervention

sessions, Mrs. Richardson has extremely excited. She texted the researcher that night stating, “Mark has been correctly saying “give me” phrases for the past hour, unprompted!”

Participant characteristic considerations. The children in this study exhibited similar characteristics. They both required significant support to engage in play experiences. Both children also lacked interest in most toys and when allowed to freely move around their environment, would engage in a high rate of self-stimulatory behaviors. Both parents reported that they required constant attention and supervision, and rarely engaged in independent functional play. Both children strived during the structured intervention that was completed in a DTI format at the kitchen table. Parents and therapists reported that it was very difficult to engage the children in learning when implementing a more natural environment teaching (NET) approach. This was also seen during the ADOS assessment and formal observations. Thus, a DTI approach may be more effective than NET for children that exhibit similar characteristics as Mark and Amy.

Jennett and colleagues (2008) compares DTI and a NET approach. Most participants increased their ability to spontaneously request faster in DTI; however, these participants were motivated to request for a variety of toys and activities that are common among young children (e.g., markers and paper, play-doh and play-doh fun factory toy). Mark and Amy are not motivated by these materials and do not functionally or independently play with most of the materials on the list that Jennett and colleagues (2008) supplied. Thus, future research should expand the Jennett, et al. (2008) study by exploring the effectiveness of NET and DTI for children with autism that have difficulty

engaging in independent, functional play with toys, and engage in a high rate of self-stimulatory behaviors when engaging in free play opportunities.

Mark lived in a trilingual household and was exposed to different languages when his extended family visited. Parents reported that they only spoke English to their children. The family's multilingual skills were not discussed as an influence to Mark's ability to learn communication through this study. This is consistent with the published literature, in that there is a lack of attention to multilingual families that have a young child with autism. Valicenti-McDermott and colleagues (2012) compared language skills for monolingual English and bilingual English-Spanish toddlers with autism spectrum disorder. The researchers compared language scores reported on the Rossetti Infant-Toddler Language Scale and found that children from a multilingual household did not display lower language development abilities. In fact, children that were bilingual were using more gestures and verbal communication. Future research should continue to include children from multilingual households and explore this influence on language development.

Amy also strived during the intervention because of the addition of the sign language prompts. Her complicated diagnosis of autism, language impairment, and ID, coupled with the high rate of self-stimulator behaviors exhibited might have contributed to her success with sign language, and her lack of verbal communication skills. Future research can be very mindful when choosing participants to participate in a verbal mand training intervention. Participants can be selected based on their medical diagnosis (autism with ID and autism without ID), and their behaviors related to the autism spectrum.

Informing practice and policy. This research attempts to unify the fields of speech and language, autism, and early childhood utilizing a DTI communication intervention that has evidence of effectiveness (Carbone et al., 2010; Gutierrez et al., 2007; Jennet et al., 2008). The DTI communication intervention in the study used evidence-based practices in the field of speech and language, and autism while using the home environment and parents as the interventionists aligning with the interdisciplinary collaboration recommendations outlined in the DEC-RP (2014). The parent training and intervention protocol used in this study can provide a model for various professionals working with young children with autism and their families. When the professionals from different disciplines utilize the protocols, they can facilitate consistent intervention use. The use of evidence-based interventions is also a recommendation stated in the Elementary and Secondary Education Act (Hale, Dunn, Filby, Rice, & Houten, 2017). Evidence is provided on the effectiveness of DTI communication interventions on communication skills for young children with autism (Carbone et al., 2010; Gutierrez et al., 2007; Jennet et al., 2008). This research begins to establish the evidence for parent training and parent implementation when using a DTI communication intervention.

Conclusion

Common early childhood best practices recommend the use of natural environment teaching and coaching for parent support (DEC-RP, 2014; Rush & Shelden, 2005). However, verbal behavior therapy and mand training for children with autism is effective in a DTI format with highly trained researchers (Carbone et al., 2010; Gutierrez et al., 2007; Jennet et al., 2008). This study is unique in that it utilizes a DTI mand intervention and follows many of the early childhood best practice recommendations. The

study provided evidence that parents can learn and effectively implement a DTI mand intervention with their child, in their home, with high fidelity. Both parents expressed that because they were the interventionists, they now have the tools needed to help their child communicate and this reduces frustration in their home.

Both parents reported that the intervention location (the home and table) and the structured approach were essential for their child's learning and communication success. It is important to note that both of the children displayed low levels of interest in toys, limited functional play skills, and high avoidance behaviors when prompted to communicate to request an item (self injurious behaviors, eloping, and falling to the ground). Thus, a more structured DTI approach may be needed when working with some children with autism with similar characteristics.

The parents implemented the intervention in their home twice per week for four to eight weeks. Many other studies exploring DTI mand interventions use a more intense intervention level, e.g. the intervention is implemented more than once per day and/or more than three days a week (Carbone et al., 2010; Gutierrez et al., 2007; Jennet et al., 2008). Thus, this study supports the literature that some children with autism can learn in a more natural setting and intervention does not have to occur at a high level (Drash et al., 1999; Kodak & Clements, 2009; Reichle et al., 2008).

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Appendix A

Anticipated Timeline for Participant 1

This will be edited for each participant and specific dates were be added.

Week 1: Consent Gathered

Week 2: Gather Background Information and Begin Parent Education

Week 3: Parent Education Continues

Week 4 to 5: Parent Education Continues, Formal Observations, Formal Assessments, and Preference Assessment Completed (to find what items would work best for the intervention) and Baseline Data Gathered (intervention without the error correction methods)

Week 5 to 6: Baseline Data Continues

Week 7 to 10: Intervention Phase- Researcher will collect data twice a week

Week 11 to 19: Intervention Phase- Parent will implement the intervention twice a week and the researcher will collect data once a week

Week 20 to 21: Maintenance Data Gathered

Week 22: Social Validity Assessment Information Gathered: A Final Interview and De Briefing

Week 23 to 24: Follow Up

Appendix B

Oral History Interview Questions

The researcher will interview the child's parents/family members and teachers to gain relevant background information and information regarding previous intervention participation. The interview will be semi-structured and the following questions will guide the interview.

Background Information:

1. Can you tell me a little bit about [child]? Age, likes/dislikes, imitation skills, preferred communication?
2. What type of communication does [child] use? How is [child] using this communication at [home, school, therapy]?
3. Can you please give me an example of [child's] language use: i.e. how many words are they using, what specific words?

Prior Intervention Information

1. Can you please describe any parent training that you have received/participated in?
2. What is the best method you use to encourage [child's] communication when he/she is at [home, school, therapy]? Can you give me an example?
3. How did you learn about this method?
4. Is it easy or hard to get your [child] to speak using this method? Please describe.

5. Are you able to encourage your [child's] communication during various times throughout the day?
6. Are you able to encourage your [child's] communication in various environments?

Appendix C

Formal Observation Data Sheet

Child's Participant Number: _____

Date and Duration	List of Toys Playing With	Independent Verbal Mand Count	Prompted Verbal Mand Count	Independent Sign Language Mand	Prompted Sign Language Mand	Notes: What words were said?

Appendix D

Intervention Protocol

Procedures adapted from Nigro-Bruzzi & Sturmey, 2010, Tinacani, 2004, and Jennett et al., 2008.

The data collection prompts will be used for IOA training only.

Baseline Procedures:

1. When child and parent are seated at the table, the parent will place 1-3 preferred items (toys or small piece of food) on a table (referring to the "Trial and Item Tracking Data Sheet"). The parent may state, "Look," "What do you want?" or "What do you want to play with?"
2. When the child requests for the item in any manner (touching, reaching, pointing, speaking, or signing), allow brief access to the item (10-20 seconds). If the item is food or drink, the child is given a small amount of the item (a small sip of a drink or one bite-sized pieces of an edible) and is allowed to access the item until finished.
    a. The data collector will then record the response. If it is a verbal mand it is coded as an independent mand.
3. While the child is playing with the toy or consuming the edible item, the parent will remove the other preferred items.
4. After the child plays with the requested item or consumes the edible item, the parent will gentle remove the item from the child (if the item is a toy or cup containing drink). The parent may state, "My turn" or "[Mom or Dad's] turn."
5. Parent will then wait for 3-5 seconds for the child to request.
6. When the child requests:
    a. If the child says the name of the preferred item within 3 seconds, the parent allows access to the item for a brief amount of time (20s or if the item is food- provide a small amount).
        i. The data collector will record the response as an independent mand.
    b. If the child points/reaches for the object or uses a sign language mand, the parent will say, "What do you want?" and will wait 3 to 5 seconds for a request. The parent will provide access to item after any request.
        i. The data collector will record the response. If it is a verbal mand it is coded as a prompted mand.

Intervention Procedures

1. When child and parent are seated at the table, the parent will place 1-3 preferred

items (toys or small piece of food) on a table (referring to the "Trial and Item Tracking Data Sheet"). The parent may state, "Look," "What do you want?" or "What do you want to play with?"

2. When the child requests for the item in any manner (touching, reaching, pointing, speaking, or signing), allow brief access to the item.
3. While the child is playing with the toy or consuming the edible item, the parent will remove the other preferred items.
4. After the child plays with the requested item or consumes the edible item, the parent will gentle remove the item from the child (if the item is a toy or cup containing drink). The parent may state, "My turn" or "[Mom or Dad's] turn."
5. The item will stay in view, but out of reach. The parent will wait for the child to request.
6. If the child says the name of the preferred item within 3 seconds, the parent allows access to the item for a brief amount of time (20s or if the item is food- provide a small amount).
    ii. The data collector will record the response as an independent mand.
7. If the child does NOT say the name of the preferred item within 3 seconds, the parent will begin the **Error Correction Procedures**:
    1) If the child does not verbally mand within 3 seconds, the parent will state, ''What do you want?'' and hold up the name of the preferred item (first verbal prompt).
    2) If the child does not verbally mand within 3 seconds of prompt #1 in Error Correction (EC), the parent will say the name of the item, e.g. "cookie" (second verbal prompt-model).
    3) If the child does not verbally mand within 3 seconds of prompt #2 in EC, the parent will sign the name of the item and say the name of the item (sign language prompt).
    4) If the child does not verbally mand or use sign language to request within 3 seconds of prompt #3 in EC, the parent will say the name of the item and physically prompt the child with hand-over-hand prompting to sign the name of the item (physical prompt). The parent will then allow access to the item for a brief amount of time (20s or if the item is food- provide a small amount).
        i. The data collector will then record the response as a no mand.

    A. If, at any point during the error correction procedures, the child signs the item's name without the verbal mand, the parent will say the name of the item and wait for 3 seconds before allowing the child access to the item.
        i. The data collector will then record the response as a sign language mand. If the child says and signs the name of the item it will be double coded as a sign language and prompted mand.

    B. If the child provides a verbal mand at any step during Error Correction, the parent will allow access to the item for a brief amount of time (20s or if the item is food- provide a small amount).
        i. The data collector will then record the response as a prompted mand.

8. After the child is provided access to the preferred item, the parent will repeat steps 3-7 and the Error Correction Procedures (as necessary) until the trial ends.

Concluding Intervention Trials. During each intervention trial, one preferred item will be used for instruction. During the intervention trials, the parent will track how many times the child has had access to the preferred item (tracking data on the "Trial and Item Tracking Data Sheet"). The trial will continue until one of the two conditions is observed:
Condition One: The child achieves access to the preferred item 10 times.
Condition Two: The child is pushing away the targeted item, refusing to consume the edible, or pointing/reaching for a different item.

9. After the trial ends, the parent will begin a new trial with another preferred item. They will begin at Step #1.
10. The trials will continue until the child requests all of the preferred items or 80% of the times are used and the child continually pushes away the remaining items. The child will be given a short break if less than 80% of the items are used.
11. After all of the trials are complete, the intervention will stop for the day and this will count as one session.

*The parent will implement two sessions, twice a week. The researcher will be present for each session.

Appendix E

Procedural Fidelity Checklist- Baseline (adapted from Tinacani, 2004)

Child/Parent:_____ Date: _____
Observer: _____ Session #: _____ Trial #:_____
Treatment Fidelity Trial: Y / N Treatment Fidelity Score: _____
Item: _____

Instructions: Circle Yes (Y) or No (N) to indicate if parent implemented the step as described.

Baseline: 1. Place 1-3 preferred items in front of the child (optional: "Look," "What do you want?" "What would you like to play with?")	Y / N
2. When the child requests an item (in any manner), allow brief access to the item (10-20 seconds). If the item is food or drink, give a small amount of the item (a small sip of a drink or one bite-sized piece of an edible). **DATA: Record the Request; Verbal Mand-Independent**	Y / N
3. Remove item from child (optional: "My turn," "[Mom or Dad's turn]")	Y / N
4. Wait 3-5 seconds for a request. **DATA: Record the Request; Verbal Mand-Independent**	Y / N
5. If the child says the name of the item, allow access to the item.	Y / N
6. If the child does NOT say the name of the preferred item, say, "What do you want?"	Y / N
7. Wait 3-5 seconds for a request. **DATA: Record the Request; Verbal Mand-Prompted**	Y / N

Appendix F

Procedural Fidelity Checklist- Intervention (adapted from Tinacani, 2004)

Child/Parent:_____ Date: _____
Observer: _____ Session #: _____ Trial #:_____
Treatment Fidelity Trial: Y / N Treatment Fidelity Score: _____
Item: _____

Instructions: Steps 1-4: Circle Yes (Y) or No (N) to indicate if parent implement the step as described. **For Steps 4-6 and Error Correction:** The 10 boxes for each step represent the 10 opportunities for the trial. During each opportunity, if the parent implements the step as described place Y, N, or leave blank to indicate not applicable.

1. Place 1-3 preferred items in front of the child (optional: "Look," "What do you want?" or "What would you like to play with?"	Y / N
2. When the child requests an item (in any manner), allow brief access to the item (10-20 seconds). If the item is food or drink, give a small amount of the item (a small sip of a drink or one bite-sized pieces of an edible).	Y / N
3. While the child is playing with the toy or consuming edible, remove other preferred items.	Y / N
Intervention Trial: 4. After 10-20s or child consumes edible, parent removes item from child (if necessary) (optional: "My turn" or "[Mom or Dad's] turn.")	#4
5. Waits for a verbal mand for 3-5 seconds	#5
6. If the child says the name of the preferred item, gives access to the item. (**DATA: Independent Mand)**	#6

Error Correction (EC):
1) If the child did not verbally mand within 3 seconds, say ‘‘What do you want?’’ and hold up the item. Wait 3s.
2)If the child does not verbally mand, say the name of the item. Wait 3s.
3)If the child does not verbally mand, model the correct sign and say the name of the item. Wait 3s.
4)If the child does not verbally mand or use sign language, physically prompt the child to sign the name of the item. Allow access to the item. (**DATA: No Mand)**
5)At any point, if the child signs the name of the item without a verbal mand, the parent will say the name of the item and wait for 3 seconds before allowing the child access to the item. (**DATA: Sign Language Mand)**
6)At any point, if the child provides a verbal mand, the parent will allow access to the item. (**DATA: Prompted Mand)**

*Repeat Steps 4-EC until the trial ends.

EC1										
EC2										
EC3										
EC4										
EC5										
EC6										

Appendix G

Item List with Corresponding Signs (Example)

"Egg"

Hyperlink to video: http://www.babysignlanguage.com/dictionary/e/egg/ (Baby Sign Language, 2018)

"Skittles"

Hyperlink to video: https://www.babysignlanguage.com/dictionary/c/candy/ (there is not a sign for skittle; thus, we will use the sign for candy; Baby Sign Language, 2018)

“Chocolate”

Hyperlink to video: https://www.babysignlanguage.com/dictionary/c/chocolate/ (Baby Sign Language, 2018)

Appendix H

Trial and Item Tracking Data Sheet (Example)

Baseline Session #_____

1. Egg
2. Candy
3. Cookie
4. Hockey
5. Game
6. iPad

Intervention Session #_____

1. Egg
2. Candy
3. Cookie
4. Hockey
5. Game
6. iPad

Appendix I

Baseline/Maintenance Data Sheet

Child: _____

*I: Independent, P: Prompted, SL: Sign Language; IOA: Interobserver Agreement; TF: Treatment Fidelity

Date/ Session #	Trial #	Duration	Item	I Mand Count	P Mand Count	SL Mand Count	No Mand Count	Reach /Point Count	% of Independent Mands	IOA or TF % Calc.	Notes

Appendix J

Intervention Data Sheet

Child: _____

*I: Independent, P: Prompted, SL: Sign Language; IOA: Interobserver Agreement; TF: Treatment Fidelity

Date/ Session #	Trial #	Duration	Item	I Mand Count	P Mand Count	SL Mand Count	No Mand Count	% of Independent Mands	IOA or TF % Calc.	Notes

Appendix K

Parent Competency Rating Scale

Directions: After each session during all the phases (baseline, intervention, and maintenance), the researcher will assess the parents' competency related to delivering the intervention. When scoring competence, scores of 1-2 should reflect low competence, whereas scores of 4-5 should reflect high competence.

Intervention Delivery Expertise
-*Assessing skillfulness*: the parent's ability to comfortably deliver the intervention as prescribed.

1 = Very poor The parent delivers the intervention in an *unacceptable manner*.

- The parent is not skillful and demonstrates *little expertise* in delivering the intervention.
- The parent does not provide the correct prompts in the correct order.
- The parent excessively asks the researcher for direction and help when delivering the intervention, causing long and unnecessary time delays.
- Most of the needed intervention materials are not available when needed.
- The parent does not remember the intervention procedures and does not refer to the directions; thus, he/she implements the intervention incorrectly.
- The parent is not recording how many times the items are used during the trial and how many items are used during the session.
- The parent causes several long breaks during the intervention when addressing a need in the home; e.g. the parent may want to 'chat' about irrelevant topics, takes a phone call, or assist another child in the home.

2 = Poor The parent delivers the intervention *poorly*.

- The parent demonstrates *marginal skillfulness* in delivering the intervention.
- The parent provides the correct prompts; however, he/she excessively "stumbles" when providing prompts, causing many excessive time delays.
- The parent excessively asks the researcher for direction and help when delivering the intervention.
- Many of the needed intervention materials are not available when needed.
- The parent does not remember the intervention procedures and often refers to the directions; this causes unnecessary time delays in between intervention steps.

- The parent makes several mistakes when recording how many times the items is used during the trial and how many items are used during the session.
- The parent causes one long break during the intervention when addressing a need in the home; e.g. the parent may want to 'chat' about irrelevant topics, takes a phone call, or assist another child in the home.

3 = Acceptable The parent delivers the intervention in an *acceptable* manner.

- The parent demonstrates *acceptable skillfulness* in delivering the intervention.
- The parent provides the correct prompts; however, he/she sometimes "stumbles" when providing prompts, causing minor time delays.
- The parent tries to deliver the intervention as described; however, he/she sometimes asks the researcher for direction and help when he/she cannot remember an intervention step.
- Some of the needed intervention materials are not available when needed.
- The parent remembers most of the intervention procedures, but sometimes refers to the directions; this causes unnecessary time delays in between intervention steps.
- The parent makes some mistakes when recording how many times the items are used during the trial and how many items are used during the session.
- The parent causes one long break or several short breaks during the intervention when addressing an irrelevant need in the home; e.g. the parent may want to 'chat' about irrelevant topics, takes a phone call, or assist another child in the home.

4 = Good The parent delivers the intervention well and demonstrates *good skillfulness* in delivering the intervention.

- The parent provides the correct prompts; however, he/she sometimes "stumbles" when providing prompts. When a "stumble" occurs, it does not negatively affect the intervention or cause an unnecessary time delay.
- The parent tries to deliver the intervention as described and rarely asks the researcher for direction and help when he/she cannot remember an intervention step.
- The parent has the necessary intervention materials; however, they may be poorly organized.
- The parent remembers most of the intervention procedures and rarely refers to the intervention procedures and directions.
- The parent makes mistakes when recording how many times the items are used during the trial and how many items are used during the session.
- The parent causes one short break during the intervention when addressing an irrelevant need in the home; e.g. the parent may want to 'chat' about irrelevant topics, has to take a phone call, or assist another child in the home.

5 = Very good The parent demonstrates *skill and expertise* in delivering an intervention.

- The parent demonstrates *very good skillfulness* in delivering the intervention.
- The parent rarely "stumbles" when providing prompts and when a "stumble" occurs, it does not negatively affect the intervention or cause an unnecessary time delay.
- The parent tries to deliver the intervention as described and does not ask the researcher for direction or help.
- The parent has the necessary intervention materials and the materials are accessible and organized.
- The parent remembers most of the intervention procedures and does not refer to the intervention procedures or directions.
- The parent may make one mistake when recording how many times the items are used during the trial and how many items are used during the session.
- The parent does not cause any break during the intervention sessions.

Behavior Responsiveness
-Assessing responsiveness: the parent's ability to read and respond to the child's behavioral cues

1 = Very poor The parent is not able to read the child's behavioral cues.

- The parent appears oblivious to the child's need for a 'break.' Thus, the child gets upset frequently and his/her behaviors greatly influence participation in the intervention.
- The child does not benefit from the intervention, is disengaged, and their behavior is likely to get worse in response to the parent's prompts for communication.
- The researcher consistently helps the parent respond to the child's behavioral cues and it greatly influences the intervention procedures.

2 = Poor The parent has difficulty reading the child's behavioral cues and responding appropriately.

- The parent notices the child's need for a 'break;' however, often "pushes" the child beyond his/her limits before providing a break. Thus, the child gets upset frequently and these behaviors influence participation in the intervention.
- The parent often appears unsure how to proceed to intervene with the child's interfering behaviors or handle poor engagement.
- The child may not benefit from the intervention, is sometimes disengaged, and sometimes does not respond to the parent's prompts for communication.
- It is often necessary for the researcher to help the parent respond to the child's behavioral cues.

3 = Acceptable The parent is able to read the child's behavioral cues; however, has difficulty responding appropriately.

- The parent notices the child's need for a 'break;' however, sometimes "pushes" the child beyond his/her limits before providing a break. Thus, the child sometimes gets upset and these behaviors may slightly influence participation in the intervention.
- The parent is occasionally distracted or inattentive to the child's behaviors when delivering the intervention.
- The child generally benefits from the intervention delivered by the parent; however, is sometimes disengaged.
- It is sometimes necessary for the researcher to help the parent respond to the child's behavioral cues.

4 = Good The parent is able to read the child's behavioral cues and is generally able to respond appropriately.

- The parent demonstrates that he/she is attentive by offering a 'break' if the child becomes disengaged or upset.
- When the child exhibits challenging behaviors, the parent is usually able to manage, but may occasionally appear unsure how to resolve a specific situation and continue to deliver the intervention as prescribed.
- The child benefits from the intervention delivered by the parent and is rarely disengaged.
- It is rarely necessary for the researcher to help the parent respond to the child's behavioral cues.

5 = Very good The parent is able to read the child's behavioral cues and respond appropriately.

- The parent is very attuned to the child and consistently maintains focus on the child's behavioral cues when delivering the intervention.
- All situations are dealt with well and the parent provides a 'break' before the child becomes upset.
- The child benefits from the intervention, makes progress, and if the child becomes disengaged, the parent is able to quickly respond.
- It is not necessary for the researcher to help the parent respond to the child's behavioral cues.

Appendix L

Social Validity Interview Protocol

*Numbers indicate questions, letters indicate possible probes.

1. After participation in this study, what do you now know about your child's communication needs? How is your understanding different from or in line with what you knew prior to this study?
    a. What did you learn about your child's ability to learn language?
    b. What did you learn about interventions that might be helpful for your child to learn language?
2. Was the intervention easy to implement?
    a. Was the intervention useful?
    b. Were you able to use this intervention (or parts of this intervention) outside of the intervention sessions, e.g. within various environments/parts of your day (meals, play-time)?
    c. What would you change about this intervention, or any parts of the study, that would make it easier for you?
3. Would you be able to implement this intervention (or parts of this intervention) without me being present?
    a. If so, how can you implement this intervention in the future? If not, what would help you implement the intervention in the future?
4. Was the intervention effective for your child?
    a. Can you provide me with a specific example?
5. Could you describe your child's communication outside of the intervention session?
    a. Is your child speaking more?
    b. Is your child responding to your communication more?
6. What would you want other parents/teachers/SLPs to know about this intervention?

Appendix M

Baseline Procedural Prompt Sheet for Mrs. Richardson

-Sit in high chair:

1. Hold up 2 items: Item 1 and Item 2
"What do you want?"

2. Request- allow brief access, 10-20 seconds.

3. Remove items from view.

4. After 10-20s- take item "My turn"

5. Wait 3-5 seconds for a request

6. If the child **says the "give me ……**," allow access to the item.

7. If the child **does NOT say "give me…."** say, "What do you want?"

8. Wait 3-5 seconds for a request.

9. Provides access to the item.

**Done for Item 1 or 2, start over at Step #1 with 2 new objects….

1. Remove item and put out of view
2. Hold up to new items.

Vita

Heather Megan (Fleming) Coleman

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EDUCATION

Ph.D. Candidate	Counseling and Special Education Virginia Commonwealth University, Richmond, VA **Dissertation Title:** Parent-Implemented Communication Intervention for Preschool-Aged Children with Autism	May 2018
Post-Baccalaureate Program	Virginia Leadership Education in Neurodevelopmental Disabilities Virginia Commonwealth University, Richmond, VA	May 2017
Post-Baccalaureate Certificate	Autism Spectrum Disorders Virginia Commonwealth University, Richmond, VA	May 2012
Master of Education	Special Education, Early Childhood Virginia Commonwealth University, Richmond, VA	August 2011
Bachelor of Arts	Psychology Christopher Newport University, Newport News, VA	December 2007

CERTIFICATIONS

Virginia Postgraduate Professional License Special Education-Early Childhood License #PGP-0646736

Certified *Autism Diagnostic Observation Schedule* (ADOS) Assessor (Research Certification expected 2018)

SCHOLARSHIPS AND AWARDS

Award recipient, the School of Education Outstanding Dissertation Award, VCU School of Education, May 2018.

Award recipient, the Graduate School Dissertation Assistantship for 2017-2018 School Year, VCU Graduate School

VCU School of Education Award Nominee, Association of Teacher Educators-Virginia Award for Excellence in Pre-Service Teacher Education, 2018 Teacher Candidate Research Award, February 2018.

Award nominee, American Educational Research Association Special Education Research Interest Group 2018 Outstanding Student Research Award, January 2018

Award nominee, Division of Research of the Council for Exceptional Children Student Research Award, September 2017

Award recipient, the Fred P. Orelove Scholarship in Disability Studies, VCU School of Education, February 2017

Award recipient, the Vicki Godsey White Scholarship in Special Education, VCU School of Education, February 2017

EMPLOYEMENT EXPERIENCE

Project Coordinator, Project 3IP
January 2018-present
Department of Special Education, Early Childhood, School of Education
Virginia Commonwealth University, Richmond, VA

- Project development, recruitment, and evaluation for the U.S. Department of Education, Office of Special Education Programs (OSEP) grant: Project 3IP: *Interdisciplinary and Intensive Intervention Preparation for Professionals Serving Young Children with Significant Disabilities*
- Instructor for graduate level courses related to Early Childhood Special Education/Early Intervention (ECSE/EI)
- OSEP data collection and implementation needed for Project 3IP

Graduate Lecturer Faculty
January 2018-present
Early Childhood Education Program, College of Education and Human Development
George Mason University, Fairfax, VA

- Adjunct Teaching for a Graduate Level Course related to Early Childhood Special Education (ECSE)

Graduate and Research Assistant **August 2014-August 2017**
Department of Special Education and Disability Policy, School of Education
Virginia Commonwealth University, Richmond, VA

- Assisted and conducted research in special education
- Served as a teaching assistant, co-instructor, and instructor for graduate level courses related to EI/ECSE and Special Education
- Assisted in program evaluation and improvement for the OSEP grant: Project KSR: *Preparing Knowledgeable, Skilled, and Responsive Early Intervention/Early Childhood Special Education Personnel for High-Need Communities*
- Assisted with OSEP data collection and implementation needed for Project KSR
- Assisted in grant writing (OSEP and IES) and development

Early Childhood Autism Special Educator
August 2013-June 2014
Hanover County Public Schools, Hanover, VA

Early Childhood Special Educator **August 2009-August 2013**
Hanover County Public Schools, Hanover, VA

- Served as a Mentorship Supervisor for Practicum Students from Mary Baldwin College and J. Sergeant Reynolds Community College

Early Intervention Educator Internship **June 2011-August 2011**
Richmond Behavioral Health Authority, Richmond, VA

Early Childhood Special Educator and Homebound Special Educator
August 2008-June 2009
Newport News Public Schools, Newport News, VA

RESEARCH INTERESTS

- Applied research in autism and early intervention
- Improving educational programming and communication, social, and behavioral instruction for early childhood, special education, and children with autism
- Family collaboration and empowerment
- Teacher preparation for teaching children with disabilities, children in poverty, and children with diverse cultural/linguistic backgrounds

PUBLISHED MANUSCRIPTS

Coleman, H., Goodwin, T., You, L., & Xu, Y. (accepted). *Examining the quality of a personnel preparation program in EI/ECSE through systematic syllabi review. Journal of Early Childhood Teacher Education.*

Xu, Y., De Arment, S., Coleman, H., Huennekens, M. E. (accepted). Teacher Scaffolding for Reciprocal Peer Tutoring to Promote English Learners' Language Skills. In P. Snyder & M. L. Hemmeter (Eds*.), Instructional Practices: Effective Strategies to Ensure Child Development and Learning* (DEC Recommended Practices Monograph Series No. 4). Washington, DC: Division for Early Childhood.

Chow, J. C., Ekholm, E., & Coleman, H. (accepted). Does early language ability underpin the development of behavior problems? A longitudinal meta-analysis. *School Psychology Quarterly.*

De Arment, S. T., Xu, Y., & Coleman, H. M. (2016). Optimizing accessibility through universal design for learning. In T. Catalino & L. Meyer (Eds.), *Environment: Promoting meaningful access, participation, and inclusion* (DEC Recommended Practices Monograph Series No. 2). Washington, DC: Division for Early Childhood.

Submitted Manuscripts Under Review:
Coleman, H. & Xu, Y. *Parent Implemented Mand Intervention for a Young Child with Autism.*
Coleman, H., Xu, Y., & De Arment, S. *Empowering Culturally Diverse Families.* Revisions submitted.

Manuscripts in Preparation:
Coleman, H., Xu, Y., Goodwin, T., & You, L. *Systematic Syllabi Review for an Early Intervention/Early Childhood Special Education Personnel Preparation Program.*

Coleman, H., Buck, D., & Carter, P. *Inclusion for students with autism and other low incidence disabilities.*

Non-Refereed Publications:
Coleman, H. & Dusing, S. (forthcoming). *Access to Early Intervention for Infants Born Preterm*. VCU Partnership for People with Disabilities: https://partnership.vcu.edu/

Fleming, H. & Hendricks, D. (December 2013). *Introduction to teaching young children with ASD to communicate using spoken language*. VCU Autism Center for Excellence Autism Q&A Fact sheet: https://vcuautismcenter.org/resources/factsheets/

Fleming, H. & Hendricks, D. (December 2013). *Introduction to alternative and augmentative communication (AAC) with children with ASD.* VCU Autism Center for Excellence Autism Q&A Fact sheet: https://vcuautismcenter.org/resources/factsheets/

PROFESSIONAL PRESENTATIONS
Coleman, H., Buck, D., & Carter, P. (March 2018). *Practical Strategies for Including ALL Children.* Conference Session for the Virginia Association for the Education Young Children. Fredericksburg, VA.

Coleman, H. (March 2018). *The Effects of a Parent Implemented Verbal Mand Intervention for a Young Child with Autism.* Poster Presentation for the Conference on Research Innovations in Early Intervention. San Diego, CA.

Coleman, H. (October 2017). *A Parent Implemented Communication Intervention for a Young Child with Autism.* Poster Presentation for the Division of Early Childhood's Annual International Conference on Young Children with Special Needs and their Families. Atlanta, GA.

Xu, Y., Coleman, H., De Arment. (October 2017). *Empowering Culturally Diverse Families to Identify Concerns, Priorities, and Resources for Intervention.* Marketplace Session for the Division of Early Childhood's Annual International Conference on Young Children with Special Needs and their Families. Portland, OR.

Coleman, H., Buck, D., & Carter, P. (July 2017). *Inclusion for students with autism and other low incidence disabilities.* Conference Session for the Creating Connections to Shining Stars. Roanoke, VA.

De Arment, S., Xu, Y., Coleman, H., & Ahmad, T. (July 2017). *Principles, planning, and partnerships, oh my! Expanding applications of UDL in preschool.* Conference Session for the Creating Connections to Shining Stars. Roanoke, VA.

Xu, Y., Coleman, H., De Arment, S., Onorato, P., & McWhorter, G. Z. (July 2017). *Collaborating with culturally diverse families in assessment and instruction.* Conference Session for the Creating Connections to Shining Stars. Roanoke, VA.

Coleman, H. (June 2017). *Ensuring consistency: Collaborative verbal communication instruction for young children.* Conference Session for the Evelyn Reed Symposium on Early Childhood

Research and Practice. Richmond, VA.
Coleman, H. (June 2017). *Increasing parent involvement: A communication intervention for a young child with autism.* Poster Presentation for the Evelyn Reed Symposium on Early Childhood Research and Practice. Richmond, VA.

Coleman, H. & Xu, Y. (April 2017). *Systematic syllabi review for an Early Intervention/Early Childhood Special Education personnel preparation program*. Paper Presentation for the Chinese American Educational Research and Development Association Annual Conference. San Antonio, TX.

Coleman, H. (January 2017). *Communication interventions aimed at increasing verbal mands for young children with autism: A review of the literature.* Poster Presentation for the Division on Autism and Developmental Disabilities, 18th International Conference on Autism, Intellectual Disability and Developmental Disabilities. Clearwater Beach, FL.

Kunemund, R. & Coleman, H. (October 2016). *The disconnect between preschool inclusion and disability incidence rates in Head Start.* Poster Presentation for the Division of Early Childhood's Annual International Conference on Young Children with Special Needs and their Families. Louisville, KY.

Swingle, M. & Coleman, H. (August 2016). *Fun and easy ways to assess challenging behaviors in the Early Childhood classroom.* Conference Session for A Tapestry for Learning Conference 2016: Access for Student Success. Richmond, VA.

Coleman, H. & Swingle, M. (June 2016). *Fun and easy ways to assess challenging behaviors in the Early Childhood classroom.* Conference Session for the Evelyn Reed Symposium on Early Childhood Research and Practice. Richmond, VA.

Coleman, H. & Kunemund, R. (April 2016). *Preschool inclusion and disability incidence rates in head start: Why the disconnect?* Poster Presentation for the 19th Annual Research Symposium and Exhibit. Virginia Commonwealth University, Richmond, VA.

Xu, Y., Coleman, H., Goodwin, T., & You, L. (April 2016). *Preparing culturally responsive early intervention and early childhood special education professionals.* Round Table Discussion for the American Educational Research Association Annual Meeting. Washington, D.C.

Coleman, H. (October 2015). *Interventions to Increase Verbal Mands for Children with Autism: A literature review.* Poster Presentation for the Division of Early Childhood's Annual International Conference on Young Children with Special Needs and their Families. Atlanta, GA.

Coleman, H. (June 2015). *Early Childhood Educators as Liaisons Between the Family and Specialists.* Poster Presentation for the Evelyn Reed Symposium on Early Childhood Research and Practice. Richmond, VA.

Coleman, H. (April 2015). *Verbal Mand Interventions for Pre-School Children with Autism: A review of the Literature*. Paper Presentation for the Chinese American Educational Research and Development Association Annual Conference. Chicago, IL.

Coleman, H. (January 2015). *Verbal Mand Interventions for Pre-School Children with Autism: A review of the Literature*. Round Table Discussion at the Virginia Commonwealth University School Of Education Annual Research Colloquium. Richmond, VA.

Coleman, H. (October 2014). *Building the bridge: Effective Collaboration Between Families, Educators, and Specialists.* Poster Presentation at the Division of Early Childhood's 30th Annual International Conference on Young Children with Special Needs and their Families. St. Louis, MO.

Fleming, H., Goetz, K., Hammer, J. (July 2013). *Let's Get Writing!* Conference session at the Creating Connections to Shining Stars: Virginia's Collaborative Early Childhood Birth through Five Conference. Virginia Beach, VA.

Fleming, H. & Whitmer, E. (July 2013). *Building the Bridge: Connecting with Families, Educators, and Specialists.* Conference session at the Creating Connections to Shining Stars: Virginia's Collaborative Early Childhood Birth through Five Conference. Virginia Beach, VA.

Fleming, H. & Gentry, J. (July 2012) *Technology Overload! Strategies for Adapting and Implementing Technology in the ECSE Classroom.* Conference session at the Creating Connections to Shining Stars: Virginia's Collaborative Early Childhood Birth through Five Conference. Virginia Beach, VA.

INVITED COMMUNITY/PROFESSIONAL DEVELOPMENT PRESENTATIONS

Coleman, H. (June 2018). *Transitioning from ECSE to Kindergarten.* Conference session at the Communities of Learning in Autism (CoLA) Summer Institute. Richmond, VA.

Coleman, H. (April 2018). *Facilitating a smooth parent/teacher conference when discussing tough issues.* Virginia Quality Early Childhood Professional Development Day. Midlothian, VA.

Coleman, H. (January and February 2018). *Early detection of developmental delays.* Child Care Provider Trainings with *Smart Beginnings Southwest.* Prince George and Lawrenceville, VA.

Coleman, H., & Stehle, E. (January 2018). *Language Development In Early Childhood.* Early Childhood Staff Training for Primrose School at Ironbridge Corner. Chesterfield, VA.

Coleman, H. (June 2017). *How to help children meet developmental milestones.* Early Childhood Staff Training for Primrose School at Ironbridge Corner. Chesterfield, VA.

Coleman, H. (March 2017). *Evidence based practice for students with Autism Spectrum Disorder- Toddler edition.* Training for the Henrico Early Intervention Autism Diagnostic Team with Commonwealth Autism. Richmond, VA.

Coleman, H. & Ahmad, T. (March 2014). *The Early Childhood Autism Special Education (ECASE) Parent Workshop Series: Behavioral Strategies.* Piloted and Presented Parent Workshop Series for ECASE Families. Hanover, VA.

Coleman, H. & Ahmad, T. (November 2013). *The Early Childhood Autism Special Education (ECASE) Parent Workshop Series: Communication and Visual Supports.* Piloted and Presented Parent Workshop Series for ECASE Families. Hanover, VA.

Fleming, H. & Leonard S. (November 2011). *Encouraging Interactive Play in Young Children with ASD.* Workshop presented to Hanover County Public School Early Childhood Special Educators. Hanover, VA.

Fleming, H. (January 2012). *Smart-Table Education and How to Implement in the Classroom.* Workshop presented to Hanover County Public School Early Childhood Special Educators. Hanover, VA.

ONLINE SEMINARS

Coleman, H. (August 2014). *How to: Providing reinforcement*. How-to video series with the VCU Autism Center for Excellence. https://vcuautismcenter.org/te/how_to/

Fleming, H. & Hendricks, D. (December 2013). *Introduction to alternative and augmentative communication (AAC) with children with ASD.* Online seminar with the VCU Autism Center for Excellence. https://vcuautismcenter.org/te/seminars/

Fleming, H. & Hendricks, D. (December 2013). Introduction to teaching young children with ASD to verbally communicate. Online seminar with the VCU Autism Center for Excellence. https://vcuautismcenter.org/te/seminars/

RESEARCH AND GRANT ACTIVITIES

Research Activities:

Dissertation IRB Approved, June 2017-present, "Parent Implemented Communication Intervention for Preschool Aged Children with Autism"

Dissertation IRB Approved Pilot, August 2016-December 2017, "Family Implemented Communication Intervention for Preschool Aged Children with Developmental Delays"

Completed Syllabi Review for the ECSE Program, October 2014-October 2016.

Qualitative Proposal, January 2016-May 2016, "Parent, SLP, and Teacher's Experiences with Communication Interventions for a Preschool Child with Autism"

Mixed Methods Proposal and IRB Development, August 2015-Decemeber 2015, "Is Sign Language Enough? A Mixed Methods Approach to Teaching Preschool Aged Children with Autism to Verbally Communicate"

Developed Single Subject Proposal and IRB Development, March 2015-July 2015, "Augmentative Communication in Preschool"

Group Design Project, January 2015-May 2015, "Education Abilities, Career Expectations, and Expectancy-Value Theory"

Single Subject Proposal, August 2014-December 2014, "Effectiveness of an Echoic-to-Mand (Request) Training Program on Increasing Vocal Requesting"

Grant Activities:

Awarded Dissertation Grant (February 2017). *Parent Implemented Communication Intervention for Young Children with Autism and other Developmental Disabilities.* Organization for Autism Research, Graduate Research Grant.

Assisted with OSERS-OSEP Grant Proposal (March 2017). *Project 3IP: Interdisciplinary and Intensive Intervention Preparation for Professionals Serving Young Children with Significant*

Disabilities. Virginia Commonwealth University. PI: Dr. Xu. Funded September 2017. PR Award #: H325K170076. Award Amounted: $98,754.00. 2017-2022
My role: Project Coordinator

Assisted with implementation, evaluation, and data collection for the OSEP Grant Funded *Project KSR: Preparing Knowledgeable, Skilled, and Responsive Early Intervention/Early Childhood Special Education Personnel for High-Need Communities*. Virginia Commonwealth University. PI: Dr. Xu.

Assisted with IES Research Grant Proposal (August 2016 and 2017). Topic 2: Early Learning Programs and Policies, Goal 2: Development and Innovation. *Developing a Teacher-facilitated Peer Tutoring (TPT) Instructional Strategy to Promote Young English Learners' Social and English Language Skills.* Virginia Commonwealth University. PI: Dr. Xu. Not Funded.

Assisted with OSERS-OSEP Grant Proposal (February 2017). *Preparation of Special Education, Early Intervention, and Related Services Leadership Personnel Grant.* Virginia Commonwealth University. PI: Dr. Xu. Not Funded.

IES Goal 1 Grant Practice Proposal (December 2015). *Exploring Language Development for Preschoolers with Autism.*

OSEP Grant Practice Proposal (May 2015). *Project Preparing Early Childhood Autism Specialists.*

COURSES TAUGHT

George Mason University

- Graduate Lecturer Faculty, Co-Instructor, ECED 506.DL1 (Online): Medical and Developmental Aspects of Disabilities of Diverse Young Children (Spring 2018)

Virginia Commonwealth University

- ECSE 700 Infant Externship: Early Childhood Special Education (Summer 2016-2017)
- Guest Lecturer in ECSE 604 (Face-to-Face): Early Literacy and Augmentative Communication (Summer 2016-2017) *Social Story Development and Boardmaker Online Introduction*
- Teaching Assistant, SEDP 711(Face-to-Face): Single Subject Research Methods (Fall 2016)
- Teaching Assistant and Guest Lecturer, ECSE 602 (Hybrid): Instructional Programming: Infants & Young Children with Disabilities (Fall 2014-2017), Guest Lecture: *Teaching Children with Autism*
- Co-Instructor, ECSE 604 (Hybrid): Early Literacy and Augmentative Communication (Summer 2015)
- Teaching Assistant and Guest Lecturer, SEDP 533 (Online): Assessment of Students with Exceptionalities
- (Summer 2015)
- Teaching Assistant, ECSE 601 (Hybrid): Assessment of Infants and Young Children with Disabilities (Spring 2015)

SUPERVISION AND MENTORSHIP

- University Supervisor, ECSE 700-I Infant Externship (Summer 2016-2017)

- Supervised Tiffany Ahmad, M.Ed. Student in implementing her Research in Action Plan: *How does play based adult led play intervention impact joint attention skills of preschool aged students with developmental disabilities?*
- University Supervisor, ECSE 700-P Preschool Externship (Fall 2016)
- Supervised Kelsie Burkhard, M.Ed. Student, in implementing her Research in Action Plan: *Video-Modeling with Feedback*
- University Supervisor, Shadow, ECSE 700-P Preschool Externship (Fall 2015)
- PhD Special Education Student Mentor (August 2015-present)
- Established mentor program for Association for Aspiring Leaders in Education (PhD Student Organization, May 2015-2017)
- Clinical Faculty Training, Trainee (Fall 2015) Virginia Commonwealth University

UNIVERSITY AND DEPARTMENT INVOLVEMENT

Associate Director at the Partnership for People with Disabilities — October 2017-present
Search Committee, Student Representative, VCU

Ruth Harris Professorship Search Committee — November 2016-March 2017
Student Representative, VCU

Association for Aspiring Leaders in Education, President, VCU — May 2015-June 2017

Association for Aspiring Leaders in Education, Member, VCU — August 2014-present

LaunchPAD@VCU, Member, VCU — August 2014-present

Charles P. Ruch Award for Excellence in Teaching Award — April 2016 and 2017
Committee Member, VCU

VCU Ph.D. Policy Board, Student Representative — September 2015-September 2016

COMMUNITY INVOLVEMENT

Parent Advisory Council and Guest Staff Trainer — September 2017-present
Primrose School at Ironbridge Corner

Autism Fellow (LEND), Commonwealth Autism, Richmond, VA — September 2016-May 2017

Family Mentorship Experience (LEND) — September 2016-May 2017

Policy/Service Internship with Dr. Stacey Dusing — June 2016- August 2016
VCU, Dept. of Physical Therapy and NICU Staff

Phi Mu Fraternity — February 2006-present

Special Olympics Volunteer, Basketball Coach — December 2010-present

Saturday Sitters, Hanover ARCH — Spring 2010-2014

President's Leadership Program, Christopher Newport University — August 2004-May 2006

PROFESSIONAL COMMITEES

Training Chair, Virginia Division for Early Childhood — 2016-present

Member, Council for Exceptional Children (CEC) — 2010-2013, 2014-present
Division for Research
Division on Autism and Developmental Disabilities
Division for Early Childhood
Teacher Education Division

Member, American Educational Research Association — 2014-present
Division K-Teaching and Teacher Education
Early Education and Child Development
Special Education Research

EDITORIAL ACTIVITIES

Young Exceptional Children, Doctoral Guest Reviewer	January 2018-present
Journal of Child and Family Studies, Guest Reviewer	November 2016-present
Journal of Early Intervention, Guest Reviewer	January 2016-present
Division of Early Childhood, Conference Proposal Reviewer	March 2017-present
American Educational Research Association, Conference Proposal Reviewer	April 2015