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Delivering the Parent-Implemented Communication Strategies (Pics) Intervention Using Distance Training and Coaching with a Father and His Child Who Is Hard of Hearing

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DELIVERING THE PARENT-IMPLEMENTED COMMUNICATION STRATEGIES (PICS) INTERVENTION USING DISTANCE TRAINING AND COACHING WITH A FATHER AND HIS CHILD WHO IS HARD OF HEARING

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Many children with disabilities (i.e., deaf/hard of hearing; DHH) experience language delays (Sarant, Holt, Dowell, Rickards, & Blamey, 2009). Parents of children who are DHH can mediate their children's language delays with responsive communication (Guralnick, 2011; Pressman, Pipp-Siegel, & Yoshinaga-Itano, 1999; Warren & Brady, 2007). This study is a partial replication of the Parent-Implemented Communication Strategies (PiCS) Project (Meadan, Angell, Stoner, & Daczewitz, 2014). The PiCS project was implemented with 11 parents and their children with various disabilities (e.g., Down syndrome, Autism Spectrum Disorder). These parents were trained and coached to use naturalistic teaching strategies (i.e., environmental arrangement, modeling, mand-model, and time delay) with fidelity and parents reported positively regarding social validity. In the current study, one parent and his child who is DHH participated. A single-case design across teaching strategies was used to evaluate the functional relation between the PiCS protocols and the parent's use of naturalistic teaching strategies.

Parents of children with low-incidence disabilities (i.e., DHH) may experience difficulty locating services within their region (Jackson, Traub, & Turnbull; Proctor, Niemeyer, & Compton, 2005). Offering services through distance technologies (i.e., videoconferencing, cloud-based file sharing). Earlier implementation of the PiCS project included coaching through videoconferencing (i.e., Skype™) and file sharing (Dropbox™) to transmit videos the parents took. The current study delivered training and coaching via Skype™ and used Camtasia™ to record video from the screen.

The dependent variables were the parent's quality and frequency of use of teaching strategies. The video data were coded using an event-recording system and displayed visually in a single-case multiple-baseline design across strategies for analysis. Intervention effect was evaluated through adjacent condition analysis and Tau-U non-overlapping data analysis (Parker, Vannest, Davis, & Sauber, 2011). The secondary outcome of child language and communication was evaluated using observational data, the MacArthur Bates Communication Developmental Inventories (CDI; Fenson, Dale, Reznick, Pethick, & Reilly, 1993), and the Cottage Acquisition Scales for Listening, Language, and Speech (Wilkes, 1999). Social validity was evaluated through pre- and postintervention surveys and interviews. The parent's interview responses were analyzed with qualitative analysis.

The outcomes of this study include the effectiveness of the PiCS intervention protocols and the feasibility of training and coaching using distance technologies. The results of analysis show that the parent learned to implement the teaching strategies with fidelity and that the goals, procedures, and outcomes of the PiCS intervention are acceptable. Recommendations for future research and for practitioners are discussed.

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M.E.D.

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THE PROBLEM STATEMENT AND BACKGROUND

Introduction

The introduction of this chapter begins with legal requirements in early intervention (EI) and extant data on outcomes for families, parents, children who are deaf/hard of hearing (DHH), and the EI system. Then, I provide information regarding key components of the current study, including (a) parent training and coaching, (b) collaborative relationships, and (c) distance training and coaching. I explain the significance of the present study, list the study questions, and define key terms used in the present study. Finally, I list assumptions and limitations of the present study.

Legal Requirements in Early Intervention (EI)

In 1975, Congress passed PL 94-142, the Education for All Handicapped Children Act (EAHCA). "The impetus for this change came from the lower courts, congressional subcommittees, and public interest groups" (Melnick, 1995, p. 45). These public interest groups were largely made up of parents of children with disabilities advocating for their children's educational rights. Legislation in 1975 stipulated that an organization receiving federal funding and providing educational services had to include children with disabilities (Jones, 1981). PL 94-142 paved the way for universal access to a free and appropriate education for children with disabilities. Public interest groups in the 1970s

and 1980s pushed for the same educational opportunities for children aged birth to 3 years old (Behr & Gallagher, 1981). "There appears to be near unanimity among professionals on the importance of early education for handicapped children" (p. 113). Distributed in 1986, House Report Number 99-860 contained similar statements. The report made the case for children aged birth to 3 to learn and benefit from educational services (Brown, 1992). In 1986, Congress reauthorized funding for PL 94-142. In doing so, they passed PL 99-457, establishing Part C, which extended special education services and protections to children birth to 3 with disabilities. Services delivered under Part C will be referred to as EI services.

Children aged birth to 3 qualify for EI services if they (a) are diagnosed with one or more of 13 disabilities listed in regulations for children aged 3 to 21, (b) have a developmental delay (DD) in cognitive, physical, communication, social or emotional, or adaptive development, or (c) have a "diagnosed physical or mental condition that has a high probability of resulting in DD" (Brown, 1992, p. 8.11). Hence, broader populations of children qualify for services under Part C than for children 3 to 21 years of age served under Part B. The child in the current study qualified under DHH. The following paragraphs outline the legal requirements for state and local education agencies (i.e., EI centers) regarding (a) early enrollment and child find, (b) family-centered services, (c) services in the natural environment, and (d) parent-implemented interventions.

Early Enrollment and Child Find

Children who are DHH should be enrolled as early as possible in EI services. Fortunately, identifying children who are DHH has become easier in most states.

Beginning in 1999, Illinois public health regulations required universal newborn hearing screening: "all hospitals performing deliveries shall conduct hearing screening of all newborn infants prior to discharge" (*Hearing Screening for Newborns Act*, 1999). Thus, infants who are DHH are identified early in life. In a study by Harrington, DesJardin, and Shea (2009), 8 children who were DHH and who received EI services were assessed at school age. The researchers observed a significant negative correlation between age at identification/enrollment and school readiness. Early identification and enrollment are imperative for children with all disabilities, including those who are DHH.

Family-Centered Services

Services for children aged birth to 3 are child-focused and based on the needs of the whole family. "Young children cannot be viewed apart from their families, nor can services be provided without a consideration of the family context" (Bailey, Raspa, & Fox, 2012, p. 218). Therefore, as part of a family-centered approach, EI service providers (a) consider the individual strengths and resources of families, (b) demonstrate cultural sensitivity, (c) collaborate with families, and (d) empower families in the decision-making process.

Part C of the Individuals with Disabilities Education Act (IDEA) has long required EI service providers to use a family-centered approach (Gallagher, 1992). Families, especially parents, are considered integral to children's development. "The family is encouraged to seek professional advice on complex issues beyond its own expertise. Indeed, families would not be performing their responsibilities if they did not do so" (p. 8). Regulations stipulate: "EI services are designed to meet the developmental

needs of each child eligible under this part and the needs of the family related to enhancing the child's development" (34 C.F.R. §303.12.a1). Services are required to be "selected in collaboration with parents" (34 C.F.R. §303.12.a2-3).

Services in the Child's Natural Environment

The regulations of Part C stipulate that interventions should take place in the child's natural environment. This means the same environment as the child's same-age peers—typically at home with family (Brown, 1992). The guiding belief is that very young children benefit from EI services most when services are delivered in children's natural environments. According to the Joint Committee of the American Speech-Language-Hearing Association (ASHA) and the Council on Education of the Deaf (CED), "Natural environments for infants and toddlers who are DHH are environments that include family members and caregivers, are developmentally appropriate, and provide direct communication with adults and peers through one or more fully accessible natural languages" ("Natural environments for infants and toddlers who are deaf or hard of hearing and their families," 2006). For services to be delivered outside of the child's natural environment, justification must be based on the unique needs of the child, family routines, and developmental outcomes.

Parent-Implemented Interventions

Parent training and coaching are necessary if parents are to deliver effective interventions to their young children with disabilities. Parent implementation of services is recommended and required for consideration when delivering EI services (IDEA, §632.4E; §303.12). Furthermore, Warren (2000) called for increases in parent training

and coaching, as parents can deliver interventions in the natural environment throughout their children's waking hours. Part C of the IDEA stipulates parent training as a related service in EI.

These legal requirements have been stipulated in the law, and are supported in the extant literature. Participation in EI has been shown to support children's early development (Bruder, 2010; Guralnick, 2011; Kaiser & Roberts, 2012) and promote school readiness (Bates, Mastrianni, & Mintzer, 2006; Harrington, 2010; Jeon et al., 2011). Children who are mildly to moderately hard of hearing (HH) can outpace hearing children in some aspects of communication development if they are enrolled within the first 3 months of life (Vohr et al., 2008). I will discuss these aspects in greater detail in the child outcomes section below.

Family-centered services can enhance the quality of life for families (Bruder, 2010; Dunst, Trivette, & Hamby, 2007), and can empower parents to make informed and appropriate choices for their families (Bruder, 2000, 2010; Byington & Whitby, 2011). Closely related to family-centered services, research supports parent-implemented service delivery in the natural environment. According to Dunst et al. (2001), intervention in the child's natural environment (e.g., in the home) benefits the child more than intervention in a less natural setting (e.g., clinic). This is because the parent and child have ongoing opportunities to repeat the activities of the intervention in the natural setting.

Research has highlighted the effectiveness of training parents to implement language interventions with their children (Roberts & Kaiser, 2011; Warren et al., 2008). According to Dunst (2007), a major principle of EI is that "parent-mediated learning is

effective to the extent that it strengthens parents' confidence and competence in providing their children with development-instigating and development-enhancing learning experiences and opportunities" (Chapter 8, Definition of Early Intervention, para. 4). Overall, the concept is that children will benefit from many more hours of evidence-based intervention if parents are trained in these interventions and can deliver them throughout their children's waking hours.

Outcomes

Outcomes in EI can provide insight into the quantity and quality of services provided. The outcomes I examine in the following sections include (a) family outcomes, (b) parent outcomes (i.e., training), (c) child outcomes, and (d) overall enrollment and expenditures. Family outcomes include types of services provided, attendance at scheduled EI services, and service delivery in the natural environment. The parent outcomes I will examine include whether the parents received training or coaching to help deliver interventions. Finally, the child outcomes I will examine include children's language and communication skills as a result of participating in EI.

Many of the outcomes were found in a longitudinal study by Hebbeler et al. (2007). The report, titled the National Early Intervention Longitudinal Study (NEILS), came from a longitudinal study that examined outcomes for children entering EI during 1997-1998. At the time, 170,000 children and families were receiving EI services under Part C, and the study included 3,338 of those participants. This is the most comprehensive set of data regarding Part C recipients. Being so broad, it was not delineated by disability category. Therefore, it is not possible to draw conclusions about

geographical locations, income levels, costs of services, and types of services for an individual disability category.

Family-Centered Outcomes

Types of services. Hebbeler et al. (2007) reported the types of services being provided to very young children, with all disabilities in aggregate, and their families. The five most commonly provided services included, from least to greatest, "physical therapy, developmental monitoring, occupational therapy, special instruction for the child, and service coordination" (p. 3-5). It was not reported which services were used most by eligibility category, but 74% of parents received help with "learning how to play with, talk with, or teach your child" (p. 3-5), while 5% did not receive this help but reported needing it.

Attendance. EI services that infants and young children receive can mitigate possible negative effects (e.g., language delays) of a disability as children develop (Harrison & McLeod, 2010; Vohr et al., 2008). According to Hebbeler et al. (2007), children were eligible for a median of 1.5 hours of services per week, with a mean of 2.8 hours per week. Interestingly, the amount of services received was less. About 23% of appointments were missed for various reasons; the most frequent reason (46%) was that the "family missed an appointment" at the EI center (p. 3-3). Therefore, EI centers must design service delivery plans that facilitate family attendance.

The location of service provision may impact family attendance. In a cost-benefit analysis of EI service delivery in New Jersey, Tarr and Barnett (2001) suggested that attendance may improve with delivery of services in the natural environment. The types

of services being delivered in natural versus more restrictive settings were not reported in the NEILS report; it is not possible to determine any justification for more clinical service delivery. However, it is important to recall that EI services are to be delivered in the natural environment unless it is to the child's benefit to deliver them elsewhere (ASHA-CED, 2006).

According to Hebbeler et al. (2007), a promising finding regarding service delivery in the natural environment was that 76% of families received a portion of their services in their homes. Some 8% of families receive a portion of services in a childcare setting or in a "regular preschool" (p. 3-2), which is considered part of the child's natural environment. Still, 61% of families received a portion of their services in a "clinical or center-based EI program" (p. 3-2). Some of these less natural settings may be unavoidable due to equipment required for delivering services. However, the most popular services delivered included "physical therapy, developmental monitoring, occupational therapy, special instruction for the child, speech/language therapy, and service coordination" (p. 3-2). These services seem ideal for delivery in the natural environment.

Parent Outcomes

For parent outcomes, I report the amount of parent training and coaching that was provided. About half of the services were delivered directly to children, rather than training the parents to deliver interventions (Hebbeler et al., 2007). This result was in concert with Peterson, Luze, Eshbaugh, Jeon, and Kantz (2007) who also conducted a study of services for 28 families receiving Part C services. This lack of parent training

likely impacts the overall efficiency of EI service provision. Parents who deliver interventions throughout their children's waking hours add to the time and financial value (Peterson et al., 2007; Vismara, Colombi, & Rogers, 2009) of EI and overall child outcomes (Bruder, 2010) of EI services. It was unclear in the NEILS report whether any services being provided directly to the children were interventions that parents could be trained to deliver. However, the findings of the NEILS report and Peterson et al. correspond with a large-scale survey conducted by Sawyer and Campbell (2012). This study included 1525 EI service providers who completed a survey. Specifically, 48.6% of respondents disagreed or strongly disagreed with the statement that they "spend more time teaching caregivers than working with kids" (p. 119).

Children's Language and Communication Outcomes

As part of the NEILS report, parents rated their children's communication at 36 months of age; (a) 22% of these parents reported their children had a lot of trouble or did not communicate, (b) 32% reported their children had a little trouble with communication, and (c) 46% reported that their children communicated well (Hebbeler et al., 2007). Unfortunately, no data were collected for children who received EI services prior to reaching 12 months of age. Therefore, for those children there was no comparison of communication prior to receiving the EI services.

For children who entered EI after they were 12 months of age, pre- and postEI comparison was possible. At 36 months, 2% of these parents reported that their children's communication had not changed and that their children were typically intelligible, 9% reported that their children's communication had changed for the worse,

30% reported their children's communication was the same and that there was still trouble understanding the children's speech, and 59% reported a change for the better (Hebbeler et al., 2007).

Performance data were not available by disability category for children in the NEILS report, regardless of when they entered EI. This makes it difficult to determine how children who are DHH are progressing in EI. Taken as a group, 54% of children entering EI services before 12 months of age had a lot or a little trouble with communication at 36 months according to their parents. Further, for 39% of children, parents reported their communication became worse or did not improve. Data regarding communication outcomes for children who are DHH are not available in the NEILS report data (Hebbeler et al., 2007).

All children who are DHH, regardless of level of hearing status, can benefit from EI services. Children who are minimally/mildly HH are at risk for language delays and difficulties (Spencer, 2004). In the study by Vohr et al. (2008), infants who were either minimally/mildly HH (n=15) or moderately/profoundly HH (n=31) were compared with hearing children (n=85). The infants who were HH had been enrolled in EI before the age of 3 months. Interestingly, after participating in EI services, children who were minimally/mildly HH performed significantly better than hearing children on assessments of phrases understood, words understood, labeling, words produced, early gestures, and total gestures as assessed on the Communicative Development Inventory (CDI), Words and Gestures subtests (Fenson, Dale, Reznick, Pethick, & Reilly, 1993).

Enrollment and Expenditures

Outcomes for children who are DHH and their families receiving EI services are difficult to locate. According to the NEILS report, about 2% of 3,338 study participants received services under the eligibility category of DHH. At the time of this study, there were approximately 170,000 children enrolled in EI services nationally.

Monthly EI expenditures are relevant, as one purpose of the NEILS study was to reduce the cost of services by minimizing travel and maximizing efficiency of EI service providers' working hours. The cost of providing services was affected by disability category. Monthly expenditures ranged from $459 to $1,286 for children with diagnosed conditions (e.g., DHH, Other Health Impairment, Orthopedic Impairment). The range of monthly expenditures across all disability categories was $213-1,286. My review of the literature did not yield more definitive information regarding costs of EI services for children who are DHH.

It seems that mandated early screening of children who are DHH would increase the number of children being enrolled in EI within the first 3 months of life. However, Houston et al. (2011) found that many children who did not pass the screening at birth either did not receive an audiological assessment, or they did not become enrolled in EI. Twenty-four percent of respondents (i.e., EI service program coordinators) to a national survey indicated that data collection and tracking of newborns who did not pass the screening was a weakness in their programs or states. This reinforces the question about how many children who are DHH eligible for services are not enrolled.

No data were present in the NEILS report regarding the number of children who "are not served; the study has no way of knowing whether EI is reaching all families in poverty who might be eligible" (Hebbeler et al., 2007, p. 5-11). However, there are some clear reasons why EI is not capable of serving all children who are eligible. Hebbeler, Spiker, and Kahn (2012) noted lack of qualified EI personnel, while others cited insufficient funding for EI programs (Cohen, 2009; Knight, 2010; Knitzer, 2007). These conditions may explain the disconnect between early hearing screenings and enrollment in EI services.

Several barriers threaten the sustainability of EI services. Brown (1991) listed the cost of transportation, lack of qualified personnel, and overcrowded caseloads when discussing EI service implementation. In Oklahoma, 50% of schools ended their EI programs completely, and many of the programs that continued could not appoint case managers for each child's Individualized Family Service Plan (IFSP) team.

These conditions may explain attempts to reduce enrollment in EI services. In a study of eligibility policy, Grant (2005) found that individual states were attempting to contain their spending on EI programs by restricting eligibility:

> Twelve states set a threshold level of hearing loss below which eligibility must be demonstrated by developmental delay. Seven states consider only severe hearing loss to be a condition with a high probability of delay. The other states exclude mild (<40 db) and/or unilateral hearing loss as diagnoses for establishing eligibility. (p. 246)

It is interesting that in a low-incidence population, there are attempts at limiting eligibility to save costs. It bears repeating that children who are minimally/mildly HH can benefit greatly from EI services (Vohr et al., 2008). Rather than cutting costs by limiting eligibility, perhaps service delivery can be made more time and cost efficient.

Rosenberg, Robinson, Shaw, and Ellison (2013) studied the discrepancy between children identified with DD and children receiving or not receiving EI services nationally. They found that in many areas, 25% or more of eligible children were not enrolled. In Illinois nearly 40% of children were eligible at 9 months, while fewer than 5% of children were receiving EI services. Rosenberg et al. suggested that broad definitions of DD may artificially drive up the number of eligible children. However, they noted that many children with truly significant delays were not being served.

While it is difficult to locate specific cases of children who are DHH being excluded from services, an attorney at an advocacy center for individuals with disabilities stated that the problem does exist (D. J. Wysong, personal communication, September 18, 2013). This attorney stated that even for children who are found eligible, the time constraint for very young children renders legal action impractical. She stated that in some cases, parents are unaware of their options, legal fees are not reimbursed, and for some parents, using personal insurance to fund services is simpler. The attorney stated that because the timeline for young children is so short, legal action takes too long to achieve eligibility by 3 years of age (i.e., exit age). Securing EI services under these conditions may be difficult for uninsured families, families who are not in contact with legal advocates, and those who cannot afford legal fees.

Given the outcomes listed above, it is clear that many children are benefiting from EI services. Parents are satisfied with the amount of services, but it is unclear which types of services are being delivered under which disability category. The majority of families (i.e., 76%), received a portion of their services in the natural environment, but ideally all families would receive most of their services in the natural environment. There is also a need to increase the amount of training for parents and to improve family attendance at scheduled meetings (Hebbeler et al., 2007). Children who are DHH and enrolled in EI services early showed improvement in language and communication skills (Hebbeler et al., 2007) and in one study showed more growth than hearing counterparts not receiving services (Vohr et al., 2008). Still, an issue that continues is that many children found to be HH are not enrolled in EI or are enrolled after 3 months of age.

Parent Training and Coaching

Parents can be trained and coached to deliver research-based interventions to their children with disabilities. Training and coaching for parents of children with disabilities enables parents to implement these interventions with quality throughout their children's waking hours. Parent training and coaching is a related service for families of children with disabilities from birth to 3 years old. While consideration of parent training and coaching is required by law (303.12) and the positive outcomes for children and families are documented in the literature (Bruder, 2010; Kaiser & Roberts, 2012), it is evident from the NEILS report that many children are receiving direct services from EI service providers rather than parents or caregivers. Increasing the number of parents who receive

training and coaching may ease EI service provider schedules and enhance efficiency of the interventions.

Collaborative Relationships

The IDEA requires that EI service providers work with parents in collaborative relationships, including families in the decision-making and service-delivery components of children's service plans. "Collaboration refers to the dynamic process of families and professionals equally sharing their resources (i.e., motivation and knowledge/skills) in order to make decisions jointly" (Turnbull & Turnbull, 2001, p. 13). Collaborative relationships between parents and EI service providers lead to positive family outcomes. In the study by Sawyer and Campbell (2012) introduced above, 23.8% of responding EI service providers stated they were more comfortable working directly with children, and 36.4% stated that parents benefited as much from watching EI service provider demonstrations with their children. These sentiments run contrary to best practice in EI (Bruder, 2010; Kaiser & Roberts, 2012; Warren, 2000) which stipulated that EI service providers empower parents by sharing information with them about available practices, helping them choose interventions, and teaching parents strategies to use with their children.

Distance Training and Coaching

The ubiquity of internet technologies for videoconferencing and data sharing has ushered in an era of distance education. These technologies have allowed for reduced travel time and expense and nearly unlimited global participation in learning opportunities. Distance education has been successful in the fields of medicine

(Dhudaybergenov & Abdurakhimov, 2012; McCarthy, Muñoz, & White, 2010), higher education (Savery, 2005; Young, 2006), and therapy (Bickel, Christensen, & Marsch, 2011; Moore, Fazzino, Garnet, Cutter, & Barry, 2011) to mention just a few examples.

For EI service providers working with parents of very young children with disabilities, distance training and coaching may alleviate some of the difficulties of meeting legal requirements and family needs. It is evident from EI outcomes that, rather than child-directed services, more parent training and coaching is needed. It may be that distance training could reduce travel and time costs and make scheduling easier (Segal, Chen, Gordon, & Kacir, 2003; Tarr & Barnett, 2001). A further possible benefit is that due to the physical absence of the EI service provider, it would be more natural for parents to take the lead and for the EI service provider to place more focus on the parent (Blaiser, Edwards, Behl, & Muñoz, 2012; Cooke & DeBettencourt, 1995; Hamren & Quigley, 2012).

Significance of the Study

I found no studies that examined the effects of delivering training and coaching in naturalistic language teaching strategies in the home to parents of children who are DHH. Further, there have been no empirical studies conducted with this population in which training and coaching are delivered, for any type of intervention, to parents primarily from a distance using internet technologies. Some EI services are delivered directly to children in their natural environments, sometimes directly to children over the internet (Goehring, Hughes, & Baudhuin, 2012), or not in children's natural environments (Pilkington & Malinowski, 2002).

Studies have found that naturalistic teaching strategies (defined below) are effective when delivered by teachers (Harjusola-Webb & Robbins, 2011; Kohler, Anthony, Steighner, & Hoyson, 2001; Miller, Collins, & Hemmeter, 2002) and parents (Peterson et al., 2007; Peterson, Carta, & Greenwood, 2005). Because of the documented lack of qualified EI service providers (Bradham, Houston, Guignard, & Hoffman, 2011; Hebbeler et al., 2012) and the expensive nature of travel combined with the low-incidence of the DHH population, it is important to develop and test new procedures for efficient service delivery. Many researchers have suggested that distance training and coaching may be as effective as in-person service delivery (e.g., Stowitschek & Guest, 2006; Symon, 2001; Zaidman-Zait & Jamieson, 2007).

EI service providers are responsible for delivering family-centered services that will improve child outcomes and family quality of life. It may be difficult for EI service providers to do so with the current service delivery models. The purpose of this study was to assess the efficiency and efficacy of distance training and coaching to deliver training and coaching in naturalistic teaching strategies to parents of children who are DHH.

Research Questions

The current study focused on the following research questions:

1. Is there a functional relation between distance training and coaching for parents of children who are DHH on frequency and quality of naturalistic teaching strategy use?

2. How acceptable are the goals, procedures, and outcomes of the PiCS protocols, including service delivery in distance training and coaching for the parent who participated in this study?

Definitions of Key Terms

Deaf/Deafness. For the purposes of this study, I will use the definition listed by the Illinois State Board of Education: "a hearing impairment that is so severe that the child is impaired in processing linguistic information through hearing, with or without amplification, that adversely affects a child's educational performance" ("Special Education Disability Categories," n.d.).

Hard of hearing (HH). For the purposes of this study, I will use the definition listed by the Illinois State Board of Education: "an impairment in hearing, whether permanent or fluctuating, that adversely affects a child's educational performance but that is not included under the definition of deafness" ("Special Education Disability Categories," n.d.).

Natural environment. This term refers to environments in which young children are involved in day-to-day activities (e.g., snacks, play activities, daily living) with family members. In this study the natural environment will consist only of areas in the family's home.

Milieu language teaching. This term refers to teaching children during interaction through activities of their interest. Key components include an engaging environment, high-interest activities/materials, joint attention between parent and child, responsive

parent communication (see Responsiveness), modeling, mand-model, and time delay (see respective definitions).

Naturalistic teaching strategies. For this study, these include environmental arrangement, modeling, mand-model, and time delay (see respective definitions).

Environmental arrangement. This term refers to the use of highly motivational activities/objects of the child's interest to enhance interaction. It includes choosing activities/objects of high interest, presenting and playing with these activities/objects in ways that require/encourage the child to communicate.

Joint attention. This term is defined by Naber et al. (2008) as "the capacity of individuals to coordinate attention with a social partner in relation to some object or event" (p. 143). For the purposes of this study, joint attention will refer to situations in which the parent and child are making eye contact. For a child who is HH, it is necessary to establish eye contact so the child can attend to visual cues of communication in addition to auditory information. Naturalistic teaching strategies should be implemented at times of joint attention.

Modeling. This term refers to the act of clearly producing a word or gesture and waiting for the child to imitate, and repeating the model if the child does not imitate. In this study a high-quality model is delivered when there is joint attention, and the parent allows sufficient time for the child to respond after each model.

Mand-Model. This term refers to the act of clearly producing a choice, question, or mand and waiting for the child to respond, and repeating the choice, question, or mand if the child does not respond, and producing a model if the child still does not respond. In

this study a high-quality mand-model is delivered when there is joint attention, and the parent allows sufficient time for the child to respond after each choice, question, or mand.

Time Delay. This term refers to the activity of establishing joint attention with the child during a repetitive activity in which the child knows what is expected and waiting an extended time (i.e., 5-15 sec) for the child to initiate communication, and using a mand-model procedure or producing a model if the child does not initiate.

Responsiveness. This term refers to parents' tendency to follow their children's communication leads and activities/objects of interest, rather than directing the child to unrelated objects or activities. Responsiveness also includes parents' tendency to give positive feedback and limit negative utterances.

Mean Length of Utterance (MLU). This term refers to the number of morphemes a person produces within an average statement in a language sample. In this study, MLU was taken from a language sample of at least 50 utterances, and calculated as the total number of morphemes produced divided by the total number of utterances. MLU is an indicator of language ability.

Type-Token Ratio (TTR). This term refers to the number of different words a person produces in a language sample. In this study, TTR was taken from a language sample of at least 50 utterances, and calculated as the number of different words spoken divided by the total number of words spoken. TTR is an indicator of vocabulary diversity.

Symbolic communication. This term refers to the conveyance of meaning through either established or idiosyncratic abstract gestures or vocalizations.

Nonsymbolic communication. This term refers to the conveyance of meaning through transparent gestures or vocalizations. An example of nonsymbolic communication is touching (i.e., contact gesture), pointing to, or reaching for a desired object (i.e., distal gesture; Light, Beukelman, & Reichle, 2003).

Gestural communication. This term refers to the conveyance of meaning through a movement of a body part.

Vocal communication. This term refers to the conveyance of meaning through production of sound from the mouth.

Limitations

The primary limitation of this study is one common to single-subject research: the small sample size of this study limits external validity. Another limitation arose from the use of internet technologies. Only families who had access to broadband internet and a computer, laptop, or tablet in the home were able to participate in this study. The findings of this study cannot apply to individuals who have no access to (or those who prefer not to use) these technologies. Also limiting this study was the video observation of parent-child interaction. There is a possibility that the parent behaved differently because he was being observed via videoconference, although this may have been less intrusive than in-person observation.

Assumptions

The adult study participant was the father of the child participant. I assumed that the adult participant was highly interested in promoting his child's language and communication growth. Therefore, I assumed the adult participant would attempt to

implement the teaching strategies during coaching sessions and outside of coaching sessions. I assumed that the parent would complete the language inventories and self-report forms honestly. The participating father were asked to check that his child's amplification devices worked properly, and I assumed that he knew how to check this and did so correctly.

Summary

There has been an increase in the practice of home-based interventions in which parents are trained and coached to deliver effective language interventions (Roberts & Kaiser, 2011). Legislative action requires parent training and coaching, but in practice, there is a need to increase the amount that occurs (Hebbeler et al., 2007; Peterson et al., 2007). EI service providers have been able to improve children's communication through direct intervention, but with support, parents have the potential to deliver services throughout children's waking hours in natural environments.

The purpose of this study was to examine the impact of training and coaching on a parent's use of naturalistic language teaching strategies with his young child who is DHH. The need for more interventions offering parents training and coaching is impeded by lack of funding (Knight, 2010; Knitzer, 2007; Proctor, Niemeyer, & Compton, 2005), lack of qualified EI service personnel (Bradham et al., 2011; Proctor et al., 2005) possibly leading to scheduling difficulties and limited time for each family (Blaiser et al., 2012; Olsen, Fiechtl, & Rule, 2012), and geographical barriers (Bradham et al., 2011; Pennington, Horn, & Berrong, 2009; Proctor et al., 2005). These conditions may limit services further for low-incidence populations like children who are DHH. There is a

need to examine ways to improve efficacy of delivering home-based interventions for parents of children who are DHH. This study proposed to address this need.

CHAPTER II

REVIEW OF RELATED LITERATURE

Need for EI in Language Development

For young children, especially those with disabilities, language and communication are paramount. Language and communication development is one of the five domains of early childhood development; (a) cognitive, (b) physical, (c) communicative, (d) social/emotional, and (e) adaptive. Development in each domain is dependent on the others. Therefore, development in communication must be supported if there is a language delay. Because development occurs more rapidly in young children, this support is legally required to begin as early as possible and "reviewed and evaluated every six months" to minimize delays (Yell, 2012, Chapter 3, Education of the Handicapped Amendments of 1986, para. 5).

School readiness is an important reason for supporting language development in early childhood. Research has indicated that children with disabilities are at a disadvantage regarding school readiness. For example, children who are deaf/hard of hearing (DHH) may struggle with literacy readiness compared to hearing children (Bergeron, Lederberg, Easterbrooks, Miller, & McDonald, 2009). Children with DDs are more prepared for school when they receive EI in language. EI prepares children for school whether they are English Language Learners (ELL; Bates et al., 2006), children from families of low socioeconomic status (Hart, 2000), children who are DHH

(Harrington et al., 2009; Yoshinaga-Itano, 2003), or children with language delays for other reasons (e.g., social deprivation; Smith & Gibbard, 2011). EI may result in better academic outcomes for children and may decrease costs for schools, local education agencies (LEAs), and state governments when educating children with language delays. Early detection of language delays and early enrollment in EI are keys to improving children's school readiness and ultimate academic success. In the following section I will review the current literature in EI.

Literature Search Methodology

To identify literature evaluating language interventions for young children with language delays, I conducted an internet-based search of peer-reviewed journal articles. I used the PsychInfo database to run my search. I cross-combined the search terms and phrases *language intervention*, *parent*, *parent-implemented*, *milieu language teaching*, *natural environment*, and *naturalistic*. I then conducted a search using the above listed search terms in (a) the Journal of Deaf Studies, (b) Deaf Education, and (c) Communication Disorders Quarterly. I found 62 articles in this search. I also conducted an archival search in the (a) Journal of Speech, Language, and Hearing Research, and (b) Volta Voices. There were no articles pertaining to parent-implemented language interventions for children birth to 5 years old in these journals. I chose to include studies that (a) were peer reviewed journal articles, (b) were experimental studies, (c) used naturalistic interventions with language and communication as dependent variables, (d) included more than half of child participants with developmental disabilities and under the age of 5, and (e) included parents without disabilities who may or may not have

received training/coaching through the intervention.

Of these 62 studies, I excluded: (a) 24, because the studies focused on alternative/augmentative communication strategies; (b) 14, because there was no intervention (e.g., they were program assessments or descriptions); (c) 4, because the interventions were not naturalistic; (d) 3, because the focus was on behaviors or skills other than communication/language; (e) 3, because the studies were not current (i.e., published more than 20 years ago); (f) 2, because participants were the wrong age; (g) 1, because the mother participants had intellectual disabilities; and (h) 1, because it was a dissertation and not a peer-reviewed publication. This left 10 studies that met my criteria of a focus on language interventions delivered to children under the age of 36 months. These studies will be discussed in detail in the section titled "Language Interventions for Young Children with Disabilities: A Review of the Literature."

Best Practices in EI

Practitioners, researchers, government agencies, and families have contributed to the improvement of EI services. The "Year 2007 Position Statement: Principles and Guidelines for Early Hearing Detection and Intervention Programs" (Joint Committee on Infant Hearing, 2007), which posited that EI service providers should be qualified in helping families choose evidence-based interventions to meet their needs, is an example of the calls for continued improvement in EI services. According to this report, evidence-based interventions for children with disabilities and their families are not being implemented universally, which can diminish the positive impact on child and family outcomes.

Yet, there is ample evidence regarding effective services of EI. Bruder (2010) identified the following essential components of EI service delivery and contended that these components will improve the chances of a positive impact on families of young children with disabilities: (a) family-centered service delivery; (b) home-based service delivery; (c) collaborative efforts, centered on the child's needs, among EI service providers and family; and (d) a choice of a variety of services that can be integrated to meet children's and families' needs.

I will review the literature in the following sections and provide a definition of evidence-based practice in developing and implementing interventions for children 0 to 5 years old. I focus on the first two components recommended by Bruder (i.e., family-centered services and home-based delivery; 2010). As part of Bruder's third recommendation, I will review literature that has investigated collaboration with parents during EI service delivery. Bruder's fourth recommendation, (i.e., a choice of a variety of services that can be integrated to meet children's and families' needs), while essential in effective EI service delivery refers to collaborative efforts across disciplines and are beyond the scope of this study. The important concept for EI program development is to develop practices that can be incorporated into larger service systems. In addition to Bruder's recommendations for best practices in EI, I will also review literature regarding parent-child interaction and language outcomes for children with disabilities.

Family-Centered Services

Family-centered services are encouraged in the literature (Bruder, 2010; Byington & Whitby, 2011; Woods, Wilcox, Friedman, & Murch, 2011). EI service providers are

required by law to take a family-centered approach, working with the entire family to meet their needs (e.g., 34 C.F.R. §303.322-3; §303.342). However, family-centered services are not always provided, as described by Mahoney and Bella (1998). These authors interviewed parents before their families began EI services, surveyed the parents after 6 months of participation, and interviewed the parents again after 12 months of participation. Parents' responses indicated vast discrepancies between the needs of the families and the services they received. Similarly, Mandell and Murray (2009) found that administrators of EI programs believed their services were family centered, but participating parents rated the services less family centered than the administrators. These two studies illustrate that perspectives of EI providers and parents can be at odds. Specifically, these two studies indicate that service providers perceived they were providing family-centered services but families receiving the services did not agree. If we are to truly base EI services on a family-centered construct then parents' perspectives of service provision should be continually solicited for ongoing program evaluation and improvement.

While the literature is descriptive and correlational (Dempsey & Keen, 2008; Dunst et al., 2007), there is agreement about the components of family-centered service delivery (Correa, Jones, Thomas, & Morsink, 2005; Trivette & Dunst, 2007). The first component of family-centered service delivery is that service providers realize that the family is a continuous source of support and interaction for the child with disabilities. The well-being of family members and the development of a child with disabilities are integrally interwoven with the family's capability as a system to support each member

(Trivette, Dunst, & Hamby, 2010). This includes the parents' well-being and self-efficacy, and family characteristics for supporting and interacting with each other. According to Trivette et al., EI service providers can positively impact these characteristics, which in turn impact the parent-child interaction and thus promote the development of the child with a disability. For example, EI service providers should encourage parents to discuss their concerns and goals with regard to their children's needs in multiple areas (e.g., development of communication skills). Listening to parents begins an empowering collaborative relationship, rather than the typical relationship that has been based on an expert/client model (Bruder, 2000) where the EI service provider dictates an intervention.

Second, EI service providers are encouraged to work collaboratively with parents to assess the needs of the family and to choose services and interventions that address those needs (Bruder, 2000). EI service providers are encouraged to serve as liaisons between family, school, other resources, and the community. Parents often search independently to locate services that will meet their children's needs, often without success (Allen, 2007). EI service providers have the opportunity to establish connections between families and services since they are more knowledgeable of available services. However, researchers have stressed that in order to help choose ideal services, EI service providers must know, understand, and spend time listening to the parents' perceptions of needs, strengths, and goals for their families (Dunst et al., 2007; Trivette et al., 2010).

A third characteristic of family-centered service delivery is that EI service providers are supportive and noncritical when supplying information to families. Ingber

and Dromi (2010) addressed this with a list of characteristics for providing relational support in a family-centered model: "active listening, compassion, empathy, respect, a nonjudgmental approach, and a set of beliefs about parenting capabilities and competencies" (p. 60). Each family, therefore, is believed to have unique values and EI service providers support parents with sensitivity to families' values and self-described needs. This type of nonjudgmental interaction is supported in models that call for cultural sensitivity (Allen, 2007; Baird & Peterson, 1997; Dempsey & Keen, 2008; Turnbull, Turnbull, Erwin, Soodak, & Shogren, 2011).

Fourth, the IFSP, which is developed to meet both child and family needs, supports the entire family and their needs related to their child, and should include information about financial resources and emotional support. The IFSP implementation process is spelled out in regulations for the IDEA Part C and requires that a case manager consider the parents' and family members' needs when creating the IFSP. One service available to all parents in Part C is that of case management, which helps coordinate the various services the family needs. These may include any services the child with a disability requires (e.g., physical therapy, health services, family counseling, "transportation and related costs" [§303.12.15]). Thus, it is clear that EI services are meant to support the needs of the entire family.

Finally, family-centered service delivery is focused on the strengths of a family, and those strengths become a basis for providing services in other areas. For example, a typical strength of parents is knowledge of their children's interests (Bruder, 2000; Byington & Whitby, 2011). This can be harnessed by teaching parents to incorporate

teaching strategies into activities of interest to their children. Another example of a family strength may be an older sibling's desire to help with intervention for his or her sibling with a disability. Consequently, all these components, and the success of family-centered service delivery, depend on the participation of parents (Dunst et al., 2007). In many families, children spend many waking hours with parents (Bruder, 2010), and this demonstrates the need to involve parents in the family assessment and service selection process (Warren, 2000).

Several benefits of family-centered service delivery have been documented in the literature. Bruder (2010) listed the following benefits: (a) increased confidence and self-efficacy of parents, (b) enhanced interactions among family members and the child with a disability, and (c) enhanced knowledge of learning developmental needs of the child with a disability. Children develop within the context of their families and they develop through the "environments experienced by a child and the characteristics of the people (including the developing child) within these environments" (p. 340).

Another benefit described by Dempsey and Keen (2008) is that parents were more comfortable and participatory when the intervention was family centered. When service providers empowered parents to set the agenda and make decisions, parents felt supported; without this empowerment, parents' stress levels raised. A study by Brady, Peters, Gamel-McCormick, and Venuto (2004) reported similar findings when analyzing language used by EI service providers. These researchers found that indirect language (e.g., showing understanding, actively listening) encouraged parents to participate and set the tone for the intervention sessions. Conversely, direct language (e.g.,

recommendations and information) was more likely to stifle parent engagement in the session. For EI services that involve parent education and participation in intervention, parents may be able to implement interventions throughout their children's day, providing multiple opportunities for reinforcement of language (Pilkington & Malinowski, 2002; Woods, Kashinath, & Goldstein, 2004) or other target skills. Moreover, parents typically understand their children's interests and preferences best, so they are more able to keep their children engaged and motivated.

Family-centered service delivery impacts families' capabilities and satisfaction in increasingly predictable ways. Dunst et al. (2007) studied proximal and distal effects when parents participated in family-centered services. Proximal effects were specific outcomes listed by the family (e.g., greater control in choosing needed services), whereas distal effects were more general outcomes perceived or measured through a survey (e.g., family quality of life). Family-centered practices were assigned to two main groups: (a) relational practices, which included actively listening, empathizing, and displaying honesty; and (b) participatory practices of providing relevant information and honoring the families' strengths (Trivette & Dunst, 2007). EI service providers were more likely to positively affect proximal needs rather than distal needs through both relational and participatory practices. Compared with relational practices, participatory practices were more often and more strongly correlated with positive outcomes in proximal and distal needs. Additionally, by impacting parents, Dunst et al. (2007) found that family-centered services positively impacted children with disabilities.

DesJardin (2005) found that parents who rated their self-efficacy high were more likely to (a) choose appropriate service options for their children, (b) be more responsive with their children, (c) interact effectively with their children, (d) use their knowledge and skills, and (e) use higher-level language. DesJardin stated that by providing services "tailored to the strengths of individual families" (p. 193), parents' self-efficacy could improve. In her study, DesJardin surveyed parents about the family-centeredness of their services and the parents' perceived self-efficacy, finding that parents were dissatisfied with family-centeredness of services. Parents of young children with cochlear implants felt they did not receive adequate family-centered services from the EI program in their local school districts. Further, their self-efficacy correlated positively with their feeling of responsibility for advocating for their children, and filling in service gaps left by the EI program at the school district. Family-centered services can improve self-efficacy in parents (Baird & Peterson, 1997; Dempsey & Keen, 2008; Dunst et al., 2007; Guralnick, 2011), leading to enhanced parental advocacy, which in turn can result in obtaining more comprehensive services for their children.

It should be stated that while parent participation generally correlates with positive outcomes for the family, there are possible negative effects. In a study by Smith, Romski, Sevcik, Adamson, and Bakeman (2011), parents' stress levels, as measured by the Parent Stress Index—Short Form (PSI-SF; Abidin, 1995) rose through participation in parent-implemented intervention. The children in this study had DDs and spoke fewer than 10 intelligible words. Parents were coached to implement one of three interventions with their children, and 75% of the sessions took place in a clinical setting.

Parent stress correlated with children's progress in language development; the authors hypothesized that parents became more aware of the severity and delayed progress of their children's language development and this accounted for increased parent stress. "Participating in a child's language intervention may sensitize parents to their child's communication skills and could contribute to the association between parent stress and language skills" (Smith et al., 2011, p. 146). The authors also postulated that the time and effort expended to learn and implement strategies with their children could have raised parent stress. While elevated parent stress is a concern and the ideal is to reduce the stress on a family, the positive impacts of interventions are likely worth the stress of implementation. If EI service providers understand that parent stress can increase due to intervention implementation and proactively address this through parent education the stress may be minimized or alleviated.

Home-Based Services in the Child's Natural Environment

Children's natural learning environments are their homes and other settings such as daycare or the grocery store. Bruder (2010) described families interacting with their children in the natural environment: "a mix of people and places and experiences such as eating during meal times, splashing water during bath time, listening to stories, and learning greeting skills at family gatherings" (p. 342). Because children learn through interacting with their families in their natural environments, the home is the ideal environment for the delivery of services (i.e., home-based delivery) and this ideal natural setting is required by the Individuals with Disabilities Education Improvement Act (IDEIA, 2004).

In a study by Campbell, Sawyer, and Muhlenhaupt (2009), parent focus groups and service provider focus groups were held to discuss the meaning of natural environment. Parents understood that children's natural learning environment is a fluid and nearly limitless one. When asked to identify a natural environment, parents included the library, grocery store, and special destinations, such as Sea World, among other places that constituted ideal locations for children to learn. By contrast, service providers only listed "transportation, cleaning house, and playing with siblings" (p. 270). Clearly there is a need to expand the understanding of the natural environment with service providers so that they may encourage the use of natural environments to enhance communication skills.

There are numerous benefits to home-based service delivery such as parent convenience, choosing activities and routines to use with intervention that are familiar and repeated frequently, and generalization opportunities. In Campbell et al.'s (2009) study parents listed the inconvenience of transporting their children to a clinic to receive services. It is likely that if EI service providers are responsible for the time and financial costs of transportation, parents' satisfaction would improve and stress would be reduced. According to Campbell et al., it may be that parents would be able to participate more regularly, not having to miss sessions for incidental reasons such as transportation issues or a sibling who is ill.

The benefits of home-based service delivery go beyond mere convenience. Practically speaking, parents can choose activities and settings in the home that are preferred by their children (Mobayed, Collins, Strangis, Schuster, & Hemmeter, 2000;

Tisot & Thurman, 2002). As noted in the section on family-centered services, parents know best the activities that interest their children (Bruder, 2000; Byington & Whitby, 2011). Thus for the child, receiving services in the natural environment (e.g., the home and a favorite park) likely increases the child's engagement and motivation to participate. According to Shelden and Rush (2001), children with disabilities may not generalize learning from one environment to another, and frequent practice for very young children with disabilities leads to generalization of target skills. "The provision of services in natural settings decreases the problems related to generalization because the child has an opportunity to practice skills in the very environments in which the child needs to use those skills" (p. 3).

The EI service provider can encourage generalization by collaborating with the parent about activities and settings that will foster the child's learning. In a study by Woods et al. (2004), four mothers of children aged 13 to 31 months with delays in social communication learned to incorporate social communication teaching strategies for enhancing communication (e.g., descriptive praise, modeling, and expansion) into their children's daily routines. Intervention sessions were held in the home and mothers incorporated social communication strategies (e.g., praise, modeling, imitation, and expansion) into daily play routines with their child using the child's preferred toys and objects. With encouragement from the service provider, parents generalized the use of strategies to other activities and settings, thus enhancing generalization. Similar training in the clinical setting would not offer these generalization opportunities.

It is evident that best practices in EI services include key components. To deliver family-centered services, a family must be a full partner in assessing the needs of their child with a disability and of their entire family with respect to that child. Effective service providers are sensitive to the unique needs and environments (e.g., work life and routines) while also focusing on the strengths of individual families. This review has demonstrated that effective EI programs carefully evaluate the family-centeredness of their services, assessing parent satisfaction and the achievement of outcomes. Services delivered in children's natural learning environments benefit children most and allow parents to apply their learning throughout the day with their children. In the following section I discuss the importance of parent-child interaction as a component of best practice in EI.

A Focus on Parent-Child Interaction

In addition to Bruder's (2010) recommendations for best practice in EI, interventions addressing children's language outcomes should focus on parent-child interaction. The quality of parent interaction affects language acquisition and the communicative abilities of children. The effect of parent interaction on children's communication skills has been investigated and findings have emerged that continue to confirm the importance of parent interaction on children's communication skill development. Hart and Risley's (1995) seminal work illustrated the importance of parent-child interaction. All children, whether they are typically developing or have language delays, develop communication skills through interaction with others. Parents are typically their children's first teachers of language. Parents often spend the most time

with their children, and, therefore, understand their interests, likes, and dislikes. Parents witness and have the potential to enhance the daily development of new communication skills and knowledge in their children. In this section I will (a) define parent responsiveness, (b) explore the impact of parent responsiveness on children's developmental outcomes, and (c) review literature regarding parent responsiveness with their children with disabilities.

Parent responsiveness. One aspect of parent interaction, responsivity or responsiveness, has been linked to communicative growth in both children who are typically developing (Haney & Klein, 1993; Harrison & McLeod, 2010; Masur, Flynn, & Eichorst, 2005; Warren & Brady, 2007) and children with disabilities (Peterson et al., 2007; Peterson et al., 2005; Pressman, Pipp-Siegel, Yoshinaga-Itano, & Deas, 1999). According to Spiker, Boyce, and Boyce (2002), responsiveness is "parental behavior that responds contingently to the child's cues, follows the child's lead, and provides input and support that build on the child's focus of attention and activity" (p. 46). Responsiveness can include imitation of a child's utterance, compliance with a child's request, clarification of a child's meaning (Yoder & Warren, 1998), and "taking the lead in reading signals and responding appropriately" (Walden, 1996, p. 2074). Parents who interact more often and more positively with their children foster earlier and richer communication abilities. Interaction and responsiveness occur from the moment of birth, before expressive language has developed (Kuder, 2012), and parents need to be adept at interpreting, narrating, and responding to their children's facial expressions and body gestures. According to Walden (1996), reading a child's signals requires the parent to

attend to the child's facial expressions and bodily gestures, which means frequently looking at the child during interaction.

A final characteristic of responsiveness is a parent's tendency to deliver input at a level ideal for the child's understanding but also for the child's growth in communication. Parents increased their language diversity (type-token ratio [TTR]) as their children's language diversity increased (Girolametto et al., 2002). TTR is a ratio of the number of different words spoken to the total words spoken and is typically obtained from a language sample of at least 50 utterances (Kuder, 2012). Ideally, parents provide sufficient but not excessive vocabulary, maximizing their children's ability to learn new vocabulary (Roberts & Kaiser, 2011).

Responsiveness is, therefore, made up of various parent behaviors that can enhance children's language outcomes. Warren and Brady (2007) stated that children likely experience different forms of responsiveness "in overlapping combinations" and that "it is probably these combinations, experienced thousands of times by the child from infancy onward that give maternal responsiveness the broad cumulative impact that it has been shown to have" (p. 331). For example, Harrison and McLeod (2010) analyzed a nationally representative sample of children aged 4 to 5 years old, and found parents' responsive social interaction to be a predictor of positive growth in language and communication.

Parent responsiveness and interventions focusing on increasing parent responsiveness have had positive effects on children's language outcomes (Warren et al., 2008; Yoder & Warren, 1998). In the following sections I review literature on

responsiveness and its relationship with children's (a) receptive and expressive language outcomes, (b) cognitive development outcomes, and (c) vocabulary outcomes. I follow the review of outcomes with a review of successful interventions that target parent responsiveness.

Parent responsiveness and children's language outcomes. Parents' responsiveness has an impact on children's development. Children's (a) receptive and expressive language (i.e., vocabulary) outcomes and (b) cognitive outcomes are two key areas that parent responsiveness can impact. In the following sections I review the literature with regard to each of these developmental areas.

Receptive and expressive language outcomes. Parent-child interaction is an important factor in children's development of both expressive and receptive language (Hart & Risley, 1995). Expressive language is a measure of a child's ability to produce language "without imitating another person's verbalizations" while receptive language is "the amount of language he or she can comprehend" (Pence & Justice, 2008, p. 170). The literature (Girolametto et al., 2002; Haney & Klein, 1993; van der Schuit, Segers, van Balkom, & Verhoeven, 2011) demonstrates a clear positive relationship between parent-child interaction and expressive language skills; as parent responsiveness improves so does the child's communication.

Parents who provide more language input in quantity and diversity foster more productive and more diverse expressive language in their children. In a descriptive study by Girolametto et al. (2002), a comparison was made between Italian and Canadian parents' communication with their children. Twenty parent-child dyads participated: 10

Italian-speaking dyads from Italy were compared to 10 English-speaking dyads from Canada, and there were no significant differences in language ability or SES between the two groups. The participating children were between 23 and 34 months of age, were within normal range of IQ and hearing ability, but all had expressive delays (i.e., at the one-word stage at 2 years of age). All children were "judged to be within normal limits" of receptive language development (p. 159). The Italian parents spoke more words in both quantity and diversity, and their children mirrored this, producing more language in quantity and diversity of words when compared to the children from Canada.

Parents' sensitivity and responsiveness to their children's communication foster receptive and expressive communication growth. The study described above by Girolametto et al. (2002) contained analyses of parent responsiveness. In both Italian and Canadian parent-child dyads, parents were responsive if they imitated and expanded their children's communication attempts. This behavior correlated with children who verbalized more often, with more complex utterances, and with more diversity of words.

In a study by Haney and Klein (1993), parents participated in the Mother-Infant Communication Program (MICP) to learn "communicative interaction strategies" (p. 15). Parent involvement was measured with the *Home Observation for Measurement of the Environment* (HOME; Caldwell & Bradley, 1979) and child language abilities were scored with the *Receptive Expressive Emergent Language* (REEL) *Scale* (Bzoch & League, 1971) when the children were 6, 12, and 18 months adjusted age. (This study did not define *adjusted age*, but given the participants' pre- and neonatal complications, the adjusted age likely compensated for premature birth and time spent in the hospital

with minimal interaction.) *Parent involvement* was defined as the parent's tendency to talk to and look at the child often during interaction, as well as to provide structured play periods. The authors found that maternal involvement was positively related with their children's receptive and expressive language scores at 18 months of age.

Another study, this one by Landry, Smith, Swank, Assel, and Vellet (2001), determined that maternal responsiveness was related to expressive language development. This study included 360 families who had participated in an EI service designed to improve parents' responsive communication. Landry et al. defined responsiveness differently depending on the ages of the children. When the children were aged 6, 12, and 24 months (early stages), the authors determined that parents were responsive when they were physically affectionate and used a positive voice tone. When children were 3 to 4 years old (late stages), the researchers coded parents as responsive if they used praise and encouragement and avoided the use of negative comments. Parents who were responsive early and ongoing, meaning that they were responsive to their children beginning at birth and through the children's 5th birthday, were correlated with children who had higher expressive language scores.

The above studies described behaviors that led to receptive and expressive communication growth, including parents who (a) provided language input in sufficient quantity and diversity (Girolametto et al., 2002); (b) imitated and expanded upon children's utterances (Girolametto et al., 2002); (c) frequently looked at and spoke to children while providing structured play opportunities (Haney & Klein, 1993); and (d) showed physical affection, positive tone, verbal praise, and encouragement (Landry et al.,

2001). In the following paragraphs I explore the ways in which parents adjust their language, providing optimal input for children's vocabulary learning.

When parents are responsive and follow their children's interest (i.e., contingent communication), the children are more likely to acquire new vocabulary. Parents who model language related to their children's activities or objects of interest are engaged in *linguistic mapping*, which means that children are receiving language input that is ideal for understanding and learning new vocabulary (Cress, Moskal, & Hoffmann, 2008). For example, a child playing with a truck is more prepared to discuss and learn about trucks and related words than he is ready to talk about what he is having for snack.

In their review of literature on responsiveness, Warren and Brady (2007) described parents who are responsive to their children's communicative abilities. Parents provide language input at differing levels appropriate to their children's needs. "For example, the onset of intentional communication at around 8–9 months of age may trigger changes in the caretaker such as increased linguistic mapping contingent on child initiation in the context of joint attention episodes" (p. 331). In other words, to be successful in linguistic mapping, parents must respond to the interest children show in objects and activities and must also provide language models that will enhance language growth.

Studies have shown that when parents communicate about their children's interest, they positively impact their children's language outcomes. In a study by Masur et al. (2005), parents were videotaped interacting with their children within naturalistic home routines of taking a bath and playtime. The study included 20 mothers and 10 male

and 10 female infants at 10, 13, 17, and 21 months of age. The authors used the *Maternal Behavior Rating Scale* (MBRS; Mahoney, 1992) and a coding system developed by Pine (1992) to label parents' verbal and gestural responses to the children's interest. Mothers' verbal responsiveness was defined as their tendency to imitate children's actions and verbalizations. Supportive directiveness was defined as the mothers' tendency to follow children's interests while soliciting responses or actions from the children. These characteristics were significantly, positively related to their children's lexical development. Mothers' utterances that were related to the children's interests were significantly predictive of greater lexical development. The converse was also supported; utterances unrelated to the children's interests were not predictive of the children's growth in lexical development.

Further evidence exists to suggest that when parents verbally label objects and actions of interest to their children, vocabulary is more easily learned and incorporated into the children's lexicon. McDuffie and Yoder (2010) studied types of parent responsiveness that predicted spoken vocabulary in young children with Autism Spectrum Disorder (ASD). This was a secondary analysis of the data collected by Yoder and Stone (2006). The original study provided intervention to 32 parent-child dyads (27 male and 5 female children between the ages of 18 and 60 months). The gender and age of the parent participants were not reported. Parents participated in one of two interventions (i.e., *Picture-Exchange Communication System* [PECS; Bondy & Frost, 1994] and *Responsivity Education and Prelinguistic Milieu Teaching* [RPMT; Yoder & Warren, 1998]). McDuffie and Yoder (2010) confirmed their prediction of a correlation

between parents' responsive communication and the children's subsequent vocabulary growth.

In a study by Shimpi and Huttenlocher (2007), parents' communication was analyzed for contingency upon their children's interest. The study included 18 mother-child dyads in which the children were typically developing. Dyads were videotaped during routine interactions when the children were 14, 18, and 22 months of age. The authors coded mothers' utterances as lead-in (i.e., not related to the child's interest) or follow-in (i.e., related to the child's interest). Children acquired vocabulary more easily when their parents used more follow-in than lead-in utterances. It was also true that children acquired vocabulary when parents successfully gained their children's attention with lead-in utterances. This study demonstrated the success of teaching parents to change their communicative behavior to enhance language development rather than solely focusing intervention directly on the child.

In a study by Kim and Mahoney (2004), the authors included 30 parent-child dyads in a correlational study of parent-child interaction. The purpose of the study was to determine the relation between parents' responsive communication (as measured by the *Korean Maternal Behavior Rating Scale*; Kim, 2000) and children's engagement (*Child Behavior Rating Scale*; Mahoney & Wheeden, 1998) and language development (*Korean Vineland Maturity Scale*; Choi & Kim, 1998). The authors found a strong correlation between parents' responsive communication and their children's language development.

Cognitive development outcomes. In the study described above by Landry et al. (2001) the authors found that parents' responsiveness was significantly related to their

children's cognitive development. Early, frequent, and consistent parent responsiveness was more beneficial than late parent responsiveness or none at all. There was clear evidence that consistent parent responsiveness benefits children more than inconsistent or no parent responsiveness. These authors concluded that parents should be consistent in their responsive communication, but that beginning to be responsive later is better than not being responsive at all.

Parent responsiveness to their children with disabilities. Parents are naturally responsive with their children, but the amount and quality of responsiveness varies by family. Parents' responsive communication can vary by socioeconomic status (Hart & Risley, 1995) and by their children's abilities and ages (Cielinski, Vaughn, Seifer, & Contreras, 1995; Gutman & Feinstein, 2010; Landry et al., 2001; Roach, Barratt, Miller, & Leavitt, 1998). Enhancing parents' communication behavior has received attention in EI research (e.g., Bruder, 2010; Warren, 2000). In order to enhance their responsive communication, parents participate in their children's interventions, ideally in their homes (i.e., the natural environment). Consequently, these reviewed studies support the concept that increasing parents' responsiveness has a positive impact on their children's language outcomes.

Unfortunately, children's behavior can inhibit or short-circuit parents' responsiveness (Guralnick, 2011):

> Parents' ability to adjust family patterns of interaction to their vulnerable children is often substantially compromised as a result of the unusual and often uneven development and behavioral patterns displayed by the children as well as the

> complexity of components that constitute their child's development resources and organizational processes. (p. 17)

Parents may feel discouraged when children avoid eye contact or speak unintelligibly. In the preceding review of several studies, I noted that parents of typically developing children respond to children's progress, delivering language at a level commensurate with their children's abilities and needs, yet also provide models that foster growth. With responsive parent communication, children can improve their length of utterances and their vocabulary diversity, and the process becomes an iterative one.

However, without parent responsiveness, a child with a language delay is less likely to accelerate in language development, which can lead to breakdowns in parent-child interaction (Guralnick, 2011). Warren and Brady (2007) noted that children with language delays may exhibit behaviors and characteristics that inhibit maternal responsiveness. Specifically, the authors stated that a child's "slow response time, gaze avoidance or atypical eye gaze, or unintelligible speech…may be disruptive to parental responsivity" (p. 334). Parents of children with disabilities tend to be less responsive and more directive (i.e., offering help or suggestions) in their communication interaction with their children, which is negatively correlated to children's language development (Masur et al., 2005; McDuffie & Yoder, 2010; Venuti, de Falco, Esposito, & Bornstein, 2009). Conversely, parents increase responsiveness when children are engaged and interactive (Kim & Mahoney, 2004). It is evident that positive changes in one communication partner (i.e., either parent or child) can positively affect the other partner's

communicative behaviors. Further exploration is needed to determine the most optimal behaviors and the lasting extent of this iterative change process.

In a study by Walden (1996), nonfamiliar observers were shown 7-sec video clips and asked to judge the social interaction between parents and their children with and without language delays. The judges were to watch specifically for social "looks" (p. 2083). A social look was defined as an attempt at joint attention or initiation of interaction. The authors determined that these judges incorrectly interpreted social looks in children with language delays. Parents may be less likely to interact meaningfully and engage their child in play and communication if they do not detect attempts at communication by their children.

Interventions have targeted and positively impacted parent responsiveness (Warren & Brady, 2007). In the previously described study by Haney and Klein (1993), all participating mothers received home visits, about half participated at an intervention center, and the others participated in a mothers' group at the homes of various participating mothers. As a result of participating in home-based service delivery, mothers were more likely to be rated "'talks to their child while doing her work,' 'encourages developmental advance,' and 'structures child's play periods'" (p. 19).

Therefore, interventions can enhance parent responsiveness and parent-child interaction by encouraging parents to follow their children's interests and to recognize and respond to their children's communication attempts. This encouragement is more important for parents of children with language delays or other disabilities (Guralnick, 2011; Warren & Brady, 2007). This review illustrates the importance of parents'

responsiveness, including the need for contingent communication (Cress et al., 2008; McDuffie & Yoder, 2010; Shimpi & Huttenlocher, 2007; Warren & Brady, 2007) and the need to encourage parent responsiveness when they have children with disabilities. Later in this chapter I review literature targeting parent responsiveness through interventions. However, home interventions do have logistical and financial difficulties, which I discuss below. In addition, I will discuss and justify using distance technology to deliver home-based EI interventions that focus on parent implementation of language interventions.

The Case for Distance Training and Coaching in EI

Home-based service delivery presents various challenges. In this section I will discuss (a) the challenges of home-based service delivery, (b) the advantages of distance training, and (c) the pitfalls of distance training. Parents are becoming more comfortable using technology for learning purposes (Porter & Edirippulige, 2007). Technologies for communicating and sharing data across the internet are becoming ubiquitous and may offer solutions to the challenges of home-based service delivery in EI. In order to capitalize on internet technology and parents' use thereof, the advantages and possible difficulties in distance training must be understood and addressed.

Challenges of Providing EI Services in the Home

The main challenges of providing EI services in the home relate to costs (i.e., time and money), scheduling difficulty, and a limited number of EI service providers. Segal et al. (2003) stated that mileage reimbursement is a costly feature of programs that require EI service providers to travel to families' homes. In addition to travel costs, time on the road is time during which home EI service providers are not delivering services. Shelden

and Rush (2001) noted this loss of time due to travel, and added the frustration of cancellations, meaning travel time and monetary cost are wasted without the benefit of service provision. Johnson, Brown, Chang, Nelson, and Mrazek (2011) conducted a cost analysis of providing EI services in the home environment, and found that on average, travel costs accounted for 28.4% of the total cost of providing services per family. For families who lived very far from the clinic, travel could account for more than 100% of the average cost of service provision per family. Tarr and Barnett (2001) conducted a cost analysis of EI services and also found travel time costly. Reduction or elimination of travel expenditures would benefit EI service providers in both reduced financial expenditures and in more efficient service delivery.

There are challenges when scheduling EI services in the home. Segal et al. (2003) found busy family schedules were identified as the prime challenge when providing EI services. In addition, if the family is receiving multiple services in the home, coordinating schedules becomes more complex and cumbersome (Shelden & Rush, 2001). Both of these studies found that scheduling was an obstacle when providing home-based EI intervention.

In addition, there is a lack of trained EI service providers. In a literature review by Symon (2001), numerous studies cited parents' concern for the lack of services and resources in their area. In areas of low population, especially for children with low-incidence disabilities (e.g., children who are DHH or children with visual impairments), the time and expense of providing in-person home-delivered services can inhibit the availability of services. Duggan, Windham, and McFarlane (2000) found similar

concerns in a literature review, where "home visitors" (p. 256) were training parents to help their children with medical issues. Parents identified insufficient contact time with their service providers and a lack of local services and resources as challenges. Parents suggested frequent phone calls between home visits to "check in" with parents.

Finally, difficulties in providing EI services in the home can derive from safety issues. Shelden and Rush (2001) acknowledged that home-based service providers may feel unsafe in some neighborhoods where they are visiting families. Salisbury, Woods, and Copeland (2009) conducted a study in which service providers were trained to coach parents in their homes during the Chicago Early Intervention Project. This project was focused on the parent-child relationship and encouraged interaction within the families' typical routines using toys and other materials found in the homes. Home service providers were surveyed after home visits and noted feeling unsafe in the neighborhoods and specifically in the apartment buildings due to poor or no lighting in stairwells, poor construction, or inadequate maintenance of stairs.

In addition to safety factors, home service providers noted that family members were at times uncomfortable with their presence (Salisbury et al., 2009). The service providers felt the need to stay in the same rooms as the parents so the parents could "watch" them. The implication was that the home service providers did not feel they were trusted. Additionally, home service providers stated that some families had rooms in the house that were "off limits" (i.e., stay out of the living room, or stay out of the kitchen). Tisot and Thurman (2002), in calling for sensitivity to families preferences, stated, "one family may have an open door policy in their home toward outsiders,

whereas another family may be extremely private and essentially close their house to others" (p. 68). Salisbury et al. (2009) contended that EI home service providers perceived the sessions as less efficient when families had neighbors or relatives visiting who would either distract the children or participate ineffectively in the session. Reducing these concerns and stressors for both the family and the home visitor, through a less intrusive form such as distance technology, may improve the efficacy of the intervention.

Advantages of Distance Training

One of the more innovative and recent practices of training in various areas of specialty is distance training. Simonson, Smaldino, Albright, and Zvacek (2006) defined *distance education* as "institution-based, formal education where the learning group is separated, and interactive telecommunications systems are used to connect learners, resources, and instructors" (p. 31). Since the focus of this dissertation is distance training, I will use that term when describing or referring to educating parents on intervention with their children. There was little information regarding delivering distance training to parents of children with disabilities. Consequently, my review of literature relating to distance training and parents is limited, but I have reviewed several studies that focused on distance training in a variety of areas, such as mental health intervention training, preservice teacher training, and training parents in medical techniques for their children.

Distance training has several advantages: reduction in travel costs of the EI service provider, ease of scheduling for both families and EI service providers, more time

to engage in parent collaboration, and a reduction of the safety issues and concerns previously described. Provided the family has access to the internet in their home, distance training could save travel time and money (Lifter et al., 2005; Rock, Zigmond, Gregg, & Gable, 2011). Canceled sessions, even those canceled with little notice, would not result in lost travel time and travel cost. Whereas delivering home services can cost between $14 and $112 for service provider time and $10 to $122 for fuel reimbursement (Olsen et al., 2012) the distance between family and service provider would not be a factor in the cost of providing services through distance training (Rock et al., 2011). Scheduling would likely become easier for the EI service provider as they would not have to factor in time for travel (Hamren & Quigley, 2012).

Additionally, removing travel time may allow more time for the EI service provider to work with additional families on his/her caseload. Applying distance training to EI would not be a complete solution to the lack of qualified personnel, but it may be a beginning. I could not locate studies that investigated the benefit of distance training on the lack of qualified service providers; however, it seems evident that a reduction in the travel time of EI service providers may result in more time to deliver services to more families, thus affecting the issue of lack of qualified service providers. Time saved by reducing travel might enable EI service providers to work with more families, or to work with each family for a longer amount of time. Further, safety concerns regarding neighborhood and building conditions (Shelden & Rush, 2001) would be reduced through online visits.

In addition, family concerns about the EI service provider seeing only part of their home, could be addressed. For example, the parent could arrange the technology (i.e., a webcam) so that he/she could control which home settings were seen by the EI service provider. Cancellations due to mild illness of the EI service provider, illness in the family, and weather conditions would be alleviated through distance training (Hamren & Quigley, 2012). The preceding situations illustrate that distance training may alleviate some of the challenges inherent in home-based service provision.

Asynchronous learning, in which information is posted by users at different times and discussions take place over time, allows for "treatment on demand" according to Moore et al. (2011). These authors conducted a review of empirical literature regarding *asynchronous* computer-based interventions for patients "with substance-related disorder that was not alcohol or tobacco" (p. 216). The authors concluded that the asynchronous nature of their program allowed for treatment during high-risk times, repeated viewing of training modules as necessary, and completion of programs at the patients' own pace.

Segal et al. (2003) reported similar results in a study of a service for parents delivering mental health interventions to their children. This intervention was not delivered online but parents asynchronously accessed the intervention through a CD-ROM with interactive multimedia. Parents reported the advantages of determining their own pace, sequence, and selecting the more relevant learning content for their needs. Researchers agree with parents about access to information. For example, in a position paper about communities of practice, Turnbull et al. (2010) noted that establishing

credible sources of information online would provide a living and ongoing connection from parents to professionals and researchers.

Other studies have focused on the advantages of *synchronous* distance training. For university students in a teacher education course at a university, Pickering and Walsh (2011) developed a program for observing classroom teachers and their students via online videoconferencing. The classroom teacher installed a webcam and university students observed the classroom teacher and her students together in real time. The university professor took opportunities to draw students' attention to key aspects of the classroom teacher's and her students' behaviors on camera. The above-mentioned difficulties of scheduling and transportation were alleviated for an entire class of undergraduate students. Additionally, fewer classroom teachers were needed for observation. Perhaps the most beneficial finding was that there was no disruption to the students and classroom teacher being observed. Traditionally, observation entailed one or two students observing a classroom teacher in person, and the classroom students were often distracted by the observers. Similarly, a parent and child may find it easier to focus on their interactions without the physical presence of an EI service provider.

Rock et al. (2011) described a program for synchronous coaching for classroom teachers. In this program, the researcher used a laptop and viewed a classroom teacher via online video (Skype™). The classroom teacher wore a bug-in-ear (BIE; i.e., Bluetooth headset) through which the researcher provided coaching hints, prompts, and instant feedback. Another study was conducted in which classroom teachers were observed by an administrator on Skype™ who gave instant feedback over a BIE

(Goodman, Brady, Duffy, Scott, & Pollard, 2008). Administrators targeted teacher-student interaction, seeking to increase the amount of *learn units*, which were defined as "antecedent, student behavior, and consequence" (p. 208). Administrators prompted the teacher to deliver a question or correct a student's response. Goodman et al. cited the advantage of immediate feedback rather than delayed feedback which classroom teachers may receive days or weeks after a visit from an administrative supervisor. Teachers in this study all acquired and maintained the target skills for working with children with various disabilities.

Advantages of distance training for EI service providers visiting young children with disabilities have been examined in the literature. Lalios (2012) described a program in which the EI service providers and parents communicated via videoconference while the parent interacted with his/her child who was DHH. According to Lalios, the EI service providers were experienced teachers, audiologists, and speech-language pathologists working with children who were DHH. Specifically, these EI service providers specialized in a spoken language option, "auditory-verbal therapy" (p. 356). Technology included computers, web cameras, and broadband internet. The "professional is able to guide and coach the parent regarding ways to make auditory information and spoken language as salient as possible for child. The parent has ample opportunity to practice strategies, ask questions, and troubleshoot ideas" (p. 360). Parents reported high levels of satisfaction with the technology, the information they received, and the benefits they saw in their children's skills and abilities. Parents also reported simpler scheduling, fewer cancellations, more consistent contacts, and decreased

family stress. While this was a program description with only anecdotal evidence, it is important information and encouraging that programs using distance learning are being developed and valued by both service providers and parents.

In another anecdotal program description, Stith, Stredler-Brown, Greenway, and Kahn (2012), explained a program, TeleCITE, that was developed to coordinate and deliver services from a distance to families with children with cochlear implants. The authors surveyed EI service providers, who felt that in distance coaching "more time in the session is dedicated to the implementation of coaching techniques" (p. 399) than in-person sessions. It seems that meetings may be more efficient through the physical absence of the EI service provider or by the nature of meeting from a distance. Other benefits of the EI service provider's physical absence have been discovered. In a program description by Blaiser et al. (2012), researchers noted that families become more active participants during distance sessions. They concluded that the physical presence of the home visitor may lead to more direct contact between the service provider and the child rather than the parent and the child. This is corroborated by Hamren and Quigley (2012) who stated that "because the visitor is not physically present, the parent must become the primary/exclusive facilitator of the child's communication and language" (p. 405). EI service providers in Lalios' (2012) study reported similar sentiments.

It is clear that distance training alleviates some of the challenges of providing services in the home. Distance training also has been found effective in (a) streamlining visits for teacher candidates (Pickering & Walsh, 2011; Rock et al., 2011), (b) providing instant coaching and feedback without physical presence (Goodman et al., 2008; Lalios,

2012; Stith et al., 2012; Blaiser et al., 2012; Hamren & Quigley, 2012), and (c) for asynchronous interactions that can be captured and shared for years through listservs or blogs (Turnbull et al., 2010).

Challenges of Distance Training

Some challenges also have arisen in distance training. The main challenge is that even in this time of ubiquitous technology, some families may not have access to hardware (e.g., laptop, tablet, or smartphone) or internet with adequate bandwidth (Davis, Hopkins, & Abrahams, 2012; Lalios, 2012; Stith et al., 2012). Even with access to technology and internet, learners still may not be versed in web-based learning technology and may be intimidated by this new frontier (Lalios, 2012; Lifter et al., 2005).

Although studies and accounts presented above claim the time and financial savings of distance training, Stith et al. (2012) warned that distance training sessions may require planning that in-home visits may not. For example, if the service provider and parent need to use similar materials or view similar information, finding a way to share materials must be determined and planned in advance. Blaiser et al. (2012) estimated that planning, scheduling, and providing feedback for distance training can take about an hour in addition to the session itself. Although this may be true for some types of programs, it is likely that there would be this sort of preparation time when providing a home-based service, as well.

Session format or purpose may also preclude distance training as a venue for service provision. Davis et al. (2012) suggested that services provided in a group format may not lend themselves to distance training. This may be the case if users are not versed

in technology for group videoconferencing. Communication could also be impeded by faulty technology and poor sound quality. In the case of any such difficulties, these authors recommended in-person sessions to supplement distance training sessions. Cohn and Cason (2012) also warned that not all consumers avidly use technology, especially for didactic or group instructional purposes. It seems that EI service providers will need to provide training in relevant technology or be prepared to supplement distance training with another form that is more comfortable for learners.

Finally, security on the internet is a concern for service providers. Confidentiality requirements apply in distance training and in-person service delivery alike. Cohn and Cason (2012) encouraged encrypting, conducting risk analyses for privacy, security, and Health Insurance and Portability Accountability Act (HIPAA) compliance when using a voice-over internet provider (p. 218). Security concerns can be met but may add additional cost to a distance training program.

In light of the preceding challenges, researchers have offered several recommendations for optimizing distance training. Bernard et al. (2004) cautioned against creating on-screen copies of existing paper materials and information. They stated that the internet has the capacity for (a) presenting information via multimedia in various interesting formats, interactive programming for allowing user input and participation; and (b) collecting data and continually monitoring learner progress. For parents searching the internet independently for information, Zaidman-Zait and Jamieson (2007) expressed concern that information presented to a general audience on the internet can be (a) inaccurate, (b) too plentiful and overwhelming to parents, or (c) not extensive

enough to answer specific questions. For the general public, obtaining information on the internet may be difficult. Parents may not be able to sort helpful, accurate information from the inaccurate or unreliable, and to sort through multiple results.

Davis et al. (2012) stated that distance training should be supplemented with in-person service provision. For sessions to be conducted online, the EI service providers should get to know the family, noting (a) the activities the family likes to do together, (b) the materials and toys they use regularly, and (c) the goals the parents are working on with their children (Stith et al., 2012). These authors also offered practical advice, such as feeding the children and making sure they have been to the bathroom before beginning an online session.

Optimal conditions for effective distance training are still being explored. Using the above recommendations, further research should be conducted to determine effective content delivery and satisfactory procedures. With regard to providing services from a distance for parents of children with disabilities, distance training may (a) reduce money (Lifter, 2005; Olsen et al., 2011; Rock et al., 2011; Segal et al., 2003) and time spent traveling to visit families (Johnson et al., 2011; Shelden & Rush, 2001; Tarr & Barnett, 2001); (b) ease scheduling (Hamren & Quigley, 2012; Shelden & Rush, 2001); (c) reduce cancellations (Hamren & Quigley, 2011; Lalios, 2012); and (d) reduce safety concerns for EI service providers (Salisbury et al., 2009; Shelden & Rush, 2001; Tisot & Thurman, 2002). It is also important to consider the possibility of more efficient meetings (i.e., more time on task; Salisbury et al., 2009; Stith et al., 2012) and empowering collaboration (Blaiser et al., 2012; Hamren & Quigley, 2012) through distance training.

Language Interventions for Young Children with Disabilities: A Review of the Literature

Extensive research has been conducted to develop and examine interventions to promote language and communication growth for young children with disabilities. Language development is important for social and cognitive development (Aram, 2008; Hart, 2000; Pence & Justice, 2008; Rous & Hallam, 2012; Warren & Brady, 2007) and successful early language development facilitates later literacy success and school readiness (Hart & Risley, 1995; Kaiser & Roberts, 2012). Therefore, it is important to deliver effective interventions to young children with disabilities as early as possible (Hart & Risley, 1995; McLeod & Harrison, 2009; Warren, 2000).

According to Kaiser and Roberts (2012), interventions aimed at improving the language outcomes of young children should acknowledge that children are naturally communicative, that interventions should be implemented in children's natural environments, and that parents should be trained to implement language interventions. The following is a review of recent literature examining interventions for children with various disabilities. I chose 10 studies that represented effective implementation of interventions with and without parent involvement in a clinical setting and in a home setting. I rejected studies that were mere descriptions of programs or interventions without efficacy data. The first five studies were based in a clinical or therapeutic setting; four involved parents minimally and one included parents as implementers of the interventions. Four studies were home based *and* involved parents as implementers. The final study (Kaiser & Roberts, 2013) was a group study that was set both in a clinic and

homes, and compared effects of parent and therapist and therapist-implemented intervention. I chose these 10 articles to provide a range of the settings and methods used to deliver language interventions for young children. According to Meadan, Ostrosky, Zaghlawan, and Yu (2009), when reviewing and evaluating interventions for young children, several questions should be asked:

> (a) Does the implemented intervention have strong scientific support? (b) Was the intervention implemented correctly (i.e., procedural fidelity measures)? (c) Does the research method control for external and internal validity? (d) Are the outcomes positive and important? (e) Are the outcome data reliable (i.e., reliability measures)? (f) Are the outcomes generalized (i.e., generalization and maintenance measures)? and (g) Are the goals, procedures, and outcomes socially or clinically important (i.e., social validity measures). p. 102

Further, Horner et al. (2005) set forth criteria for establishing evidence-based practices (EBP) in single-case design studies. These include (a) description of participants and settings, (b) operational definition of independent variables (IVs) and dependent variables (DVs), (c) demonstration of experimental control, (d) external validity, and (e) social validity. In addition to these requirements, the What Works Clearinghouse (WWC; Kratochwill et al., 2010) published standards to establish rigor in single-case research design (SCRD) studies. The WWC standards for rigorous SCRD studies include: (a) systematic manipulation of the IV by the researcher, (b) systematic measurement of the DV by more than one assessor, and (c) three attempts to demonstrate an intervention effect.

Kratochwill et al. (2010) described how researchers should meet the WWC SCRD standards. To demonstrate systematic measurement of the IV, the researcher must determine "when and how the independent variable conditions change" (p. 14). To

demonstrate systematic measurement of DV, measurement must be conducted by two or more assessors, interobserver agreement (IOA) data must be collected in every phase (e.g., coaching) and condition (e.g., baseline, maintenance) for a total of 20% of all sessions, and if reporting IOA as a percentage, it should be above 80% in each phase. Finally, to show making three attempts to demonstrate intervention effect, Kratochwill et al. listed several designs (e.g., reversal/withdrawal, multiple-baseline) that qualify depending on the number of phases or baselines. An important requirement is that each phase ideally contains five data points, but studies can be determined "Meets with Reservations" if they have 3-4 data points per phase.

Barton and Fettig (2013) evaluated the rigor of studies involving parent training and parent-implemented interventions using WWC SCRD standards. Under systematic manipulation of the IV, Barton and Fettig used a dichotomous scale (i.e., present, not present) to indicate whether the study met the criterion. For the measurement of intervention fidelity (IV) and implementation fidelity (i.e., the DV), they used a dichotomous scale to indicate whether IOA was assessed during at least 20% of the sessions and that IOA was greater than 80%. Barton and Fettig noted the importance of assessing and reporting both fidelity on parent training procedures and parents' implementation of their newly acquired skills. Without proper implementation of both, it would be impossible to attribute any changes in children's behaviors to the intervention. Next, they also used a dichotomous scale to indicate whether there were at least three attempts to demonstrate intervention effect. Finally, to indicate whether studies met WWC standards, they used a trichotomous scale of "(a) *Meets Standards* if they provided

five or more data points per condition and met all other design standard criteria, (b) *Meets Standards with Reservations* if there were three or four data points per condition and they met all other criteria, and (c) *Does Not Meet Standards* if there were fewer than three data points per condition or the case failed to meet any other criteria" (Barton & Fettig, p. 209). I will use the procedures described above in Kratochwill et al. (2010) and Barton and Fettig to determine whether the single-case studies included in my review of language interventions met WWC SCRD standards.

Finally, Barton and Fettig (2013) also evaluated the study quality of group studies involving parent implementation. They set the following standards based on a set of quality indicators in Gersten, Fuchs, Coyne, Greenwood, and Innocenti (2005): "(a) random assignment, (b) comparable groups, (c) adequate description of the intervention and comparison condition, (d) the use of multiple outcome measures, (e) reliability of outcome measures, (f) evidence of validity of outcome measures, (g) fidelity of intervention reported, (h) effect size reported or computable with information provided, and (i) attrition is reported and is lower than 30%" (Barton & Fettig, p. 209).

The purpose of this review is to explore the varying types of interventions being implemented and the procedures for delivering those interventions, including (a) how researchers defined participants, settings, IV, and DV (Horner et al., 2005); (b) assessments of generalization, maintenance, and the social validity of interventions (Horner et al., 2005; Schwartz & Baer, 1991; Wolf, 1978); and (c) the ways in which researchers ensure rigorous research design (Barton & Fettig, 2013; Kratochwill et al., 2010). Table 1 contains summary information for participants, social validity,

generalization, maintenance, and role of parents in the interventions. I referred to the requirements in Horner et al. (2005) to determine whether studies meet single-case requirements of (a) description of participants, settings, IV, and DV; (b) external validity (i.e., generalization of effect); and (c) social validity. While Horner et al. also listed some criteria for rigorous single-case methodology, the WWC SCRD standards are more recent and more thorough. Therefore, I used the procedures described above in Kratochwill et al. and Barton and Fettig to determine whether the studies included in my review of language interventions met WWC SCRD standards (see Table 2). Finally, I used the standards for evaluating group comparison (Barton & Fettig) to evaluate the study quality of the two group studies (Kaiser & Roberts, 2013; Kouri, 2005) in my review of language interventions (see Table 3).

Table 1

Summary of Studies Targeting Children's Language and Communication Abilities

Study	Role of Parents	Setting	Procedural fidelity	Social Validity *Assessed Variable*	Generalization of Effect	Maintenance of Effect
Craig-Unkefer & Kaiser 2002	Consent	Clinic	93%			
Hancock & Kaiser 2002	Gen. Sessions	Clinic	98% Responding 86% Expanding	Parent Survey *Outcomes*		
Hester et al. 1996	Implement	Clinic		Parent Survey *Procedures/Outcomes*		
Ingersoll et al. 2005	Gen. Sessions	Clinic			Child gains generalized[a]	
Kaiser & Roberts 2013	Implement	Clinic & Home	100%		Parent strategy use across activities	√
Kouri 2005	Gen. Sessions	Clinic	96% Mod-AB 94% MEI		Child gains (clinic to home setting)	√
Mobayed et al. 2000	Implement	Home		Parent Survey *Procedures/Outcomes*		√
Peterson et al. 2005	Implement	Home		Parent Survey *Procedures/Outcomes*		√
Schertz & Odom 2007	Implement	Home		Parent Survey/ *Procedures/Outcomes*		√
Woods et al., 2004	Implement	Home			Some gains generalized to other activities	√
Totals			4	5	4	6

[a]Gains generalized from sessions with clinician to sessions with parents

Table 2

Determination of Evidence-Based Practices Using WWC SCRD Standards

Study	Manipulation of IV	DV repeatedly measured	IOA ≥ 20%	IOA≥ 80%	At least 3 attempts	5 data points/ phase	WWC standards met
Craig-Unkefer & Kaiser 2002†	√	√	√	√	√	√	Meets
Hancock & Kaiser 2002	√	√	√	√	√	√	Meets
Hester et al. 1996	√	√	-	-	√	√	Does Not Meet
Ingersoll et al. 2005	√	√	√	√ *	√	√	Meets
Mobayed et al. 2000	√	√	-	√	√	√	Does Not Meet
Peterson et al. 2005	√	√	-	√	√	√	Does Not Meet
Schertz & Odom 2007	√	√	-	-	√	√	Does Not Meet
Woods et al. 2004	√	√	√	√*	√	√	Meets
Totals	8	8	4	6	8	8	4

[a]Manipulation of independent variable
[b]Dependent variable measured repeatedly
[c]Interobserver agreement (IOA) reported for at least 20% of sessions across conditions and behaviors
[d]IOA reported to be greater than 80% across conditions and behaviors
[e]The study has at least three attempts to demonstrate intervention effect
*Measure assessed/reported for either parent(s) or parent trainers, but not both

Table 3

Determination of Evidence-Based Practices in Large Group Comparison Studies

	Random Assign-ment	Comparable groups	IV and comparison described	Multiple outcome measures	Reliability of outcomes	Validity of outcome measures	Fidelity of IV reported	Effect size	Attrition <30%
Kaiser & Roberts 2013	√	√	√	√	-	-	√	√	√
Kouri 2005	√	√	√	√	-	-	√	√	Not Reported

Note. IV = Independent variable

Therapist-Implemented Interventions

Promoting lexical growth through play has been found to improve school readiness and language development (Hart & Risley, 1995; Hayiou-Thomas, Harlaar, Dale, & Plomin, 2010). Craig-Unkefer and Kaiser (2002) conducted a single-case, multiple-baseline study across dyads to examine the effectiveness of organizing children's play and preteaching vocabulary necessary for the play situation. Three-year-old children with language delays were placed in dyads within the preschool classroom for play sessions, and a researcher helped the children plan play sessions by teaching the children the names and functions of the toys and asking the children how they might interact with each other using the toys (e.g., grocery store checkout). During the play session the children were allowed to play independently with occasional redirection (i.e., modeling, direct instructions, and indirect instructions) from the observing researcher to "maintain and sustain interaction" (p. 6). Following the interaction portion of the session, the researcher and children reflected on the play session. The DVs in this study included the children's verbal engagement, diversity and complexity of language, and the frequency and complexity of the children's play.

Through 8 weeks of intervention, the children used more words in quantity and diversity, increasing their average mean length of utterance (MLU) by .6 and increasing their total number of words by 42.6 (range -2 to 75) and total number of different words per session by an average of 38.5 (range 15 to 70). The quantity of social and cooperative play increased for each child from baseline to intervention. Procedural fidelity was observed and measured at 93% (90-95%). Social validity, generalization, and maintenance were not assessed in this study.

Kouri (2005) compared two interventions, mand-elicited imitation (MEI) and Modeling-Auditory Bombardment (Mod-AB), targeting vocabulary growth for children with specific language impairment (SLI). She conducted a large group study, included 29 preschool children aged 19 to 36 months who were able to produce single-word utterances. During the MEI the interventionist used mands and required a response from the child following the mand. The interventionist moved from open-ended questions (i.e., "What do you want?") to mands including a model (i.e., "Tell me bubble;" p. 162). The interventionist only delivered mands related to predetermined target objects that were included in the play situation.

In the Mod-AB intervention the child participated in three-phase sessions. First, the child listened to an audio recording of target words while the interventionist displayed picture cards corresponding to the target words. This phase was called Auditory Bombardment (AB). Then the child and interventionist interacted and the interventionist modeled the names (i.e., labeled) of the target items as the child played with the items. Finally, the interventionist repeated the AB phase. The purpose of this study was to compare the effects of these two interventions on children's vocabulary growth with regard to the targeted words. Specifically, children's language samples were assessed for production of the target words, spontaneous production of the target words, spontaneous utterances without target words, and the number of sessions to the acquisition of target words.

Among the statistically significant findings, children in the MEI group acquired more target words, spontaneously produced more target words, and required fewer sessions to acquire target words. However, during generalization sessions conducted in

the home with parents, children did not differ in these areas. Children in the Mod-AB group showed increases in their use of target words that they did not show during treatment sessions. It appeared that "Mod-AB participants were more likely to communicate with caretakers who were not constantly modeling to them" (p. 168). Therefore, both treatments were effective in teaching children the meaning of target words and in fostering production of those target words. Procedural fidelity was observed for both interventions and measured at 96% (94-100%) for Mod-AB and 94% (85-95%) for MEI. This study did not contain an assessment of social validity.

Hancock and Kaiser (2002) implemented a language-enhanced milieu teaching (EMT) intervention with children with ASD aged 35 to 54 months. They conducted a single-case multiple-baseline across participants study in a university-based clinic room containing two adult chairs, a small table with child-sized chairs, and play materials for the child. The researchers delivered the intervention directly to the children in the study; parents were introduced to the intervention strategies during the generalization phase in the home through observation. The intervention consisted of EMT strategies (i.e., environmental arrangement, responsive interaction techniques, prompting, and modeling). The purpose of this study was to determine the effect of EMT strategies on children's language development. Specifically, researchers measured children's MLU, TTR, and number of utterances during baseline and intervention sessions. The children were also assessed using the *Peabody Picture Vocabulary Test—Revised* (PPVT-R; Dunn & Dunn, 1981) and the *Expressive One-Word Picture Vocabulary Test—Revised* (EOWPVT-R; Gardner, 1990). The researchers conducted follow-up sessions to assess children's maintenance of gains made during intervention sessions.

Children in this study made rapid gains, although the type and magnitude of gains varied across children. Three children increased their spontaneous utterances and vocabulary diversity (i.e., TTR), and two children increased their MLU from baseline to intervention. Two of the children generalized, and in some cases showed increases in all areas, one child generalized total utterances and diversity, and one child generalized spontaneous utterances. For these two children, the areas that were not generalized only showed a slight decrease from intervention performance, and generalization data were greater than baseline data. Two of the four children increased their total utterances between intervention and generalization to home sessions.

Hancock and Kaiser (2002) did not assess children's generalization to other adult partners (e.g., parents) or maintenance of skills. Treatment fidelity was observed and measured for two interventionist variables: (a) 98% for responding to children's communication, (b) and 86% for expanding children's utterances. To assess social validity, the researchers surveyed parents about their satisfaction with the effects of the training. Parents were positive about their children's gains in language development and indicated they were anxious for the generalization settings when they would be able to learn "the secret" of the intervention (p. 49).

Ingersoll, Dvortcsak, Whalen, and Sikora (2005) implemented a developmental, social-pragmatic (DSP) intervention with three boys with ASD aged 30 to 46 months. The treatment was delivered by a speech and language pathologist (SLP) and involved following the child's lead, environmental arrangement, acknowledging all communicative attempts as purposeful, appropriate affect, and indirect language stimulation. Appropriate affect involved labeling children's emotions if they became

frustrated or upset, and indirect language stimulation involved using language to describe the child's physical play (e.g., "Press the clay. Press. Press clay."). The purpose of this intervention was to increase children's social interaction and general communication ability (i.e., turn-taking, language production, and spontaneous language production).

During the baseline phase, intervals with spontaneous language production were low and stable, whereas during the intervention phase, all children increased the mean percentage of intervals with spontaneous language production and verbalized more frequently with parents and the SLP. Generalization sessions were conducted weekly in the same setting with the parents on days when intervention sessions were not conducted. "Parents were instructed to 'play with your child as you do at home'" (Ingersollet al., 2005, p. 216).

All children increased the mean percentage of intervals with spontaneous language production during generalization sessions; however, visual data analysis for one child showed a continuous increasing trend from baseline through intervention conditions. Two children began to generalize immediately, when intervention began, which is an especially encouraging result from this study. If children begin to generalize their gains in language production across interaction partners, they should have more interaction in quality and quantity as their interaction partners respond to their gains (Cress et al., 2008; Venuti et al., 2009; Vigil, Hodges, & Klee, 2005; Warren & Brady, 2007). Procedural fidelity was observed and measured at 90% (84-96%). No maintenance or social validity data were collected in this study.

Parent-Implemented Interventions

Clinic-based studies. Hester, Kaiser, Alpert, and Whiteman (1996) conducted a study that contained several layers that were assessed for effectiveness: (a) researchers trained trainers, (b) trainers trained parents, and (c) parents implemented strategies with children. These three levels were assessed for effectiveness (i.e., outcomes). For the purposes of this literature review, I restricted my review to the training delivered to the parents and the outcomes for parents and children.

Six parent-child dyads participated in the Hester et al. (1996) study. Children in the study had varying disabilities, including Down syndrome, ASD, and language delays. Parents were instructed in milieu language teaching (MLT) strategies, including modeling, mand-model, time-delay, and incidental teaching. Through visual data analysis it was clear that parents used the targeted strategies more often as a result of training. This visual presentation of data was the extent of reporting on procedural fidelity. However, there is no way to discern the percentage of correct versus incorrect implementation. Further, these authors did not report procedural fidelity for trainers' procedures.

Children also responded more frequently during the intervention phase. The researchers examined the number of strategy-use episodes in which parents correctly delivered more than one strategy in order to obtain correct responses from the children (i.e., complex episodes). For example, if a parent asked a child a question and the child did not respond, a complex episode would include restating the question to provide multiple chances for the child to respond. Complex episodes may also include rephrasing the question or using modeling as a follow-up to a mand. During the baseline phase, 7%

of the correct episodes were complex episodes. The percentage of correct complex episodes during intervention were not reported, but visual data analysis indicated that parents reached higher percentages of correct complex episodes during the intervention phase.

Hester et al.'s (1996) parents completed a questionnaire containing items related to the training they received and the benefits of the training. Parents reported that after training they were more effective language trainers and their children's communication skills had improved. They indicated that information handouts were helpful and they approved of the training procedures. Finally, parents reported using targeted strategies at home with their children. Other than this item on the questionnaire, generalization and maintenance data were not collected for parents' and children's outcomes.

Home-based studies. Children with ASD often require training in pivotal skills (e.g., joint attention) which, when acquired, can lead to gains in multiple areas of development (Koegel, Koegel, & Carter, 1999). Kaiser and Roberts (2012) suggested that "social attention and prelinguistic behaviors are fundamental to language learning and use" (p. 299). Schertz and Odom (2007) studied the effects of teaching parents of young children with ASD prelinguistic social-communicative skills. Three parents and their children with ASD, aged 23 to 33 months, participated in this single-case multiple-baseline design study across targeted outcomes. Children were assessed in the five domains using the *Modified Checklist for Autism in Toddlers* (M-CHAT; Robins, Fein, Barton, & Green, 2001) and tested below their chronological ages in all areas. The two lowest scores were in the communication and social/emotional domains for all children. Parents were trained using the Joint Attention Mediated Learning (JAML) manual

(Schertz, 2005) and the Mediated Learning Strategies Curriculum (Kahn & Hosaka, unpublished). Intervention sessions included training and collaboration, parent-child interaction, and feedback portions.

The overall intervention was comprised of four phases: (a) focus on faces, (b) turn-taking, (c) responding to joint attention, and (d) initiating joint attention. Parents' and children's performance data were analyzed and social validity was assessed through a survey when the intervention ended. Maintenance data were collected on each targeted behavior once the next targeted behavior became the focus. One maintenance session was conducted for all targeted behaviors 5 weeks after the conclusion of intervention.

Parent outcomes were reported as a degree of procedural fidelity. The parents were coded as implementing with (a) full fidelity (8-85%), (b) partial fidelity (0-46%), and (c) no fidelity (15-46%). Two of the three parents "showed close fidelity with weekly intervention plans while [one parent] showed difficulty with conceptual understanding of turn-taking and joint attention, resulting in less adherence to the appropriate phase of intervention" (p. 1567). Children's scores improved with the introduction of the parents' use of the intervention strategies. All children had a higher and more variable level of face-to-face behavior, for which they simply had to look at any part of their parents' faces. Turn-taking in the baseline phase was also more variable for all children than responding to joint attention and initiating joint attention. Both of these initial skills improved with intervention. For responding to and initiating joint attention, two of three children showed low and stable baseline performance and began responding to and initiating joint attention with intervention. One child remained at baseline levels for both of these skills, initiating only twice in four sessions and never responding to joint

attention. This was the child whose parent did not implement the intervention with high fidelity.

For the maintenance session, which was conducted 5 weeks after the end of intervention, all children maintained their intervention levels for all targeted skills. Parents reported that their children were beginning to produce words in daily life that they hadn't produced before. One child imitated his grandmother who "said, 'See ya,' and he goes 'Ee ya'" (Schertz & Odom, 2007, p. 1570). The researchers also noted the onset of verbalizations during sessions. This is an ancillary gain that has been observed in other studies when pivotal skills were targeted (Sulzer-Azaroff, Hoffman, Horton, Bondy, & Frost, 2009; Wetherby & Woods, 2006).

In Schertz and Odom's (2007) postintervention survey, parents reported that the intervention purposes and procedures were satisfactory. "Making my own decisions about which materials or toys to use in daily activities" (p. 1569) was a high-scoring item, but one parent stated that when things were difficult she would rather be told what to do. Parents' mean responses were lower with regard to outcomes for their children (e.g., "I am satisfied with my child's progress in responding to joint attention;" and "I am satisfied with my child's progress in initiating joint attention;" p. 1569).

Mobayed et al. (2000) studied the effects of an intervention for teaching parents to implement a mand-model procedure with their young children with language delays. They conducted a multiple-baseline design across four parent-child dyads. The children, aged 24 to 31 months, had varying disabilities: multiple genetic anomalies, expressive language delays, and DDs due to prematurity. The children's receptive language, as assessed with the *Hawai'i Early Learning Profile* (HELP; Furno et al., 1985), ranged

from 6 to 15 months below chronological age. Their expressive language ranged from 6 to 17 months below chronological age.

The intervention was conducted in the home using the children's toys and typical activities. Mobayed et al. (2000) provided written instructions and oral presentations about how to incorporate mand-model procedures into daily activities. Parents were taught to (a) obtain joint attention, (b) provide a mand, (c) wait for a response, (d) repeat the mand if needed or provide the desired activity and positive verbal feedback if the child responded correctly, (e) wait for a response, (f) provide a model if needed or provide the desired activity and positive verbal feedback if the child responded correctly, (g) wait for a response, and (h) provide the desired activity while repeating the model if needed or with verbal positive feedback if the child responded correctly. This was a complex procedure that parents may implement in part naturally (Hester et al., 1996), but a question may be raised about parents' ability or tendency to provide further prompting (i.e., modeling and repeated mands) when children have language delays and may not respond correctly after one mand.

Parents in the Mobayed et al. (2000) study did not correctly implement the mand-model procedure during the baseline phase, but they did learn to implement the procedure correctly with training. Parents' average use of correct mand-model procedures during the coaching phase ranged between 31 and 53% overall. The lowest percentage of correct mand-model procedures for any parent in a coaching session was 19%, and the highest was 77%. This was the only measure of procedural fidelity; procedural fidelity was not measured for parent trainers. The children began to produce target requesting words when the parents used the mand-model procedure, and they began to produce these

without prompting. The authors collected maintenance data and both parents' and children's gains were maintained after intervention.

Parents completed a survey to express their satisfaction with the intervention effectiveness, quality of the training and information provided, and satisfaction with the intervention procedures. Parents were highly satisfied in all areas. Generalization data were not collected, but as the study was conducted in multiple daily activities within the families' homes, the authors were positive about the generalizability of the results.

Children from homes with multiple risk factors (i.e., "low SES, low education levels of parents, high degree of life stress, multiple chronic problems, minority group status, family size and limited life support to buffer these stress factors" [Peterson et al., 2005, p. 95]) are more likely to experience delays in language and communication development (Butera, 2005; Hart & Risley, 1995). Peterson et al. (2005) studied the effects of teaching EMT to parents in three multiple-risk families with children aged 24 to 43 months. Researchers provided weekly training sessions in the families' homes, and taught the strategies of (a) environmental arrangement; (b) responsive interaction (i.e., descriptive statements, imitation, and expansions); and (c) incidental teaching (i.e., modeling, mand, mand-model, and time delay). Each week the researchers brought toys, books, or puzzles that the families were able to keep for their own use.

The DV in the Peterson et al. (2005) study was parent-child language interaction. Specifically, the researchers coded the parents' use of the targeted strategies and the children's comments and correct responses to parents' use of strategies. Researchers conducted language sampling and children's MLU data were reported to show growth in language complexity. Children's development was also assessed with standardized

testing (i.e., *Sequenced Inventory of Communication Development, Revised Edition* [SICD]; Hedrick, Prather, & Tobin, 1984). Because of the number of different skills taught to parents and because parents may prefer one strategy over another, the researchers surveyed parents to ascertain their perceptions of the helpfulness of each strategy.

All parents showed an increase in their use of MLT strategies with the introduction of training. Two parents increased their use of responsive interaction (RI) strategies (i.e., descriptive statements, imitations, and expansions) during the RI phase, while one parent used these strategies at a higher rate during the baseline phase. All parents increased their use of incidental teaching strategies (i.e., modeling, mand, mand-model, and time delay). Parents' use of imitations, models, mands, and mand-models decreased with the introduction of the final strategy (i.e., time delay). This is not surprising because time delay requires significantly more time to implement. All children experienced increases in their MLU (range 0.9-1.4), and gained 8 to 12 months growth in expressive language and 4 to 12 months growth in receptive language as measured by the SICD.

On the parent survey, descriptive statements, imitation, expansion, and mand-model were "very helpful" strategies for all parents. Modeling was "helpful" for two parents and "very helpful" for one parent, mands were "very helpful" for two parents and "helpful" for one parent, and time delay was "helpful" for one parent, and "very helpful" for two parents. These findings indicate that overall parents find MLT strategies beneficial for improving their children's communication skills.

The Peterson et al. (2005) study is important because it shows that despite stress

factors, parents were able to learn and implement strategies known to promote children's communication growth, and children experienced gains that were disproportionately large for the amount of time spent in intervention; children spent 30 weeks in the intervention phase and their MLU gains corresponded to a year or more of growth. Researchers conducted 3- and 6-month maintenance sessions and both parents and children maintained gains from intervention. As with the Mobayed et al. (2000) study, generalization data were not collected, but the authors hoped that by conducting intervention in the home during daily activities, the skills would generalize to other family activities.

Woods et al. (2004) studied the effectiveness of teaching four mothers to implement language teaching strategies with their children aged 15 to 31 months with DD, social communication delays, expressive language delay, and hypotonia. Two targeted strategies for this study were chosen for each mother "to build on strategies that already were being used, but that could be improved in terms of frequency or quality of implementation" (p. 181). Possible choices were praise, gestural/visual cues, modeling, imitation, choices, expansions, open ended questions, and waiting. Target areas for children included frequency of (a) vocalizations, (b) spontaneous words and phrases, and (c) one- to three-word phrases.

Researchers held training sessions in the homes and mothers (a) were given handouts defining the strategies and giving examples of possible uses for the strategies, (b) described the strategies in their own words to solidify their learning, (c) viewed videotape segments of other parents using the strategies and discussed these with the researcher, (d) watched as the researcher modeled the strategies with the child, and (e)

practiced the strategies with their children until they were able to demonstrate three uses of the strategies during the same play routine. Visits occurred weekly, but the procedures described above only occurred with the introduction of a new strategy (i.e., during two visits). Weekly visits after the introduction to a strategy reinforced and monitored the use of strategies. The authors did not identify criteria for moving from phase to phase.

Strategies were chosen for the four mothers: two received training in modeling and gestures, one received training in expansions and open-ended questions, and one received training in time delay and open-ended questions. All parents implemented the strategies with low frequency during the baseline phase, with the exception of one mother using open-ended questions. All mothers implemented their targeted strategies with higher frequency after training and during subsequent sessions for targeted strategies. Visual analysis of the data showed that mothers' implementation was variable in the intervention phase, but all performed higher than baseline levels. These data were the only measure of procedural fidelity, and the authors did not indicate a percentage of correct versus incorrect uses of strategies.

The researchers collected data for generalization to other activities throughout intervention and found that three of the eight targeted strategies were generalized. During maintenance sessions, all mothers continued to use targeted strategies above baseline levels and near intervention levels for all but two strategies (i.e., modeling and expansions). Social validity was not assessed.

Parent- and Therapist-Implemented Intervention

Kaiser and Roberts (2013) conducted a large group study comparing the impact on children's language outcomes as a result of (a) therapist-implemented communication

strategies and (b) therapist- and parent-implemented communication strategies. Seventy-seven children between 30 and 54 months of age and their caregivers participated in the study. The researchers collected observational, norm-referenced, and parent-reported data at the beginning of the study, directly after the intervention, 6 months after intervention, and 12 months after intervention. Children were chosen for participation in the study if they had a "nonverbal IQ between 50 and 80 as measured by the *Leiter International Performance Scale-Revised* (Leiter-R; Roid & Miller, 1997), total language standard score less than the 11th percentile on the *Preschool Language Scale 4* (PLS-4; Zimmerman et al., 2002) and an MLU between 1.00 and 2.00 as measured in a standardized 20-min language sample" (Kaiser & Roberts, 2013, p. 298). These measures were used to compare children's growth after participating in the intervention. All parents were observed to determine the "quality and quantity of home stimulation and support available to the child" using the *Home Observation for Measurement of Environment* (Caldwell & Bradley, 1984) and their use of EMT strategies before, during, and after the intervention.

About half of the children participated in the "therapist only" intervention, in which therapists delivered intervention to the children in the clinic (24 sessions) and in the home (12 sessions). The authors stated that the parents did not observe the clinic-based sessions, but did not specify whether this was the case for home-based sessions. While the second group of children received the same therapy as the first group, their parents were also trained in EMT strategies. The training involved a workshop introducing the strategies, and follow-up sessions to reinforce the EMT strategies individually. Each of these sessions included a "parent-implemented EMT session"

(Kaiser & Roberts, 2013, p. 301), providing the parent an opportunity to practice with his or her child, followed by a review session to provide feedback to the parent. Parents were trained to use EMT strategies in activities of their choice, and they were observed in both the trained activities and untrained activities to assess generalization across activities.

Kaiser and Roberts (2013) predicted that when evaluated 6 months after the intervention, children in the therapist and parent group would show greater gains in language outcomes, and that parents who delivered therapy to their children would use the targeted strategies (i.e., EMT) more frequently than parents who did not deliver therapy. At the close of the intervention phase, the children in both groups experienced gains; the difference in gains between the two groups was statistically insignificant. Parents who were trained in EMT strategies learned to implement them with fidelity. When evaluated 6 months after intervention, children whose parents were trained in EMT strategies had a significantly higher MLU, diversity (i.e., "number of different words," p. 299), and production of target words than children in the "therapist only" group. The researchers attributed this outcome to the use of EMT strategies by the parents who received training.

Because Kaiser and Roberts (2013) delivered therapy in the clinic and home for all children, there was not an assessment of generalization for children from clinic to home. The parents were assessed for generalization across activities and maintenance of EMT strategy use. Parents maintained their use of EMT strategies over time and generalized their use of EMT strategies from trained to untrained activities.

Determining EBP and Research Methodology Rigor

Because the studies included in this review utilized differing methodologies (e.g., group comparison, single-case) and components (e.g., parent or researcher implementation), they require examination using differing standards. The single-case design studies (Craig-Unkefer & Kaiser, 2002; Hancock & Kaiser, 2002; Hester et al., 1996; Ingersoll et al., 2005; Mobayed et al., 2000; Peterson et al., 2005; Woods et al., 2004) will be examined using Horner et al.'s (2005) standards regarding (a) description of participants and settings, (b) operational definition of IV and DV, (c) demonstration of experimental control, (d) external validity, and (e) social validity. The rigor of single-case studies' methodology (e.g., manipulation of IV and DV repeatedly measured) will be examined through the WWC SCRD standards (Kratochwill et al., 2010). The group comparison studies (Kaiser & Roberts, 2013; Kouri, 2005) will be examined using the methods described in Barton and Fettig (2013).

I also make a distinction between parent- and therapist-implemented interventions. Interventions that include training and coaching parents are likely to increase generalization and maintenance of effect (Dunst, 2007; Roberts & Kaiser, 2011; Warren et al., 2008). Therefore, while the standards of single-case research apply and may have been met in the therapist-implemented intervention studies, the studies that employed parent training may be more predictive of success for future parent training interventions.

Determination of EBP in Therapist-Implemented Interventions

The therapist-implemented intervention studies reported gains for children in language and social communication growth. Kouri (2005) used a group comparison but

did not report measures for reliability or validity of outcomes, and, therefore, did not meet the requirements for rigorous research (see Table 2). Without reliability of outcomes (e.g., Cronbach's alpha) or validity (i.e., construct validity) of outcome measures, it is difficult to understand relatedness among outcome measures or to predict externality (Gersten et al., 2005). The three studies used single-case design (Craig-Unkefer & Kaiser, Hancock & Kaiser, 2002; Ingersoll et al., 2005). These met two of the criteria of EBP in single-case research: (a) the interventions, settings, and participants were operationally defined; and (b) procedural fidelity was documented and of high-quality (Horner et al., 2005). They also met the WWC SCRD standards (see Table 2).

While the above single-case studies met most criteria for rigorous single-case design studies, some concerns should be discussed. The interventions showed positive gains for the participating children, but it is impossible to determine whether interventions could be delivered regularly by teachers in the preschool setting or whether the teachers approved of the intervention procedures. This is a concern especially when considering that interventionists in the Hancock and Kaiser (2002) study had years of experience working with young children with disabilities and were trained initially and supervised weekly during intervention. Teachers who may be expected to implement these strategies may not have this level of experience or supervision. Furthermore, because social validity, maintenance, and generalization data were not uniformly collected in these studies, conclusions about the (a) acceptability of goals, outcomes, and procedures; (b) lasting effects of gains by children; and (c) generalizability of those gains to other environments and individuals are limited (Horner et al., 2005). One study (Craig-Unkefer & Kaiser, 2002) did not assess social validity, maintenance, or

generalization. Hancock and Kaiser (2002) collected generalization data when they moved intervention sessions from the clinic to the home. Parents were satisfied with intervention outcomes for their children, but the acceptability of procedures is not known. Ingersoll et al. (2005) collected generalization data that indicated intervention effects were generalized from the researcher to the parent during parent-child sessions.

One major concern with the therapist-implemented intervention studies is that the researchers examined interventions delivered from the research teams to the children. Kaiser and Roberts (2012) recommended that children receive support throughout the stages of language development, and, therefore, parents should be involved as implementers. In a review of literature, Roberts and Kaiser (2011) found no statistical difference in gains for children when therapists or parents implemented language interventions. Therefore, parents can be taught to deliver interventions with fidelity, and because parents can deliver interventions during more of their children's waking hours (Warren, 2000; 2007), children have more exposure to high-quality interventions when parents are involved. "Parents' linguistic input and interactional strategies affect children's language development. Parent training to support language development in children with language impairments is an effective early intervention" (Kaiser & Roberts, 2012, p. 300). With these concerns in mind, I reviewed the following studies that involved parents as intervention implementers.

Determination of EBP in Parent-Implemented Interventions

The studies of parent-implemented interventions reported gains for children in language and social communication. They met the following criteria of EBP in single-case research: (a) the interventions, settings, and participants were operationally defined;

and (b) parents' procedural fidelity was documented and high quality (Horner et al., 2005). Because the targeted strategies and training procedures were similar across studies, it may be reasonable to conclude that the results are generalizable to larger populations. The targeted strategies included responsive interaction, incidental teaching, milieu language teaching, and enhanced milieu language teaching, which are all naturalistic intervention strategies. All studies reported that parents learned to implement the targeted strategies and children made gains as a result. Procedures were acceptable to parents (Hester et al., 1996; Mobayed et al., 2000; Schertz & Odom, 2007), parents approved of the intervention purposes (Peterson et al., 2005), and parents reported higher self-efficacy (Hester et al., 1996; Schertz & Odom, 2007). Only one study did not assess social validity in any way (Woods et al., 2004). Likely because parents were trained to implement the strategies, the skills maintained over time (Mobayed et al., 2000; Peterson et al., 2005; Woods et al., 2004) and generalized across activities and settings (Mobayed et al., 2000; Woods et al., 2004).

Woods et al. (2004) was the only study I reviewed that met the WWC SCRD standards for rigorous research methodology. All of the parent-implemented intervention studies met the following WWC SCRD standards: (a) manipulation of the IV, (b) repeated measurement of the DV, (c) three attempts to demonstrate intervention effect, and (d) five data points per phase (see Table 2). Interestingly, none of the studies of parent-implemented interventions assessed procedural fidelity for parent training. Mobayed et al. (2000) and Peterson et al. (2005) collected IOA in each phase and maintained a minimum of 80% agreement, but they did not stipulate whether they collected IOA on 20% of sessions. The WWC SCRD standards require both intervention

fidelity (i.e., procedural fidelity for training parents) and implementation fidelity (i.e., parents' implementation of learned skills). Without these, any change in the parents' or children's behavior cannot be attributed to the intervention.

Procedural fidelity was reported on parents' implementation of the interventions (i.e., implementation fidelity; Barton & Fettig, 2013); however, three studies did not report this as a percentage of correct implementation (i.e., [correct instances / (correct instances + incorrect instances)] x 100; Hester et al., 1996; Peterson et al., 2005; Schertz & Odom, 2007; Woods et al., 2004). The visual presentation of data demonstrates increased frequency of parent use of strategies; however, without a ratio it is difficult to determine if parents decreased incorrect implementation instances. Using a strategy incorrectly is poor practice in applied behavior analysis interventions and may not benefit children who benefit from predictability (Woods et al., 2011).

Determination of EBP in a Parent- and Therapist-Implemented Intervention

One study compared the differential effects of a therapist-implemented intervention and a parent-implemented intervention in which parents were trained to deliver interventions (Kaiser & Roberts, 2013). This study met the requirements of group comparison studies (Barton & Fettig, 2013) with the exception of reporting reliability of outcomes and validity of outcome measures (see Table 3). Without these, it is difficult to understand and predict relatedness among outcome measures or to predict externality (Gersten et al., 2005).

Summary of the Review of Literature

The studies summarized in this review targeted language development in young children with varying abilities and risk factors. Regardless of the ability levels of the

children, the interventions involved interaction with adults who were trained to deliver teaching strategies. Four studies involved MLT (Hancock & Kaiser, 2002; Hester et al., 1996; Ingersoll et al., 2005; Peterson et al., 2005) and reported gains with children with ASD, Down syndrome, and children identified as "at risk." Other studies involved teaching strategies that were components of MLT (Kouri, 2005; Mobayed et al., 2000; Schertz & Odom, 2007; Woods et al., 2004) and were reported as effective for children with ASD, DD, specific language impairment, hypotonia, expressive delays, and delays in social communication. One study reported communication improvement for children with DD, Down syndrome, and ASD (Kaiser & Roberts, 2013) through the use of EMT strategies. Craig-Unkefer and Kaiser (2002) investigated children interacting with each other under the direction of an interventionist who pretaught target vocabulary. Researchers found this intervention effective for children with language delays and behavior issues. Children in these studies ranged in ages from 15 to 60 months.

Parents approved of all intervention procedures and outcomes when these were assessed. Researchers who assessed social validity used written surveys and asked about parents' satisfaction with procedures and outcomes of the interventions. Training methods for parents included written handouts, video clips, oral presentations, direct modeling with children, and feedback for parents following parent-child interaction sessions in which parents implemented teaching strategies. Parents in one study enjoyed the freedom to set activities and session goals, but desired more direction when interaction became more difficult with their children (Schertz & Odom, 2007). Typically, intervention sessions were held 1-2 times per week for about an hour.

MLT and EMT strategies, therefore, may be effective in promoting language

development for young children with various disabilities: (a) children with Down syndrome, and language delays (Hester et al, 1996); (b) children with multiple genetic anomalies, language delays, and DDs (Mobayed et al., 2000); (c) children from multiple-risk families (Peterson et al., 2005); (d) children with ASD (Hancock & Kaiser, 2002; Hester et al., 1996; Ingersoll et al., 2005; Schertz & Odom, 2007); and (e) children with DDs, social communication delays, expressive language delays, and hypotonia (Woods et al., 2004), specific language impairment (Kouri, 2005); and language delays (Craig-Unkefer & Kaiser, 2002). Parents may be trained to implement these strategies and their use of strategies may be expected to maintain over time (Hester et al., 1996; Mobayed et al., 2000; Peterson et al., 2005; Schertz & Odom, 2007; Woods et al., 2004) and generalize to different settings or activities (Kouri, 2005; Woods et al., 2004). Optimal dosage (i.e., frequency and duration of training sessions) is yet unknown and there is a paucity of literature regarding distance training (e.g., via internet) of parents in language interventions to use with their young children.

Although this review of literature yielded quality descriptions of intervention practices, the conclusions that can be drawn regarding effectiveness are limited. Only one of the studies (Woods et al., 2004) met the WWC SCRD standards, and this study did not report fidelity of implementation. Therefore, in that study, claims about the effectiveness of the intervention are less certain. Measures of maintenance, generalization, procedural fidelity, and social validity were collected in about half of the studies. Of the studies that included parent training and coaching, only one reported procedural fidelity, three reported social validity of procedures and outcomes, none reported social validity of goals, two measured generalization of effect, and five reported

maintenance of effect. These measures must be collected and reported in order to make a case for training and coaching parents in the use of naturalistic teaching strategies for communication. Further research is needed to examine the effectiveness of these practices.

The Parent-Implemented Communication Strategies (PiCS) Project

Meadan, Angell, Stoner, and Daczewitz (2014) developed a home-visiting, family-centered intervention package for working with families of young children with language delays. The goal of this project was to determine whether training and coaching improved parents' use (i.e., frequency and quality) of naturalistic and visual teaching strategies designed to increase the social-pragmatic communication of their children. The researchers used a single-subject multiple-baseline design to evaluate the effectiveness of the intervention (Kazdin, 2011).

The PiCS project included 11 families over 3 years with each family participating for approximately 4 months. A coach from the PiCS team visited each family's home for (a) training in naturalistic teaching strategies (i.e., environmental arrangement, modeling, mand-model, and time delay); (b) coaching in each of these naturalistic teaching strategies; (c) training in visual teaching strategies (i.e., visual schedules, visual task analyses, and visual rule reminders); and (d) coaching in each of these visual teaching strategies. A separate PiCS team member collected baseline, probe, and maintenance videos during parent-child interaction.

During the naturalistic teaching strategies training sessions, the PiCS coach delivered instruction to teach the parents about the teaching strategies using (a) flowcharts explaining the teaching strategies, (b) written examples of a parent using the

teaching strategies, and (c) professionally produced and scripted video clips of parents using the teaching strategies. To facilitate incorporation of the teaching strategies into family routines, the PiCS coach and parent listed examples of when the parent could use the teaching strategies in activities with the child. Together the coach and the parent completed an action plan describing routines in which the teaching strategies could be used and included parent goals for each session.

Following the training session, the parent was coached in the naturalistic teaching strategies over three phases: (a) environmental arrangement and modeling, (b) mand-model, and (c) time delay. The coach and parent met 2-3 times per week in the parents' homes. Each phase consisted of at least four coaching sessions. The criteria for mastery of a targeted teaching strategy were defined as: (a) the PiCS coach observed the parent using the teaching strategy with high quality at least four times during four coaching sessions, and (b) the parent rated his or her use of the teaching strategy as "good" or "very good" on a self-report form. A high-quality use of each teaching strategy was given if the parent (a) had joint attention (which included eye contact) with the child with regard to a desired item or activity, (b) delivered the targeted teaching strategy, (c) waited for the child to respond, (d) repeated the teaching strategy if the child did not respond, and (e) provided positive verbal feedback and the desired item. Once the parent met the criteria for mastery of the targeted teaching strategy, the next coaching phase was begun.

Coaching sessions included a preobservation conference, parent-child interaction, and a postobservation conference. During the preobservation conference, the PiCS coach and the parent completed an action plan for using the targeted teaching strategy, and the PiCS coach reviewed the steps involved in the teaching strategy with the parent. During

parent-child interaction the parent implemented the action plan while engaging the child in a daily activity (e.g., snack). The PiCS coach observed and video recorded the session. During the feedback portion, the PiCS coach and the parent reflected on the parent-child interaction, and the PiCS coach gave feedback to the parent on his or her use of the targeted teaching strategies.

After the third coaching phase (i.e., time delay), the parent received training in visual teaching strategies. This training consisted of the same modes of instruction as the naturalistic teaching strategies training, but included two separate training sessions. In the first session, the PiCS coach delivered instruction regarding visual teaching strategies, and then the coach and parent developed plans for creating visual schedules, visual task analyses, and visual rule reminder cards that would be used during family routines. During the second session, the PiCS coach brought materials (i.e., computer and Boardmaker™ software) and together the coach and parent created the final products. The parent verified the format, font size, color, and images used in the visual teaching strategies. Finally, the PiCS coach instructed the parent in the use of visual teaching strategies using the same criteria for mastery as were used for the naturalistic teaching strategies.

Each baseline, coaching, intermittent probe, and maintenance session called for the parent and child to interact for 15 min while the coach recorded the interaction. The PiCS team analyzed 10 min of randomly selected video, noting the frequency and quality of parents' teaching strategy use and the children's communication behaviors. For the first eight participating families, the PiCS coach traveled to the homes for each session.

For the final three participating families, the PiCS coach conducted the majority

of sessions using distance training and coaching. Specifically the internet, Skype™, Dropbox©, cell phones, and e-mail were used to communicate and share data. Parents were given a reference manual and received training in the use of all relevant technology.

Training sessions and the first coaching session of each phase were conducted in person. For all other coaching sessions the PiCS coach and parent met on Skype™. At the scheduled meeting time, the PiCS coach and parent signed in on Skype™ and established a video connection. The PiCS coach began the coaching session much the same way as sessions conducted in person. The parent and coach planned the intervention session, incorporating teaching strategy use into daily family routines. When the interactive session was planned, the PiCS coach and the parent scheduled a time later in the day or at the beginning of the next coaching session when they would conduct a 10-min feedback session. They then ended the Skype™ call, and the parent recorded an interactive session with the child for 15 min sometime during the day. The parent sent the video via Dropbox© to the PiCS coach, who then reviewed the session, observing the parent's use of targeted teaching strategies. At the scheduled time for the feedback session, the PiCS coach and parent signed in on Skype™ and the PiCS coach provided feedback related to that day's intervention session.

The PiCS team assessed project outcomes (i.e., parent use of teaching strategies), procedural fidelity for training and coaching sessions, interobserver agreement (IOA) for parents' use of teaching strategy and children's communication behavior, social validity, and parents' maintenance of teaching strategies over time (Meadan et al., 2014).

Parents used modeling and mands in the baseline phase with high quality, but all parents used the mand-model, time delay, and visual teaching strategies with high quality

throughout the training and coaching phases. Procedural fidelity was high with a range of 88 to 100% across all trainers. IOA was also high, with a range of 90.5 to 94.1% across eight families. Parents completed surveys after the naturalistic and visual teaching strategies phases, and all parents rated goals, procedures, and outcomes (i.e., social validity) as acceptable, rating all questions at an average of 4 or higher on a 5-point Likert scale.

Team members also interviewed the families after the intervention to assess social validity, and parents reported positive results and satisfaction with goals, procedures, and outcomes. It is important that, in addition to achieving targeted outcomes, participants value the goals, are satisfied with the procedures for meeting those goals, and feel the outcomes were sufficient for the time and effort expended (Horner et al., 2005; Wolf, 1978). For seven of the families, each being observed and coded for modeling, mand-model, time delay, and visual teaching strategies, there were 28 graphic displays with plotted performance data. For maintenance of teaching strategy use, parents in this project returned to baseline levels in 20 out of 28 graphic displays. Individual parents maintained performance using varying teaching strategies, possibly preferring one of the four teaching strategies. The researchers concluded that without ongoing coaching and feedback, parents may not maintain a high level of teaching strategy use over time.

Additionally, the team conducted a multiattribute utility (MAU) evaluation of the PiCS project (Stoner, Meadan, Angell, & Daczewitz, 2011), and found that the project met or exceeded all goals but three attributes (i.e., indicators of success in larger goals), and met all larger goals identified by PiCS team members, consultants, and participating families (i.e., stakeholders). Tools used in this evaluation included parent performance

data, fidelity checklists, team member interviews, family interviews, and the *Family Quality of Life Scale* (FQOL; Hoffman, Marquis, Poston, Summers, & Turnbull, 2006).

In the third year of the project when distance training was provided, all outcomes were similar to those reported above (Personal access to data, 2013). The project continued with the same goals, changing only those procedures necessary for implementing the project from a distance. Parents completed surveys and participated in face-to-face interviews, indicating satisfaction with project goals, procedures, and outcomes.

Specifically, parents indicated ease of use with nearly all aspects of technology. One family indicated they would prefer to use their own camera instead of the FlipCam™ provided. All families noted that there were occasional glitches in technology, but that these were rare and easy to fix (e.g., restarting laptop, resetting wireless router or internet modem). Parents indicated that conducting sessions from a distance was easier than having a coach because their home did not have to be tidy, their children did not act differently because of the presence of a nonfamily member in their home, and the sessions were easier to schedule. Therefore, the procedures developed by the PiCS team for distance training should be further implemented and assessed with more families and with children with varying disabilities, such as children who are DHH.

EI with Children who are Deaf/Hard of Hearing (DHH)

There is a strong case for EI with children who are DHH. Increasingly, state governments have recognized this and enacted legislation requiring newborn hearing screening ("Enacted universal newborn hearing screening legislation," 2013). Because some causes of deafness/hard of hearing are not detectable at birth, the Joint Committee

on Infant Hearing (2007) has recommended regular hearing checks at doctor visits. These organizations urged early identification, but the scope of this section will explain practices after a child is identified as DHH. This will parallel the earlier sections in this chapter with a review of literature in the area of DHH: (a) explaining the need for EI, (b) defining best practice in EI, and (c) making a case for distance training in EI.

The Need for EI for Children who are DHH

Studies have shown that early identification of a child with DHH, and thus earlier enrollment in EI services, yielded positive results for these children. Studies focused on children with DHH have investigated children's language development (Yoshinaga-Itano, 2003), social/emotional development (Yoshinaga-Itano), and school readiness (Bergeron et al., 2009; Calderon, 2000; Harrington et al., 2009). Yoshinaga-Itano stated "the first 6 months of life represents a particularly sensitive period in early language development, a window of opportunity for initiation of intervention services" (p. 14). Yoshinaga-Itano reviewed data from a longitudinal study to examine the difference in outcomes for children identified and enrolled in EI at an early age (i.e., within 6 months of birth) and contrasted with children identified and enrolled in EI at a later age (i.e., more than 6 months after birth). The target outcomes included expressive and receptive language, social-emotional development, and speech production. The author concluded that early identification followed by enrollment in EI services was correlated with more positive outcomes in all areas when compared to children who were identified later and subsequently received intervention later. Yoshinaga-Itano recommended that the first 5 years should contain ongoing intervention and progress monitoring as these years are the critical stage for language and communication development.

In a similar study, Harrington et al. (2009) found a positive correlation between early language skills and later school readiness for children with cochlear implants. Researchers measured children's language skills *Clinical Evaluation of Language Fundamentals—Preschool* (CELF-P; Wiig et al., 2004), cognitive skills *Wechsler Preschool and Primary Scale of Intelligence—Revised* (WPPSI-R; Wechsler, 2002), and school readiness *Bracken Basic Concept Scale—Revised* (BBCS-R; Bracken, 1998). These measurements were all taken in the year 2005 (Time 1) and 1 year later (Time 2). Children's ages ranged from 37 to 63 months at the beginning of the study, and they had received implants at ages ranging from 12 to 34 months. Some children had hearing aids between the ages of 2 to 24 months. The researchers controlled for these variables in their statistical analyses to isolate early language skills and parent-child interaction as the IV.

As expected, children who performed better in language skills at Time 1 also performed better at Time 2, performing at the level of typically developing same-age peers. These children also performed better on school-readiness tasks. The converse was also true: children with lower performance on language skills performed lower on school-readiness tasks. Further, age at identification and enrollment in EI services were related to school readiness, confirming the importance of early identification and services. These findings underscore the importance of early detection of hearing loss and enrollment in EI services in order to facilitate interaction and language input by parents (Cress et al., 2008; Girolametto et al., 2002; Haney & Klein, 1993; Hart & Risley, 1995; Landry et al., 2001; Masur et al., 2005; McDuffie & Yoder, 2010; Shimpi & Huttenlocher, 2007; van der Schuit et al., 2011).

Evidence exists that indicates that age of enrollment in EI is not the only important factor for children's early language development. In their correlational study, Sarant, Holt, Dowell, Rickards, and Blamey (2009) examined age at enrollment, cognitive ability, parental involvement, and degree of hearing loss as independent factors affecting language ability. Age at enrollment was not a significant factor for language ability. Parental involvement was a determining factor, and these researchers suggested that parental involvement acted as a "buffer against the effects of late diagnosis on language development" (p. 214). However, this study had a low sample size (N=57), especially in the number of children diagnosed early as DHH (18 children were diagnosed by 6 months of age); the median age at identification was 10 months, and the age at identification ranged from 1 to 51 months. The median age for entry into intervention was 15 months, and the age at entry into intervention ranged from 2 to 52 months. Other researchers urge earlier identification and enrollment in EI services, i.e., by 6 months of age (Calderon, 2000; Uhler, Yoshinaga-Itano, Gabbard, Rothpletz, & Jenkins, 2011; Yoshinaga-Itano, 2003) for children who are DHH. Thus, early enrollment in EI services *and* parental involvement are of utmost importance for children who are DHH.

Parents are often less interactive and responsive with their young children with varying disabilities (Guralnick, 2011; Walden, 1996; Warren & Brady, 2007) including children who are DHH. Koester and Meadow-Orlans (1999) conducted a study of parents of both hearing children and children who were DHH. The researchers observed parents interacting with their children and being "still" (i.e., not interacting) while children played, and coded the children's actions as "rhythmic activities" (e.g., cycling

feet, waving arms, closing and opening fists) or "look at mother/look away" (p. 397). Parents then completed the *Parental Stress Index* (PSI; Abidin, 1986) and results were compared to their children's behavior during observation of the parent-child interaction. Children who were DHH were rated "more distractible or hyperactive than their counterparts" (p. 398). According to Koester and Meadow-Orlans, parents saw repetitive actions and looking away as a sign of hyperactivity and not as a function of communication. The authors hypothesized that the repetitive behaviors could be a sign of interactive stress. Children who were DHH also turned away more often during interactive portions, but turned away less often when parents were being still. The authors interpreted this to mean that children felt overstimulated during interactions with their parents.

Deaf parents of children who are DHH seem to interpret these physical actions in the way hearing parents of hearing children interpret infants' babbling (Loots & Devise, 2003). Koester and Meadow-Orlans (1999) recommended that EI service providers encourage parents to acknowledge and respond to these nonsymbolic actions as communicative functions.

As stated above, children's early language abilities lead to school readiness (Bates et al., 2006; Bergeron, 2009; Calderon, 2000; Harrington et al., 2009; Hart, 2000; Smith & Gibbard, 2011; Yoshinaga-Itano, 2003) and are related to progress in other developmental domains (Yoshinaga-Itano). Parents have a direct impact on their young children's language abilities (Harrison & McLeod, 2010; Hart & Risley; Kim & Mahoney, 2004; Shimpi & Huttonlocher, 2006; Warren & Brady, 2007). Given that hearing parents of children who are DHH may not provide optimal interaction,

responsiveness, and language modeling (Spencer, 2004), EI services, especially those aimed at helping parents provide appropriate language modeling and interaction, are of utmost importance for parents of young children who are DHH (Guralnick, 2011; Walden, 1996; Warren & Brady, 2007).

Best Practice in EI for Children who are DHH

Best practice in EI for children who are DHH should incorporate all the best practices of EI discussed previously. In addition, Hintermair (2006) included parent empowerment, "participation, self-responsibility, and codetermination" and resource-oriented service delivery as a prime EI best practice for children who are DHH (p. 494). Resource-orientation refers to an individual's (in this case a parent's) tendency to capitalize on strengths as opposed to compensating for deficits. In addition, as consistent with best practices in EI, services for young children who are DHH should be family-centered and parent directed. Hintermair explained the need for supporting parents; parents with high stress and limited resources were found to be less responsive to their children which correlated negatively with child development. Further, in a confirmatory path analysis, Hintermair found that parental stress significantly impacted children's "socio-emotional problems" (p. 506).

Several researchers have emphasized the importance of family-centered service delivery for children who are DHH (e.g., DesJardin, 2006; Houston & Perigoe, 2010; Muma & Perigoe, 2010; Rice & Lenihan, 2005; Yoshinaga-Itano, 2013). DesJardin (2005) surveyed mothers of children who were DHH to examine their self-efficacy. Maternal self-efficacy was correlated with developmentally appropriate goal selection for their children, responsiveness, effective parent-child interaction, and greater use of

knowledge and skills learned through interventions. Therefore, as suggested by Hintermair (2006), collaborative relationships wherein EI service providers build on parents' strengths may lead to better outcomes for families and children.

Distance Training for Parents of Children who are DHH

EI service delivery concerns are applicable to children who are DHH. In addition, DHH has a low incidence (Gargiulo, 2012; Scarborough et al., 2004) which may result in underserving children who live in certain geographical areas. Jackson, Traub, and Turnbull (2008) interviewed nine parents of children who were DHH to ascertain the parents' experiences with early intervention service provision. A common theme for negative experiences was "limited access to services" (p. 95). While this sample size was not large, the participants were from varied settings (i.e., urban, suburban, and rural), community sizes, and geographical areas (e.g., the Northwest and the Northeast). These researchers did not indicate parents' specific challenges with regard to locating services. In another study, Proctor et al. (2005) surveyed Part C coordinators, service providers "appointed in each state to administer a comprehensive system of coordinated services" (p. 114) from 36 states. One survey item asked "Are services challenging to obtain?" (p. 120), and respondents were to indicate which services were challenging to obtain. The top response was "auditory-verbal therapy" with 63% responding "yes." Two other "challenging-to-obtain" services were "sign language" and "speech language therapy" with 46% and 29% responding "yes," respectively. For "auditory-verbal therapy," 16 respondents indicated the cause of this problem to be "staff unavailability" and two respondents indicated "cost." These researchers made a strong case for training EI service providers in "auditory-verbal therapy," as it received the least amount of state

money for personnel training each year.

Bradham, Houston, Guignard, and Hoffman (2011) surveyed EI service providers regarding strengths, weaknesses, opportunities, and threats in serving young children who are DHH. Providers listed "affiliations with national family support organizations, state/local family support services, and staff positions for parent services" (p. 186) as strengths. Providers listed "geographical challenges, lack of coordinated services, lack of leadership or inadequate training for new leaders, and lack of services" (p. 186) as weaknesses. Opportunities to overcome these weaknesses, were listed as "digital/electronic media, internet, email, websites, webcams, social media, and listservs" (p. 189). Threats included "funding, program development barriers, and parent involvement barriers" (p. 186). These studies illustrated parents' and service providers' perspectives and confirmed a service gap for young children who are DHH and their families.

Language and Communication Interventions

for Parents of Young Children who are DHH

Naturalistic teaching strategies for communication may be effective for children who are DHH. Auditory-verbal therapy is a common practice for this population (The AG Bell Academy for Listening and Spoken Language, 2014). While auditory-verbal therapy is not completely naturalistic, it includes some naturalistic components. Among the guidelines are early detection and amplification, collaboration with parents, parent coaching, and parent-child interaction. Less naturalistic is the practice of requiring the child to rely only on auditory sensations, to the exclusion of facial and gestural cues, to understand spoken language and interact with his or her parent. Eriks-Brophy (2004)

noted that "most children with mild to profound hearing loss can learn to communicate through oral language if provided with appropriate amplification, abundant language stimulation, and adequate opportunities to develop their residual hearing" (p. 22). Limited information on the specific coaching protocols is available, but parent modeling of language during parent-child interaction is a key component in auditory-verbal therapy (Eriks-Brophy; Neuss, 2006).

Dornan, Hickson, Murdoch, and Houston (2007) conducted a group comparison study in which children aged 2 to 6 who were DHH and their parents participated in auditory-verbal therapy once a week for "a minimum of 6 months" (p. 42). These children's pre- and postintervention language and communication measures were compared with those of hearing children. The researchers assessed children using (a) the PLS-4 (Zimmerman et al., 2002) for auditory comprehension, oral expression, and total language, (b) the *Peabody Picture Vocabulary Test—3* (PPVT-3; Dunn & Dunn, 1997) for vocabulary, and (c) the *Goldman-Fristoe Test of Articulation-2* (FRTA-2; Goldman & Fristoe, 2001) for articulation. Dornan et al. described the components of the intervention as "All children participating in this study were receiving regular audiological follow-up to ensure optimal amplification as well as weekly individual therapy in which parents were guided and coached as primary language models for their child" (p. 42). The experimental and control groups gained on all assessments significantly. At the end of intervention there were no significant differences in language abilities on all measures. This indicated that participation in auditory-verbal therapy may have mitigated delayed language development for children who are DHH. There is limited empirical research in which naturalistic teaching strategies were taught to parents

with methodology similar to that of the PiCS project (Meadan et al., 2014). The outcomes of Dornan et al. (2007) are promising for parent training and language outcomes for children who are DHH.

Based on the above review of literature, there are several gaps in the extant research that focus on training parents in naturalistic teaching strategies to foster communication growth in their children who are DHH. As stated at the conclusion of the review of literature on language interventions, only one study met the WWC SCRD standards and can, therefore, be counted as evidence-based support for the practice of training parents in language interventions for their young children with disabilities. There is also limited empirical evidence for the practice of training parents of children who are DHH in any type of intervention. Finally, the distance approach to service delivery is quickly gaining support (e.g., Edwards et al., 2012; Hamren & Quigley, 2012; Houston, Stredler-Brown, & Alverson, 2012) but research is needed to provide support for best practice in procedures and to prove the viability of distance training and coaching as either a supplement or replacement for in-person service delivery.

Purpose

I have reviewed the literature on (a) best practices in EI, (b) distance training and coaching in EI, (c) language interventions for young children with disabilities, (d) the PiCS project, and (e) EI for children who are DHH. The PiCS project used best practices for EI and developed a distance training and coaching protocol to teach parents to implement naturalistic teaching strategies of modeling, mand model, and time delay to facilitate the social-pragmatic communication of their young children with varying DDs. Additionally, while there are studies similar to PiCS that support training of parents of

children who are DHH, there are no studies that have investigated training parents of children who are DHH through distance training and coaching. Consequently, training parents of children who are DHH in communication teaching strategies using distance training and coaching has the potential to provide effective and efficient intervention and produce positive outcomes for both families and children.

Therefore, the purpose of this dissertation is to implement the PiCS project with a parent of a child who is DHH. Because families like this one often do not receive EI services, especially in the natural environment, this project is a contribution to the literature regarding service delivery to children who are DHH, a low-incidence population.

Research Questions

1. Is there a functional relation between distance training and coaching for parents of children who are DHH on frequency and quality of naturalistic teaching strategy use?
2. How acceptable are the goals, procedures, and outcomes of the PiCS protocols, including service delivery in distance training and coaching for the parent who participated in this study?

CHAPTER III

METHOD

Overview of the Design

This study employed a single-case multiple-baseline across strategies design to assess the effectiveness of the PiCS project, an intervention package, with a parent and his young child who is DHH. This chapter includes a description of the methods used to conduct the current study, and it is organized to provide: (a) descriptions of the parent and child participants; (b) information on human participant safeguards; (c) descriptions of the research setting (i.e., family home); (d) description of the experimental design; (e) definitions of dependent and independent variables, (f) experimental conditions with procedures; (g) data collection methods; and (h) data analysis methods.

Participants

Two parent-child dyads began participation in this study, however one dyad withdrew from the study after one training and one coaching session. Data will be reported only for the parent-child dyad who completed the study. I chose pseudonyms for the family members. At the beginning of the study, the child, Anna, had a documented hearing loss with a pure tone average (PTA) of 55 dB or higher. Anna was diagnosed with several physiological conditions and disabilities, including hypotonia, hypothyroidism, dysphagia, and silent aspirations with thin liquids (for a comprehensive medical and family service history, see

Table 4). The father, Bob, indicated that his daughter had many interests, including animals, freeze-dried fruit, and car rides. Anna is a twin, and her twin sister is typically developing. This may have impacted the family dynamic and Anna's language development. (See Table 5 for more details regarding family demographics.)

Table 4.

History of Medical Diagnoses

Disabilities/Conditions	**Date of Diagnosis**	**Responsible Professional**
Hypothyroidism	2-3-12	M.D.
Hypotonia	unknown	M.D.
Dysphagia & silent aspirations with thin liquids	unknown	M.D.
Bilateral sensorineural hearing loss	6-4-12	M.D.
Delayed myelination	8-10-12	M.D.
Extra fluid in and around the brain	8-10-12	M.D.
Empty Sella syndrome	8-10-12	M.D.
Hyperopia	8-28-12	M.D.
Reflux	10-2-12	M.D.
Partial trisomy 16p13.11	unknown	M.D.
Constipation	4-8-13	M.D.
Ataxia	10-21-13	M.D.
Hypermobility	10-21-13	M.D.
Seizures	11-27-13	M.D.
Resolved Issues	**Date of Resolution**	**Responsible Professional**
Umbilical hernia	unknown	M.D.
Artery leaving the heart too small	unknown	M.D.
Hole between upper chambers of the heart	unknown	M.D.
Artery bypassing lungs still open	unknown	M.D.
Large fontanel	unknown	M.D.
Ear infection in left ear	8-28-12	M.D.
Immature visual system	10-2-12	M.D.
RSV & ear infection in right ear	2-15-13	M.D.
Ear infection in left ear, fluid in right ear	4-8-13	M.D.
Ear infection in left ear	11-27-13	M.D.

Table 5.

Family Demographics and Participating Child's Interests

Parent Characteristics		
Participating Parent (Bob)		*Spouse (Sara)*
Gender: Male		Gender: Female
Age: 25-35		Age: 25-35
Race: White/Caucasian		Race: White/Caucasian
Education: Bachelor's Degree		Education: Bachelor's
Annual Family Income: $25,000-45,000		Degree
Children's Characteristics		Nonparticipating Children
Participating Child (Anna)		Child 1 (Jake)
Gender: Female		Gender: Male
Age: 26 months		Age: 5 years, 6 months
Disabilities: See Table 4		Disabilities: None
Anna's Communication Habits		Child 2 (Lea)
Vocalizing, gesturing, reaching, pushing away, squealing, pointing, babbling, smiling, laughing, clapping.		Gender: Female Age: 26 months Disabilities: None
Participating Child		
Anna's Interests	Likes	Dislikes
Places:	Zoo, church, car rides	NA
People:	Anyone who will pay attention to her	NA
Objects and Toys:	Stuffed monkey, Mardi Gras beads	NA
Food and Drinks:	Milk, freeze-dried fruit	Fruit

Bob was a father of three children (Jake, Anna, and Lea) and he worked full-time outside the home. He was Caucasian, between 25 and 35 years old, and had earned a bachelor's degree. Bob worked for a local newspaper in a computer-related department. It was unclear how many services Bob was able to participate in. Bob stated that Sara participated in most of the services and that he tried to learn what he could from her. Overall, the family received services for about 5-6 hours in the home and 3 hours outside the home. These services included (a) speech therapy, (b) physical therapy, (c) occupational therapy, (d) developmental therapy, (e) emotional/social therapy, and feeding therapy. As an example of Bob's

level of involvement with his wife and children, he and wife Sara volunteered in vacation bible school, each night for a week after work, with their children. Additionally, Bob stayed home with the children for a week so Sara could attend a rare recreational trip with her friends.

Human Participants Protection and Recruitment

I obtained approval from my doctoral dissertation committee and the university's Institutional Review Board (IRB) to conduct this research (see Appendix A). Permission was obtained from agencies and service providers to post fliers (see Appendix B for permission form). Fliers were posted on bulletin boards at EI centers (i.e., Child Find services, Public Health Department Women, Infants & Children department) and given to EI service providers to distribute to potential participants. The fliers contained information regarding (a) the purpose of the study, (b) a description of procedures, (c) the duration of the intervention, (d) potential risks involved, and (e) possible benefits of participating in the study (see Appendix C for recruitment flier). Interested parents contacted me, and I explained the study and answered parents' questions (see Appendix D for phone script). A face-to-face meeting was held to describe the project (see Appendix E for project description script) and obtain parents' informed consent for (a) parental participation [see Appendix F for adult informed consent to participate and video capture form] and (b) Anna's participation [see Appendix G for parent permission for Anna's participation and video capture form]. Anna's assent to participate in the intervention was not obtained. Informed assent was not feasible due to Anna's developmental abilities, and the IRB approved a waiver of assent. At this meeting Bob and I also completed a family information form (see Appendix I) and a preintervention

social validity survey (see Appendix J). I conducted the preintervention interview (see Appendix K) with Bob via Skype™ at a later date.

Settings

I conducted this study with a family living in the rural Midwest. Bob, the participating parent, worked with his daughter, Anna, in various rooms in their home (e.g., Anna's bedroom and the kitchen). The coaching portions of each session were held over Skype™ with me, the coach in this intervention. Sessions were conducted via distance technology; I was in my home and Bob was in his home. Sessions took place in the kitchen and in Anna's bedroom. Because the family had two children in addition to the Anna, the mother cared for the children who were not participating in the study while Bob and I conducted training and coaching sessions. When the dyad interacted in the kitchen, Bob set up the camera and put Anna in a highchair. Visible in the video frame were Bob, Anna, toys and snacks at the table, and the refrigerator in the background. Family pictures and children's artwork decorated the refrigerator, and Anna often pointed to the family pictures and named her siblings. Behind Anna, outside the video frame, was the sliding door to the backyard, and she often turned around to look outside. Anna's bedroom contained two beds, two comfortable chairs, a window, a changing table, and several of Anna's favorite toys and stuffed animals. Activities varied, but Anna was often interested in the window, a box of baby wipes, and the blankets in her crib. I audio recorded all sessions with Bob using a digital recorder and captured parent-child interaction with Camtasia™, a software program that allows video recording of videoconference calls. The video recording was used for assessment of (a) procedural fidelity of coaching sessions and (b) Bob's and Anna's behaviors during parent-child

interaction.

Experimental Design

I used a single-case multiple-baseline across teaching strategies design, as described by Gast and Ledford (2010, Chapter 11) to evaluate intervention effectiveness. In this design, the researcher targets at least three behaviors to be changed by applying an intervention. The researcher collects baseline (i.e., preintervention) data on these targeted behaviors to determine the frequency or quality of their occurrence. Ideally, this frequency is: (a) stable, (i.e., 80% of the data points fall within 20% of the median line); and (b) at a level (i.e., zero-celerating) or contratherapeutic (i.e., not improving) trend before the intervention begins (Gast & Spriggs, 2010, Chapter 9). First, the intervention is applied to the first targeted behavior and data are collected on all targeted behaviors.

The two behaviors that are to be targeted next are the second and third behaviors. The researcher hopes to see improvement while the intervention is applied to the first targeted behavior, and also hopes to see no covariance (i.e., change occurring at the same time) with the second or third targeted behaviors. When the participant meets performance criteria for the target behavior *and* data are level and stable for the second target behavior, the researcher ends the intervention for the first targeted behavior and begins intervention on the second target behavior, repeating the analysis described above, and then targets the third behavior. Finally, when the participant meets performance criteria for the third behavior, the intervention is ended. At this point the researcher collects data to study maintenance of effect (i.e., the tendency of the research participant to continue behaving as under the conditions of the intervention).

Multiple-baseline across behaviors designs are effective for evaluating the success

of interventions on similar but not functionally related targeted behaviors. In order to demonstrate experimental control in this design, the researcher must choose to evaluate the effect of an intervention on at least three functionally independent behaviors. Gast and Ledford (2010, Chapter 11) suggested that researchers have established experimental control when, and only when, an increase in the targeted behavior is accompanied by the introduction of the intervention. Horner et al., (2005) referred to this as demonstrating a functional relation between the intervention and the DV, and argued this is crucial to establishing an evidence-based practice.

There are two key advantages of a single-case multiple-baseline design (Gast & Ledford, 2010, Chapter 11). First, this design allows for replication of effect for each participant (i.e., intrasubject replication), with no need to return to baseline conditions. This makes the multiple-baseline design ideal for nonreversible behaviors (e.g., adults learning to implement naturalistic behaviors). Second, as the intervention is targeted at second and third targeted behaviors, this design allows for analysis of maintenance of effect over time. Both of these advantages indicate that the multiple-baseline design is ideal for this study, in which Bob learned to implement naturalistic teaching strategies in their home with Anna.

Gast and Ledford (2010, Chapter 11) specified several challenges with multiple-baseline design: (a) difficulty monitoring multiple behaviors, (b) covariation, and (c) prolonged baseline phase for second and third targeted behaviors. The first concern is that it may be cumbersome to monitor targeted behaviors (Gast & Ledford, 2010, Chapter 11). To ensure that baseline behaviors are "zero-celerating" or demonstrating a "contratherapeutic trend" (p. 284), all behaviors must be monitored continuously.

Covariation, a threat to internal validity, is another possible concern. Covariation across tiers may indicate changes in behavior due to response generalization (Gast & Ledford). This means that participants are responding in other behaviors based on the intervention applied to the first targeted behavior. Finally, the third difficulty is a possible ethical concern. In a multiple-baseline across behaviors design, the second and third targeted behaviors do not receive intervention until the participant has reached performance criteria for the first targeted behavior. This may be an ethical concern if the second and third targeted behaviors are threats to safety that need immediate attention.

It is true that monitoring and coding video data in this study was rigorous and time-consuming. However, the coding system for this intervention had been developed and adjusted over 3 years and was effective and efficient for measuring parents' use of targeted teaching strategies (Meadan et al., 2014). This system will be described in the data analysis section. Second, to minimize the possibility of covariation, at least three behaviors were chosen that fit the following criteria: (a) the behaviors were functionally independent, so that second and third targeted behaviors were not impacted by the application of the intervention to the first targeted behavior; and (b) the behaviors were similar enough to assume that direct application to each individual behavior would result in the expected change (Gast & Ledford, 2010, Chapter 11). The ethical concerns of a prolonged baseline phase were not a concern since no targeted behaviors were a threat to safety.

General Procedures. For the majority of this study, I used the PiCS procedures for baseline, coaching, and maintenance phases. A description of these phases follows. I will first describe the materials used to replicate the PiCS study. I will then describe the

sessions and procedures that I replicated from the PiCS study. In the following section of this chapter, I will describe changes I made to the PiCS procedures.

Materials. I used forms from the PiCS project for this replication study. These forms included (a) parent self-report forms for each teaching strategy; (b) protocol form for first coaching sessions; (c) protocol form for each coaching session; (d) training handouts for each teaching strategy, including flowcharts and definition pages; (e) action planning forms; and (f) coaching feedback forms (see Appendices L-U). Bob captured the parent-child interaction with a webcam on his smartphone and I recorded this with Camtasia™, software that records video and audio from a computer screen.

For participation, Bob was required to have access to a computer, laptop, tablet, or phone that would allow videoconferencing. I used a desktop computer and an external hard drive borrowed from the Department of Special Education (SED) at Illinois State University (ISU) for communicating with Bob and for collecting, storing, and analyzing video data. For data coding, I used ProcoderDV™ (i.e., Procoder for Digital Video; Tapp, 2003). This software package allows the user to view and control digital video and apply codes to mark the time, category, and description of events occurring in the video. This software combines with MOOSES™ (i.e., The Multiple Option Observation System for Experimental Studies; Tapp, Wehby, & Ellis, 1995) to tally events and compile data once they are coded in ProcoderDV™. Finally, to plot Bob's and Anna's interaction behaviors, I used Sigma Plot™ (Version 12.0; Systat, 2012). All of these software packages are available commercially and I used the licenses purchased by SED at ISU. To analyze language samples, I used Systematic Analysis of Language Transcripts (SALT©). This program allowed for coding of Bob's and Anna's language production

and calculated MLU and TTR.

I used Skype™ to communicate with Bob. This software package allows users to communicate with videoconferencing and screensharing technology. Bob had the option of using a headset with a microphone or using one built into his smartphone. I also used e-mail to share documents with Bob.

Baseline phase. During the baseline phase, sessions were conducted one or two times per week. In this phase, Bob and I met on Skype™. I encouraged him to interact the way he usually would and to use typical materials and routines, and I observed for 15 min while recording the sessions using Camtasia™.

Coaching phases. There were three coaching phases: (a) modeling, (b) mand-model, and (c) time delay. All coaching sessions took place over Skype™. In the first coaching session, Bob and I established rapport (see Appendices O-T) [training handouts and coaching protocols]), and Bob discussed his short- and long-term goals for Anna and listed some favorite characteristics about her. He listed Anna's favorite snacks and play routines, along with her communication behaviors (e.g., waving to get parents' attention, pointing, and signing). I explained to Bob that he would be using this information to arrange the environment for communication. I then explained the environmental arrangement teaching strategy using an informational handout including graphics, definitions, and written examples demonstrating ways to use the teaching strategy correctly (see Appendix O for training handouts). I also displayed on my shared Skype™ screen a graphic that organized the environmental arrangement teaching strategy into three categories: (a) *pick*, in which the parent picks snack and play routines that are of high interest to the child; (b) *present*, in which the parent presents the pieces required in

small amounts or with pieces missing; and (c) *play*, in which the parent plays in a way in which the child must communicate in order to continue playing. Next, Bob watched the environmental arrangement chapter of the PiCS® Project Training DVD online (2012). The environmental arrangement DVD chapter reinforced Bob's learning through (a) onscreen flowcharts, (b) narration, and (c) video clips of parents using environmental arrangement and modeling in various routines. I answered any questions Bob had about the environmental arrangement teaching strategy. The following paragraphs describe the steps involved in the coaching sessions.

Introduction to the naturalistic teaching strategy. The first session of each phase was longer than subsequent sessions since it required an introduction and training in the targeted teaching strategy. This was followed by action planning, parent-child interaction, and feedback. Subsequent sessions in each phase began with a review of the teaching strategy and a discussion of Bob's self-reported use of the teaching strategy (see Table 6 for an overview of components by session). I used handouts from the PiCS intervention that included definitions, written examples, and a flowchart (see Appendix O for training handouts). The introduction segment typically lasted about 20 min.

Table 6

Components of Coaching Sessions by Phase and Session Type

Component:	First Coaching Session	First Coaching Session of Each Phase	Subsequent Coaching Sessions in Each Phase
Establishing Rapport	*	-	-
Video Chapter	*	*	-
Handouts: Definitions, Written Examples, and Flowcharts	*	*	*
Action Plan	*	*	*
Parent Self-Report	-	-	*
Feedback Portion	*	*	*

Action planning. After the introduction of the teaching strategy, action planning took place (see Appendix S for the action planning form). I assisted Bob with the action planning form by having him choose snack and play routines he and Anna would do during that session. We then discussed how he would use the environmental arrangement teaching strategy to encourage Anna to communicate. I reviewed the flowchart, reminding Bob of the steps for using the teaching strategy (see Appendix O for training handouts). We listed opportunities within the snack and play routines to use the teaching strategy. I answered any questions he had about using the teaching strategies or other general questions. At this time I asked him to check that Anna's amplification device was functioning properly. This concluded the action planning segment, which typically lasted about 15 min.

I gave video feedback to Bob using the video feedback form (see Appendix T). Prior to the session, I chose several video segments in which he had used teaching strategies with high quality. I shared these video segments using the screensharing function on Skype™, gave him feedback, and encouraged him to reflect on his use of the teaching strategies. This occurred during the action planning segment of a coaching session and was completed during each phase.

Parent-child interaction. I asked Bob to interact with Anna for about 15 min and follow the action plan. I observed the parent-child interaction over Skype™, noting Bob's use (i.e., frequency and quality) of the teaching strategy. Areas that needed improvement were identified through my notes. This procedure was consistent across all coaching sessions.

Feedback. Immediately following the parent-child interaction, Bob and I discussed the session on Skype™. I first asked him to reflect on the parent-child interaction and his use of the teaching strategy. I then described some of Bob's quality 4 uses of the teaching strategy and offered constructive feedback on some of Bob's quality 1, 2 and 3 uses of the teaching strategy. Finally, we concluded the session and scheduled the time and date of the next session. This feedback segment typically lasted about 10 to 15 min (see Appendix U for the coaching feedback form).

Maintenance phase. Once Bob met performance criteria in the last intervention (i.e., time delay phase), the maintenance phase began. In this phase, Bob and I continued to meet on Skype™. I observed 15 min of parent-child interaction and recorded the session using Camtasia™. However, during the maintenance phase, I no longer (a) reviewed the teaching strategies, (b) assisted with action planning, or (c) provided feedback.

Dependent Variables

This study included three DVs: (a) frequency of Bob's use of teaching strategies, (b) quality of Bob's use of teaching strategies, and (c) Anna's communication outcomes. The definitions of each of the teaching strategies are listed in Chapter 1, Key Terms. Additionally, Appendix V (PiCS Coding Manual) contains examples and nonexamples of each teaching strategy. These DVs are described in detail below.

Bob's frequency and percentage of high-quality teaching strategy use. In order to quantify Bob's use and quality of teaching strategies, I transcribed 5 min of each video. To establish IOA, I compared my transcriptions with those of Dr. Julia B. Stoner,

and we discussed any disagreements in the transcriptions and came to agreement on a final transcript. We then viewed the segment again, using the final transcript as a guide to code Bob's use of teaching strategies. His use of teaching strategies were marked using an event recording system (Gast, 2010, Chapter 5), and an agreement in a category named *strategies* was counted if the teaching strategy coded was the same for both coders. An agreement in a category named *quality* was counted if the teaching strategy was rated with the same quality by both coders, regardless of whether or not the coders agreed on the teaching strategy type. See Table 7 for criteria for teaching strategies of quality 1-4. Therefore, the teaching strategy type and quality of teaching strategy use were coded each time Bob used a teaching strategy. In cases when Bob used a strategy a second time, the second strategy counted both as feedback on the first strategy and as a new strategy. Anna's communication behavior was coded as either *none*, *responding*, or *initiating*. Therefore, the coding categories included Bob's teaching strategy use, quality of teaching strategy use, and Anna's communication behavior.

The DV of Bob's use of teaching strategies was measured by his frequency and percentage of quality 4 use of teaching strategies. These data were observed in the parent-child interaction videos and recorded using an event recording system (Meadan et al., 2014), ProcoderDV™ (i.e., Procoder for Digital Video; Tapp, 2003), and MOOSES™ (The Multiple Option Observation System for Experimental Studies; Tapp, Wehby, & Ellis, 1995) to tally events and compile data. The frequency and quality of Bob's use of teaching strategies was observed, coded, tallied, and compared using visual analysis as described below in the data analysis section. Because this study employed a multiple-baseline across teaching strategies design, Bob's use of teaching strategies was

observed, coded, tallied, and analyzed across all phases of the study.

Anna's communication outcomes. The communication outcomes included communication behaviors (i.e., responding and initiating), diversity and complexity of language production, and performance on assessment of social-pragmatic communication. I assessed communication behaviors in each session, and I assessed diversity and complexity of language production in each phase, including baseline and maintenance phases. I conducted the assessment of social-pragmatic communication in the baseline and maintenance phases.

Anna's communication behaviors. The DV of Anna's communication behavior (i.e., responding and initiating) provided data regarding Anna's reaction to Bob's use of the teaching strategies. The mode of communication was determined by Anna's individual communication preferences. Bob was consulted to determine idiosyncratic utterances, gestures, or signs Anna typically produced. These data were then observed, coded, tallied, and analyzed using the same coding system, software, and visual analysis described in the data analysis section.

Diversity of vocabulary and complexity of Anna's language production. The DV of Anna's language production (i.e., TTR and MLU) provided data regarding Anna's language growth throughout the intervention. One session was transcribed in both pre- and postintervention phases. TTR was calculated as (number of different words ÷ total number of words). MLU was calculated as (total number of morphemes ÷ total number of utterances).

Table 7.

Criteria for Coding Quality of Teaching Strategy Use

	Criteria		
Quality	Modeling	Mand-Model	Time Delay
1	Bob produces a verbal, sign, or gestural model related to Anna's interest	Bob produces a verbal prompt in the form of question, choice, or mand	Bob looks expectantly at Anna for 5-15 sec
2	Joint attention + above	Joint attention + above	Joint attention + Bob looks expectantly at Anna for fewer than 5 sec
3	Above + waits 2-3 sec for Anna's response	Above + waits 2-3 sec for Anna's response	Joint attention + Bob looks expectantly at Anna for 5-15 sec
4	Above + verbal feedback (Praise or repeated model)	Above + verbal feedback (Praise or repeated prompt or use of model)	Above + verbal feedback (Praise or use of model or mand-model)

Anna's social-pragmatic communication development. To assess Anna's social-emotional development, I used the CDI (Fenson, Marchman, Thal, Dale, Reznick, & Bates, 2007) and the *Cottage Acquisition Scales for Listening, Language, and Speech* (CASLLS; Wilkes, 1999). The CDI was created to involve parents more fully in the

assessment and monitoring of their children's communication skills. It is a norm-referenced assessment that allows parents to assess and report on their children's (a) gestures, (b) comprehension of early social routines and words (Crais, 2011, p. 350), and (c) "children's imitation of adults in play and to identify symbolic play acts" (p. 359). I used the "Words and Gestures" version of the CDI, which was the most appropriate to Anna's communicative abilities. The CASLLS was developed using the following theoretical guidelines from Yoshinaga-Itano (1994): Acquisition of language is based in cognition and social interaction and language assessments should account for changes in children's language learning styles at various stages of language development (Wilkes, 1999). The CASLLS allow for assessment at (a) preverbal, (b) presentence, (c) simple-sentence, and (d) complex-sentence stages of language development. Wilkes (1999) recommended that several sessions be observed to gain a more complete assessment of the child's communicative abilities. For this study, I used all baseline (i.e., preintervention) and maintenance (i.e., postintervention) sessions to complete the CASLLS checklist. For both the CDI and CASLLS, change would not be expected in the brief time (i.e., approximately 3 months) between pre- and postintervention.

Data Collection

I collected video data and coded frequency data for Bob's use of teaching strategies and Anna's behaviors. To control for threats to internal validity, I collected and analyzed data for IOA, and procedural fidelity (Gast, 2010, Chapter 5).

Bob's Use of Teaching Strategies and Anna's Communication Behaviors

Both Bob's use of teaching strategies and Anna's communication behaviors were captured on video with Camtasia™ during videoconference calls on Skype™. I stored

the data on an external hard drive connected to my computer. Collecting video data allowed for precise and repeated observation of parent-child interaction.

Procedural Fidelity

Horner et al. (2005) stated the importance of assessing and reporting procedural fidelity in single-subject research. Without procedural fidelity, there can be no assumption about the power of the IV (Barton & Fettig, 2013), and there can be no replication of effect (Gresham, Gansle, & Noell, 1993). Therefore, I (a) established a clear definition and description of the IV; and (b) collected and reported procedural fidelity data expressed as a percentage, to minimize threats to internal. Since each training and coaching session was videotaped, Dr. Stoner assessed the coach's adherence to the coaching session protocol (see Appendix W for the Procedural Fidelity Manual). If the fidelity of any session fell below 90%, I met with Dr. Stoner and retraining was conducted. The final percentage for each session was reported as number of correct steps ÷ the total number of steps in the protocol. The targeted percentage was 100% but I considered 90% acceptable (Vogt, 2007).

Interobserver Agreement

Observers coded randomly selected a 5-min segment of video in each session. Training for IOA included instruction in transcribing videos and instruction in the operational definitions of the DVs for parents (i.e., use of teaching strategies) and children (i.e., communication behaviors). Examples and nonexamples were illustrated through text (see Appendix V for the PiCS Coding Manual) and video clips of previous PiCS participants. The coders watched video segments and filled in a worksheet that contained spaces to record a teaching strategy used, quality of teaching strategy use, and

children's communication behaviors. We completed these worksheets together and discussed reasoning behind the codes we assigned to Bob's uses of teaching strategies.

An agreement in a category named *strategies* was counted if the teaching strategy coded was the same for both coders. An agreement in a category named *quality* was counted if the teaching strategy was rated with the same quality by both coders, regardless of whether or not the coders agreed on the teaching strategy type. Whenever the coders observed Bob using a teaching strategy we coded Anna's communication behavior if present or coded none if absent. We also coded Anna's communication behavior if she initiated without Bob's use of a teaching strategy. An agreement was counted if we coded the same communication behavior for the same 2-sec window.

The coders then met to establish agreement and rules for Bob and Anna. The segment of each session to be coded was chosen randomly. To assess IOA, 30% of the sessions within each phase were randomly chosen for Dr. Stoner to code. Videos and coding software were made available to both coders and they coded sessions within 2 days after each session. I calculated IOA using the following equation: (agreements / (agreements + disagreements)) * 100. For the purposes of this study, I considered 80% IOA to be the minimum acceptable (Gast, 2010, Chapter 5).

If IOA data fell below an average of 80% within a given phase, the coders met to review disagreements. It was, at times, necessary to retrain the coders on the rules and also to discuss new behaviors that required new coding rules. The coders used these new rules to proceed as long as IOA remained above 80%. Both coders were trained and had reached reliability using a similar coding system in the previous PiCS project (Meadan et al., 2014).

I randomly chose one session from each phase to determine IOA; this resulted in an IOA computation for 11, or 30%, of the sessions. The overall IOA across the 11 sessions was 84.63% (range = 81.25-87.61%). By phase or condition, the IOA were as follows: baseline = 84.39% (range = 82.45-86.84%); modeling = 86.38% (range = 84.88-87.61%); mand-model = 82.61% (range = 81.65-83.67%); time delay = 83.89% (range = 81.25-85.71%), intermittent probe = 86.70%, and maintenance = 86.81%. The data for IOA are presented in Table 8.

Table 8

Interobserver Agreement Data

	Teaching Strategy Use	Quality	Child Behavior	**Total by Phase**
	Agreements / (Agreements + Disagreements)			
Phase	*% Interobserver Agreement*			
Baseline	124/143	105/129	117/138	**346/410**
	86.71	*81.39*	*84.78*	***84.39***
Modeling	61/64	51/62	52/65	**164/191**
	95.31	*82.25*	*80.00*	***85.86***
Mand-Model	63/76	55/65	53/66	**171/207**
	82.89	*84.61*	*80.30*	***82.60***
Time Delay	36/44	32/37	31/37	**99/118**
	81.81	*86.48*	*83.78*	***83.89***
Maintenance	28/33	25/29	26/29	**79/91**
	84.84	*86.20*	*89.65*	***86.81***
Intermittent Probes	33/39	32/35	33/39	**98/113**
	84.61	*91.42*	*84.61*	***86.72***
Total by Category	**345/399**	**300/357**	**312/374**	**957/1130**
	86.46	***84.03***	***83.42***	***84.69***

Threats to the Validity of this Study

I conducted three types of validity measures in this study. I controlled for threats to internal validity, assessed social validity, and listed threats to external validity. Use of a multiple-baseline across teaching strategies design allowed me to control for threats to

internal validity. Social validity required additional data collection to assess the acceptability of the goals, procedures, and outcomes (Wolf, 1978).

Internal validity. Few threats to internal validity (Gast, 2010, Chapter 5) were relevant to this study. This was a multiple-baseline across teaching strategies design; therefore, I was able to demonstrate intrasubject replication across teaching strategies. This strengthens the internal validity by rendering threats due to history, maturation, testing, and multiple-treatment implausible (Gast, 2010, Chapter 5). Threats to internal validity due to history were implausible because this was not a group intervention in which one parent could be influenced by another within the study. Threats due to maturation were implausible because the second and third targeted behaviors were monitored while intervention was applied to the first behavior. Threats due to testing and multiple-treatment effects were implausible because the longer baseline phases for the second and third behaviors showed that the repeated sessions did not have an effect on those behaviors. Additionally, the "test" for second and third targeted behaviors required different behaviors from Bob, further rendering this threat implausible.

Instrumentation was also a possible threat to internal validity (Gast, 2010, Chapter 5). To reduce this effect, Bob videotaped all parent-child interaction sessions, I trained the coders to observe and code behaviors in a systematic manner, I clearly defined Anna's communication behaviors and Bob's use of teaching strategies, and I measured IOA. Gast (2010, Chapter 5) noted that an IOA score of 90% and above is acceptable and a score below 80% is unacceptable or a cause for concern. He clarified the disparity between 90% and 80% by stating that a study in which targeted behaviors are more difficult to observe or record, such as "high-rate behaviors, behaviors of short duration,

[or] vocal responses" (p. 105), are more likely to result in a higher level of observer disagreement. Videotaping and retraining coders are two ways in which I attempted to maximize IOA (Gast) and reduce the threat to internal validity related to instrumentation.

Social validity. Social validity is comprised of acceptability of goals, procedures, and outcomes of an intervention with regard to relevant stakeholders (Wolf, 1978). Without social validity, interventions are less likely to be implemented due to their lack of worth relative to the work of implementation (Schwartz & Baer, 1991). To measure social validity, I asked Bob to complete pre- and postintervention Likert-type surveys and to participate in interviews regarding the acceptability of the goals, procedures, and outcomes of this study (see Appendices J, K, and Y for the surveys and interview questions). The surveys and interviews contained questions regarding Bob's perspectives on communication and satisfaction with the intervention. Survey items provided options from 1 to 5, with 1 indicating strongly disagree and 5 indicating strongly agree. A comment section was included for Bob to explain or amend their answers in the Likert-type scale. In addition to obtaining Bob's perspectives regarding the goals, procedures, and outcomes of the PiCS intervention, I collected data on the performance of Skype™ and the internet connections. I did not have the capacity to determine whether malfunctions were caused by (a) connectivity issues at my end (b) connectivity issues at Bob's end, or (b) Skype™ malfunctions. I observed all sessions after they occurred and noted call freezes/dropped calls, screensharing difficulties, and poor audio or visual quality. For all these issues, I recorded both the frequency and the duration, beginning the duration count when the issue began, and ending the count when the normal activity of the meeting resumed. This is because after many dropped calls, Bob and I talked

about what had just happened, and this consumed more time.

External validity. External validity is inherently a threat because of the small *N* typical of single-case design studies. This study is a partial replication of the PiCS study (Meadan et al., 2014). In order to facilitate future replication, I used protocols, parent handouts, action plan forms, and training video clips from the PiCS study. The protocols, which serve to facilitate completion of this study (Wolery et al., 2010), included (a) instructions for training and coaching parents in naturalistic teaching strategies, (b) the PiCS coding manual, (c) the PiCS procedural fidelity manual, and (d) the PiCS IOA coding and calculation manual. These are provided in Appendices L-X. I met with Bob via Skype™ on various days of the week. In addition, Bob recorded their parent-child interaction videos while engaged in various routines at various times of the day. These procedures contribute to the generalizability of this study.

Data Analysis

I presented Bob's and Anna's coded behaviors graphically and analyzed them visually across baseline, intervention, and maintenance conditions (Gast, 2010, Chapter 9). I included the frequency of quality 4 teaching strategy uses and also represented this as a percentage (number of quality 4 teaching strategy uses ÷ total number of teaching strategy uses). I conducted intrasubject analysis to determine the effect of the intervention across Bob's use of each teaching strategy. Anna's coded behaviors were part of secondary analysis and did not affect Bob's progress from phase to phase. Visual analysis allowed me to continually assess Bob's progress and allowed me to make data-based decisions about his readiness to progress to subsequent coaching phases. I created a table containing IOA and procedural fidelity data and visually inspected Bob's

performance data. Acceptable IOA was 80% and above, and acceptable procedural fidelity was 90% and above.

Visual Analysis of Observation Data for Parent Outcomes

I used visual analysis as described by Gast and Spriggs (2010, Chapter 9) to determine data stability and trend within conditions (i.e., baseline, coaching, and maintenance). By plotting a median line within a condition and a 20% "stability envelope" (p. 202), I was able to determine whether or not Bob's use of teaching strategies was stable within each phase. I employed the split-middle analysis to determine data trends for Bob's use of each teaching strategy. If there was a therapeutic trend in the baseline data, I continued the baseline phase until the trend became zero-celerating or contratherapeutic. Finally, I calculated the stability of trends using the "level stability envelope" (p. 207). When the baseline performance data for a targeted teaching strategy were level or contratherapeutic and stable, I moved Bob into the intervention phase.

In order to determine the effectiveness of the intervention, I conducted adjacent-condition analysis using the "absolute level change" and "relative level change" between baseline and coaching phases (Gast & Spriggs, 2010, p. 214). Absolute level change is calculated by subtracting the last data point value in the first phase from the first data point value in the second phase. Relative level change is calculated by subtracting the average value of the second half of the first phase from the average value of the first half of the second phase. I also compared the data between phases using Tau-U nonoverlapping data (Parker, Vannest, Davis, & Sauber, 2011) between adjacent phases to demonstrate the change in Bob's use of the targeted teaching strategy after the

intervention began. I predicted that with the intervention, Bob would begin to use the teaching strategies with higher quality and greater frequency.

Analyses for Anna's Language Outcomes

Anna's communication behaviors. I used similar analyses to determine levels and trends for Anna's communication behaviors. Anna's responding and initiating behaviors were largely contingent on Bob's use of teaching strategies. A response by Anna could only be coded if I coded modeling or mand-model use by Bob, and initiations could be spontaneous or when Bob used time delay. Therefore, I represented Anna's responding and initiating as a percentage of the number of opportunities Bob gave her. I predicted that if Bob increased his quality of teaching strategy use, Anna's frequency of responding and initiating would increase and that her frequency of *not responding* would decrease. Increases in responding and initiating equated to decreases in not responding.

Diversity of Anna's vocabulary and complexity of her language production. One language sample was collected in both pre- and postintervention phases from video interaction between Bob and Anna. Dr. Stoner and I transcribed the language samples verbatim (both Bob's and Anna's utterances), highlighted any differences, and Dr. Stoner resolved these differences. The language samples were then analyzed using Systematic Analysis of Language Transcripts (SALT©). The SALT© analysis provides (a) MLU, (b) TTR, (c) total words spoken, etc. The SALT© software contains details for language targets by chronological age which can be used to assess language skills when no comparison group is available. I collected and analyzed language samples during the baseline and maintenance phases using randomly chosen videos of the parent-child interaction.

Anna's performance on the CDI. I consulted Fenson et al. (2007) to analyze Bob's completed CDI form. "In general, scoring involves counting responses, summing scores, looking up normative values, and completing the summary sheet" (p. 19). The Words and Gestures is divided into (a) early words and (b) actions and gestures. The words and gestures part allows for assessment of a child's receptive and expressive vocabulary. To analyze these data, I tallied the number of words Anna understood (i.e., receptive) and the number that she produced (i.e., expressive) according to Bob. The sum of understood words and produced words provided me with her total comprehension of words in the CDI for this part. The actions and gestures part allows for assessment of gestures typically developed early and late relative to the child's age. To analyze these data, I tallied Anna's gesture production according to Bob. Using the totals for both parts of the CDI, I referenced Fenson et al. (2007, Chapter 5) to obtain percentile ranks.

Anna's performance on the CASLLS. Finally, I analyzed Anna's communicative abilities using the CASLLS (Wilkes, 1999) at the "Pre-Sentence Level. This instrument allows for the assessment of behaviors (e.g., cognition/play and listening), receptive language, and expressive language. To complete this assessment, I observed videos of Bob and Anna interacting and checked off behaviors and words listed on the CASLLS. For preintervention, I observed baseline videos, and for postintervention, I observed maintenance videos. Because these were brief glimpses of Anna's interactive days, I included words and behaviors that overlapped with the CDI that Bob listed for Anna.

Social Validity

To determine acceptability of goals, procedures, and outcomes, I analyzed Bob's responses to social validity surveys (see Appendices J and Y). The range of composite scores for each response ranged from 1 to 5, with higher numbers indicating greater acceptability of goals, procedures, and outcomes. I coded Bob's comments line-by-line, identified themes that emerged, and continually returned to my data to expand, combine, or delete emerging themes (Creswell, 2012). Dr. Stoner read all interviews and validated my findings. This procedure, expert validation, is described by Miles, Huberman, and Saldaña (2013) as a form of confirmability when analyzing qualitative data and adds strength and rigor to my qualitative analysis of the interviews with Bob.

I applied simple arithmetic calculation to analyze the connectivity issues related to videoconferencing. I tallied the frequency of call freezes/dropped calls, screensharing difficulties, and audio/visual quality issues. I calculated the total time lost to dropped calls and screensharing difficulties. Although the audio and visual quality issues did not often result in lost productivity during meetings, I calculated the total time for those occurrences as well.

Changes in the PiCS Procedures

In replicating the PiCS study, I made two changes to the procedures. First, I removed the naturalistic teaching strategies training session in which parents were introduced to all teaching strategies in an hour-long session. I removed this portion for two reasons. First, removing the training session made this project more efficient by eliminating the training session and probe sessions that followed to test the effect of the training session. This meant fewer sessions, less data collection, and less data analysis.

Second, I hoped to test the effect of training in each teaching strategy individually. I believed that delivering the training in all teaching strategies prior to intervention with each teaching strategy might lead to covariation across teaching strategies. Training was still delivered in each of the teaching strategies, but the training occurred at the beginning of each phase, and only applied to the teaching strategy that was the focus of that phase (i.e., the targeted teaching strategy).

Second, I changed the procedures with regard to observation of parent-child interaction and feedback. Best practice calls for providing feedback directly after the coach has observed participants practicing target skills (Kaiser & Hancock, 2003; Rush, Shelden, & Hanft, 2003; Woods et al., 2011). When the PiCS study changed from in-person sessions to a distance education format, the coaches observed a video that the parent had recorded and then feedback was given sometime later in the day or at the beginning of the next session. For this study, I observed parent-child interaction over Skype™ and immediately met with Bob to provide feedback.

Summary

Research has been conducted regarding the use of naturalistic teaching strategies for communication (Harjusola-Webb & Robbins, 2011; Kohler et al., 2001; Miller et al., 2002; Peterson et al., 2007; Peterson et al., 2005). Results of the PiCS study (Meadan et al., 2014), determined that parents of children with Down syndrome learned to implement teaching strategies with high quality at a frequent rate. The current study aimed to replicate the procedures of the PiCS study to determine the effectiveness of delivering the PiCS intervention using distance education technology with a parent of a young child who is DHH. The assumption was that Bob's use of teaching strategies would remain at

a stable level during the baseline phase, and increase frequency and quality of teaching strategy use during coaching phases.

With a multiple-baseline across teaching strategies design, I measured Bob's use of teaching strategies during baseline, intervention, and maintenance conditions to determine intervention effectiveness and efficiency. The multiple-baseline design has several advantages. First, it does not require a return to baseline conditions to replicate or demonstrate control. Further, a lengthened maintenance phase for first and second behaviors allows for a thorough examination of Bob's maintenance of teaching strategy use. The multiple-baseline design controls for internal validity through intrasubject replication. Because I used protocols and parent handouts developed in the PiCS study,, future researchers can replicate this study.

CHAPTER IV

RESULTS

Introduction

In this chapter I will discuss the results of this study. I will first explain the parent and child outcomes, and then I will describe measures of implementation fidelity and social validity. In the sections that follow, I will provide a description of the data analysis methods I used and the outcomes of my analyses.

Parent and Child Outcomes

Parent Outcomes

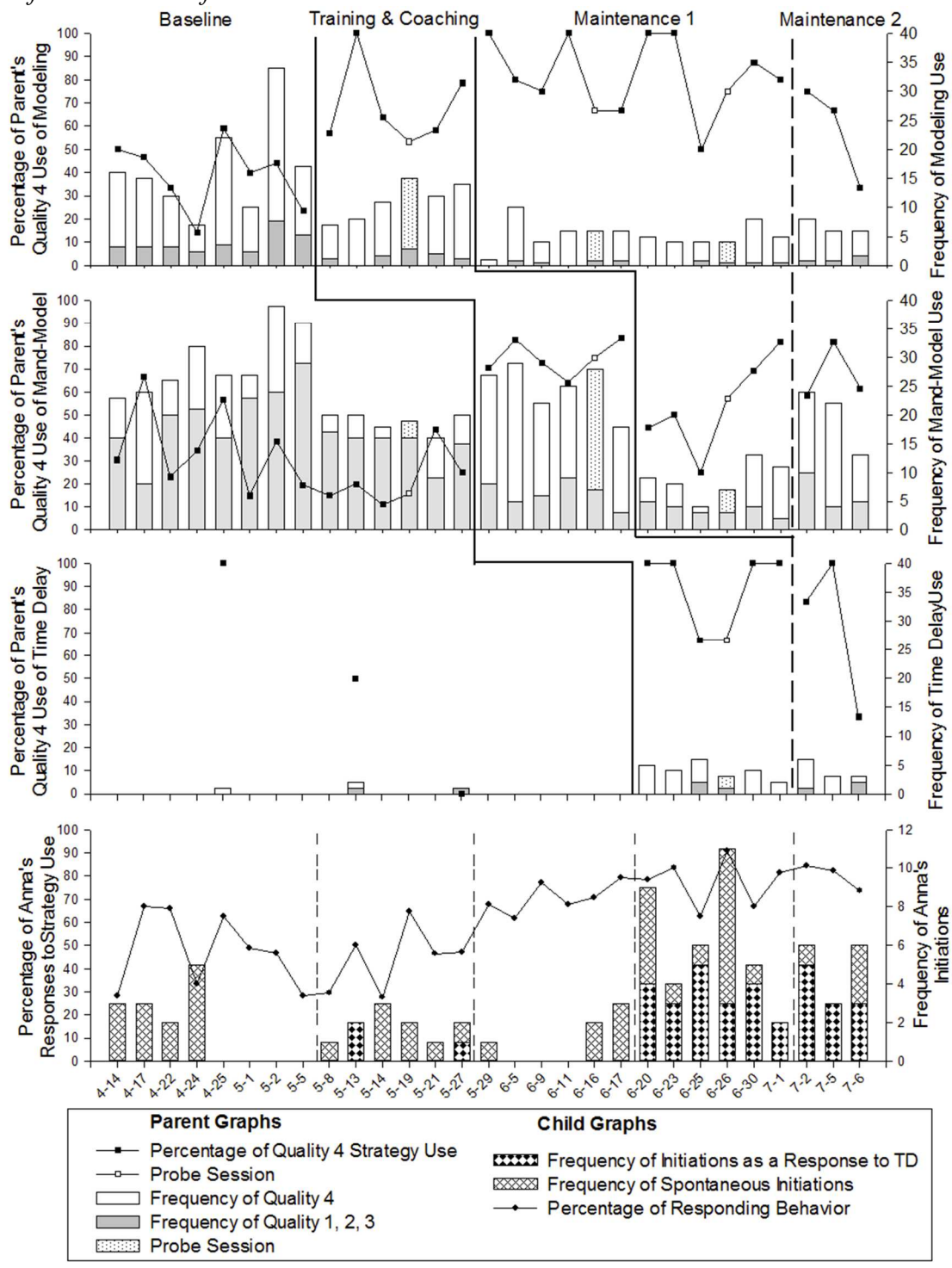
I entered the parent data into Sigma Plot (Systat Software, Inc., 2012) and created a graphic representation for visual analysis (see Figure 1). The line plots represent the percentage of teaching strategy use at the quality 4 level. The bar plots represent the frequency of teaching strategy use including all quality levels. The bars are split to represent frequency of teaching strategy at quality levels 1, 2, and 3 (i.e., gray portions of the bars) and quality 4 level (i.e., white portion of the bars). The dotted bars and open circles represent probes in which intervention did not occur. I viewed parent performance in adjacent phases to compare use of strategies (i.e., quality and overall rate) between baseline and intervention conditions and between intervention and maintenance conditions. Before moving to intervention, I determined that parent teaching strategy use was level or that it had a contratherapeutic trend (Gast & Spriggs, 2010, Chapter 9).

Anna's communication behaviors in each session are represented in Figure 1. I calculated Anna's response percentage by dividing her total responses per session by the number of opportunities Bob gave her to respond: Percentage of responding = total responses ÷ total modeling and mand-model uses. I calculated Anna's initiation frequency similarly with time delay: Percentage of initiating = total initiations ÷ total time delay use. Spontaneous initiations (i.e., those occurring without a time delay) were not included in these calculations. Because Anna could also initiate without Bob's use of time delay, the bar plots are included to represent Anna's total frequency of initiating. These initiations and those occurring within time delay strategies constitute the total initiation frequency in Figure 1.

Intervention effect. To determine effectiveness of the intervention, I conducted within- and adjacent-condition analysis (Gast & Spriggs, Chapter 9). During baseline, Bob's overall frequency of modeling (i.e., all quality levels) was variable and did not display a trend. During intervention, his overall use of modeling was variable and did not display a trend. Between conditions, there was 100% overlapping data with regard to Bob's overall use of modeling. The average use of the modeling teaching strategy overall was 16.63 (range = 7-34) during the baseline phase and 11.17 (range = 7-15) during intervention, for a decrease of 5.46. Adjacent-condition analysis yielded an absolute level change of -10 and a relative level change of -12.08.

Figure 1.

Performance Data for Bob and Anna.



During both baseline and intervention, Bob's percentage of quality 4 use of modeling was variable and did not display a trend. Between conditions, there was 100% overlapping data with regard to Bob's quality 4 use of modeling. The average use of the modeling teaching strategy with high quality was 38.88 (range = 14.28-59.09%) during the baseline phase and 68.50 (range = 53.30-100%) during the modeling intervention, for an increase of 29.62. Adjacent-condition analysis yielded an absolute level change of 33.61 and a relative level change of 21.57.

During baseline, Bob's overall frequency of mand-model was variable and did not display a trend. During intervention, his overall use of modeling was variable and did not display a trend. However, at the onset of training and coaching for modeling, Bob's overall use of mand-model decreased in level dramatically. Bob maintained a level trend until the end of this condition. Between baseline and intervention condition, there was 100% overlapping data with regard to Bob's overall frequency of mand-model. Using the 6 final sessions of baseline (i.e., during modeling training), there is 0% overlapping data between baseline and intervention for mand-model. The average frequency of the mand-model teaching strategy overall was 25.5 (range = 16-39) during the baseline phase and 24.83 (range = 18-29) during intervention, for a decrease of -0.67. Adjacent-condition analysis yielded an absolute level change of 7.00 and a relative level change of 4.71.

During both baseline and intervention, Bob's percentage of quality 4 use of mand-model was variable and did not display a trend. Between conditions, there was 20% overlapping data with regard to Bob's percentage of quality 4 use of modeling. There did not appear to be covariation when modeling training and coaching began regarding Bob's

percentage of quality 4 use of mand-model. The average percentage of high-quality mand-model use was 29.62 (range = 11.11-66.67%) during the baseline phase and 74.69 (64.00-83.33%) during the mand-model intervention, for an increase of 45.07. Adjacent-condition analysis yielded an absolute level change of 45.37 and a relative level change of 53.28.

During baseline, Bob's overall frequency of time delay was zero for 17 of 20 sessions and did not display a trend otherwise. During intervention, his overall frequency of time delay use was variable and did not display a trend. Between conditions, there was 0% overlapping data with regard to Bob's overall use of modeling. The average use of the time delay strategy overall was 0.20 (range = 0-2) during the baseline phase and 4 (range = 2-6) during intervention, for an increase of 4.80. Adjacent-condition analysis yielded an absolute level change of 5 and a relative level change of 4.9.

During baseline, Bob's percentage of time delay use was variable when he did use the strategy. During intervention, Bob's percentage of quality 4 use of time delay was variable and did not display a trend. Between conditions, there was 100% overlapping data with regard to Bob's percentage of quality 4 use of time delay. Bob's average percentage of time delay use with high quality was 50% (0-100%) during the baseline phase and 88.89 (range = 66.67-100%) during the time delay intervention for an increase of 31.89. Adjacent-condition analysis yielded an absolute level change of 100. The relative level change for time delay was 83.33.

Visual analysis showed changes in Bob's lower-quality use of teaching strategies across phases. I compared Bob's total quality 1, 2, and 3 uses of strategies between baseline and intervention phases. Because these were lower-quality uses of strategies, I

considered it a therapeutic trend when data decreased. For modeling, the average frequency of use was 9.63 (range = 6-19) during the baseline phase and 3.67 (range = 0-7) during intervention, for a decrease of 5.96. The absolute level change was -10 and the relative level change was -9.42. There was 16.67% overlap in frequency of lower-quality modeling between baseline and intervention. For mand-model, the average frequency of lower-quality use was 17.57 (range = 8-29) during the baseline phase and 6.33 (range = 3-9) during intervention. The absolute level change was -13 and the relative level change was -20.52. There was 33.33% overlap in lower-quality use of mand-model between baseline and intervention. For time delay, the average lower-quality use was 0.10 (range = 0-1) during the baseline phase and .5 (range = 0-2). The absolute level change was 0.00 and the relative level change was 0.55. There was 100% overlapping data between time baseline and intervention.

Maintenance of teaching strategy use. I also collected maintenance data for all teaching strategies. I will first compare Bob's use of teaching strategies between intervention and maintenance I conditions, and then I will compare his use of strategies between baseline and maintenance II conditions. During intervention, Bob's overall frequency of modeling was variable and displayed an unstable accelerating trend. During maintenance I, the data were variable and displayed no trend. Between conditions, there was 33% overlapping data with regard to Bob's overall use of modeling. The average overall use of the modeling teaching strategy was 11.17 (range = 7-15) during intervention and 5.53 (range = 1-10) per min during the maintenance phase, for a decrease of 5.64. Adjacent-condition analysis yielded an absolute level change of -13 and a relative level change of -8.42.

During intervention and maintenance I, Bob's percentage of quality 4 modeling was variable and displayed no trend. Between conditions, there was 100% overlapping data with regard to Bob's percentage of quality 4 modeling. The average use of the modeling teaching strategy with high quality was 68.50 (range = 53.3-100%) during intervention and 77.05 (range = 33.3-100%) during the maintenance phase, for an increase of 8.55%. Adjacent-condition analysis yielded an absolute level change of 21.42 and a relative level change of 21.58.

During intervention and maintenance I, Bob's overall frequency of mand-model was variable and displayed no trend. Between conditions, there was 0% overlapping data with regard to Bob's overall use of modeling. The average overall use of the mand-model teaching strategy was 25.5 (range = 16-39) during intervention and 12.33 (range = 4-24) during the maintenance phase. Adjacent-condition analysis yielded an absolute level change of -9.00 and a relative level change of -15.47.

During intervention, Bob's percentage of quality 4 mand-model use was variable and displayed no trend. During maintenance I, these data displayed a stable accelerating trend. Between conditions, there was 33.33% overlapping data with regard to Bob's overall use of mand-model. The average use of the mand-model teaching strategy with high quality was 74.69 (range = 64-83.33%) during intervention and 58.81 (range = 25.00-81.81%) during the maintenance phase, for a decrease of 15.88%. The absolute level change for mand-model was -38.89 and the relative level change was -25.00.

Finally, during intervention and maintenance II, Bob's overall frequency of time delay was variable and displayed no trend. Between conditions, there was 100% overlapping data with regard to Bob's overall use of time delay. The average overall use

of the time delay strategy was 4 (range = 2-6) during intervention and 4 (range = 3-6) during the maintenance phase. Adjacent-condition analysis yielded an absolute level change of 4.00 and a relative level change of 1.5.

During intervention and maintenance II, Bob's percentage of quality 4 time delay was variable and displayed no trend. Between conditions, there was 33.33% overlapping data with regard to Bob's overall use of time delay. The average use of the time delay teaching strategy with high quality was 88.89 (range = 66.67-100%) during intervention and 72.22 (range = 33.33-100%) during the maintenance phase, for a decrease of 16.67. The absolute level change was -16.67 and the relative level change was -8.33.

Visual analysis showed changes in Bob's lower-quality use of the teaching strategies in the maintenance phase. For modeling, the average was 3.67 (range = 0-7) during intervention and 1.33 (range = 0-4) during the maintenance phase. The absolute level change was -3 and the relative level change was -4.13. For mand-model, the average was 6.33 (range = 3-9) during intervention and 5.2 (range = 2-10) during the maintenance phase. The absolute level change was 2 and the relative level change was -2.53. For time delay, the average use was 0.5 (range = 0-2) during intervention and 1.0 during the maintenance phase. The absolute level change was 1.0 and the relative level change was 0.17.

Bob's overall frequency of modeling during baseline and maintenance II was variable and did not display a trend. There is 100% overlapping data between these two conditions. Bob used the modeling strategy with less frequency during maintenance II than baseline. His average frequency of modeling was 16.63 (range = 7-34) during baseline and 6.67 (range = 6-8) during maintenance II.

During baseline, Bob's percentage of high quality modeling use was variable and did not display a trend. During maintenance II, these data displayed a variable, rapidly decelerating trend. There was 33.33% overlapping data, with the first two data points in maintenance II being higher than all points in baseline. Bob's average percentage of high quality modeling was 38.88% during baseline and 58.33% during maintenance II.

Bob's overall frequency of mand-model during baseline and maintenance II was variable. There was no trend during baseline but there was a variable, rapidly decelerating trend during maintenance II. Further, there was 100% overlapping data between the two conditions. His average overall use of mand-model was 25.5 (range = 16-39) during baseline and 19.67 (range = 13-24) during maintenance II.

During baseline and maintenance II, Bob's percentage of high quality mand-model use was variable and did not display a trend. There was 66.67% overlapping data between these conditions. However, removing the highest data point early in baseline, there would have been 0% overlapping data. Bob's average percentage of high-quality mand-model use was 38.87% (range = 11.11-66.67%) in baseline and 58.33 (range = 58.33-81.82%) in maintenance II.

Bob's overall frequency of time delay was very low during baseline. He used it a total of 4 times in 20 sessions compared to 12 times in 3 sessions during maintenance II. There was no trend during baseline and there may have been a variable, decelerating trend during maintenance II. However, there was 0% overlapping data between the two conditions. The average overall frequency of time delay was .2 (range = 0-2) during baseline and 4 (range = 3-6) during maintenance II. By removing all data points during baseline when no time delay strategies were used, the average during baseline was 1.33

(range = 1-2), compared to 4 during maintenance II.

During baseline, Bob's percentage of high-quality time delay use was variable. It could not be plotted because most data points were undefined (i.e., required dividing by zero occurrences). During maintenance II, these data were highly variable and did not seem to display a trend. There was 100% overlapping data between the two conditions. Bob's overall percentage of high-quality time delay use was 7.5% during baseline (range = 0-100%) and 72.22% (range = 33.33-83.33%) during maintenance II. By removing all data points during baseline when no time delay strategies were used, the average during baseline was 50% (range = 0-100), compared to 72.22% during maintenance II.

Based on the above analyses and the WWC SCRD standards (Kratochwill et al., 2010), it may be difficult to demonstrate causal relations between the PiCS intervention and Bob's use of teaching strategies. The study design met SCRD standards in that I was able to (a) manipulate the IV, (b) repeatedly measure the DV, (c) collect satisfactory IOA data, (d) attempt to replicate the effect 3 times, and (e) collect 5 data points per phase. At the data level, however, many of the items required to demonstrate effect are not present. The characteristics for these analyses are level, trend, and variability within conditions, and overlapping data, immediacy of effect, and consistency across similar conditions (e.g., baseline and maintenance). In some cases (e.g., the percentage of high quality uses in all strategies between baseline and intervention), the level changes do appear to demonstrate a therapeutic effect of the intervention. However, to demonstrate a functional relation between the PiCS intervention and Bob's use of the naturalistic teaching strategies, the data should be stable within conditions and have low proportions of overlapping data. In nearly all conditions, the data were variable at an unacceptable

level. Therefore, conclusions about the functional relation will have limitations.

Tau-U analysis for effect size. Finally, I used an online calculator for Tau-U nonoverlapping data (Parker et al., 2011) to demonstrate overall intervention effect. I entered the data by following instructions on two websites (Single Case Research™, n.d.; Tau-U Calculator Demo, 2012). Tau-U analysis is a four-part process that (a) determines and, if necessary, controls for baseline trend; (b) compares baseline data to intervention data; (c) determines intervention data trend; and (d) determines an overall effect size (i.e., Tau) across all targeted behaviors.

During the baseline phase, Bob's use of time delay strategy was 0 for 17 of 20 sessions. For all of these data points, the percentage of high-quality use of time delay was undefined (i.e., quality/frequency = 0 ÷ 0 = ∅). Therefore, Tau-U analysis could not include these values; instead, I used frequency of high-quality use of teaching strategies to determine the overall effect size. I also conducted the Tau-U analysis procedure for Bob's percentage of high-quality use of modeling and mand-model.

The baseline data for modeling, mand-model, and time delay were stable with Tau values less than .40. Therefore, they did not require "correcting" and could be compared directly with intervention scores. This comparison showed that Bob's frequency of high-quality use of (a) modeling improved with an effect size of .1875, but the change was not statistically significant ($p = .5613$); (b) mand-model improved with an effect size of .8333 ($p = .0039$; CI = 0.358 < > 1.308); and (c) time delay improved with an effect size of 1.000 ($p = .0003$; CI = 0.549 < > 1.451). Finally, the combined Tau for all three strategies showed that the overall effect size was .6970 ($p < .05$; CI = 0.3623 < > 1.0317).

I then analyzed Bob's percentage of high-quality use of modeling and mand-

model using the Tau-U calculator. This comparison showed that Bob's percentage of high-quality use of (a) modeling improved with an effect size of .875 (p=.0067; CI = 0.344 < > 1.406), and (b) mand-model improved with an effect size of .9762 (p = .0007; CI = 0.501 < > 0.099). I did not calculate an overall effect size for these two analyses because they did not include all strategies.

Child Outcomes

Child communication behaviors. Anna's responding and initiation behaviors are represented in Figure 1. For responding, I calculated the percentage by dividing the number of Anna's responses by the total number of opportunities (i.e., Bob's total use of modeling and mand-model). For initiation, I divided the number of Anna's initiations by the total number of opportunities (i.e., Bob's total use of time delay). Initiations that were not part of a time delay strategy were not used in this calculation; these were represented as a frequency only.

Anna's average responding percentage was 47.53 during the baseline phase, 44.23 during modeling intervention, 70.64 during mand-model intervention, 77.21 during time delay intervention, and 80.07 during the maintenance phase. No clear trend was apparent during the baseline phase. However, Anna's responding behavior increased steadily from the second half of modeling intervention through the maintenance phase.

Anna's initiating behavior with relation to time delay could not be calculated for most baseline sessions when Bob did not use time delay. When he did use time delay during the baseline phase, her initiating behavior was 100%. During time delay intervention, Anna's average initiating behavior was 89.72%, and during the maintenance phase this figure was 94.44%. In this condition when Bob was using time delay at an

average frequency of four times per session, Anna initiated readily.

Anna's spontaneous initiations (i.e., those that happened outside the use of a time delay) were relatively frequent during baseline, with a mean of 1.5 (range = 0-4) per session. Her spontaneous initiations were less frequent during modeling and baseline. However, during time delay intervention, Anna's spontaneous initiation rate was 2.67 (range = 0-11). Compared to mand-model intervention, her average was about 1.5 higher during time delay intervention. Her highest session had 8 spontaneous initiations, and only one session in time delay intervention had no spontaneous initiations from Anna. 9 sessions in other conditions had no spontaneous initiations from Anna: 4 in baseline, 1 in modeling, 3 in mand-model, and 1 in maintenance.

Diversity of Anna's vocabulary and complexity of Anna's language production. Dr. Stoner and I transcribed one language sample each from the pre- and postintervention conditions and entered the transcript into SALT©. The pre- and postintervention videos were approximately 15 min and 10 min respectively. The time between videos was approximately 2.5 months. The child's MLU and TTR data and other communication outcomes are listed in Table 9. This analysis showed little change in Anna's vocabulary and language complexity. Her MLU remained the same at 1.00 from preintervention to postintervention. Her TTR decreased from .75 to .57. These numbers are based on a total of 35 words for preintervention and 34 words for postintervention, but only intelligible words were used in calculations of MLU and TTR. For the preintervention sample, 24% of Anna's words were intelligible, and for postintervention this value was 21%. Therefore, the calculations were based on eight words for preintervention and seven words for postintervention.

Table 9

Communication Measures for Anna.

Assessment	Pre	Post	Change
Language Sample Analysis			
Anna			
Total Number of Utterances	35	34	-1
Total Number of Words	35	34	-1
MLU	1.00	1.00	0.00
TTR	.75	.57	-.18
Bob			
Total Number of Utterances	65	45	-20
Total Number of Words	226	135	-91
MLU	3.63	3.18	-.45
TTR	.43	.50	.07
CDI	Raw (Percentile)	Raw (Percentile)	Raw (Percentile)
Early Words			
Phrases Understood	12(<5)	19(15)	7(10)
Vocabulary Checklist			
Understands	73 (<5)	168(15-20)	95(10-15)
Says	11 (<5)	21(5-10)	10(0-5)
Gestures			
Early	10 (<5)	16 (50-60)	6 (55)
Late	10 (<5)	14 (<5)	4 (0)
Total	20 (<5)	34 (<5)	14 (0)

Table 9 *cont'd.*

Assessment	Pre	Post	Change
CASLLS		Criteria Met	
Age in Months (Total Items Possible)		Emerging	
Cognition/Play			
12-18 (7)	0,4	0,5	0,1
18-24 (7)	0,0	0,3	0,3
Totals[1]	4 of 14	8 of 14	+4
Listening			
12-15 (8)	0,8	0,8	0,0
15-18 (5)	0,1	0,1	0,0
18-21 (6)	0,0	0,2	0,2
21-24 (10)	0,0	0,8	0,8
Totals	9 of 29	19/29	+10
Social Interaction			
12-15 (9)	0,8	0,8	0,0
15-18 (5)	0,4	0,4	0,0
18-21 (2)	0,2	0,2	0,0
21-24 (11)	0,1	0,2	0,1
Totals	15 of 27	16 of 27	+1
Linguistic Meaning			
12-15 (2)	0,2	0,2	0,0
15-18 (10)	1,0	1,7	0,7
18-21 (3)	0,0	0,2	0,2
21-24 (13)	0,0	0,2	0,2
Totals	3 of 28	14 of 28	+11
Expressive Syntax[2]			
15-18 (2)	0,2	0,2	0,0
18-21(2)	0,0	0,0	0,0
21-24 (6)	0,2	0,2	0,0
Totals	4 of 10	4 of 10	0

Note. CDI percentiles apply to children at age 18 months. Anna was about 26 months when she began the study. Therefore, percentiles do not apply but are provided for context.
1–Total emerging and mastered assessment items for child and total possible assessment items per language area and age range.
2–Syntax cannot be measured with an MLU of 1

Anna's performance on the CDI and CASLLS. I assessed the child's language development before and after intervention with two assessments: the CDI and the CASLLS. The CDI is a parent-completed, age-normed assessment. Bob completed the preintervention CDI on April 24, 2014 and sent it to me by US Mail, and he completed

the postintervention CDI on July 23, 2014 and sent it to me by e-mail attachment. Intervention sessions were held between May 8, 2014 and July 1, 2014. These dates provide a timeframe in which changes in Anna's communicative abilities took place. The data from this assessment are contained in Table 9. Anna made positive changes in raw scores in all measures. These positive changes registered as percentile rank growth in (a) phrases understood, (b) vocabulary understood, (c) vocabulary produced, and (d) early gestures. The CDI is normed to 18 months for the Words and Gestures assessment, and Anna was 26 months old when the study began. Therefore, Anna's percentile rank cannot be obtained. The percentiles provided in Table 9 are for children at 18 months and are provided for context only. Anna's communicative abilities precluded use of the CDI: Words and Sentences, which covers ages 16-30 months.

The CASLLS is a criterion-referenced assessment that is divided into five areas of language and communication development: (a) cognition/play, (b) listening, (c) social interaction, (c) linguistic meaning, and (d) expressive syntax. Each of these areas is subdivided into age ranges and corresponding developmental milestones (e.g., for Listening, a child is expected to "understand 50 words" at around 15-18 months). The CASLLS is meant to be scored by observing children in natural interaction. I observed the baseline parent-child interaction sessions (i.e., preintervention) and the maintenance sessions (postintervention) to complete this assessment. For each behavior on the checklist, there is a space to indicate if the behavior is Emerging, Mastered, or Generalized. Because the parent-child interaction sessions were conducted almost exclusively in Anna's bedroom, always at night, and exclusively with Bob, I could not determine whether Anna's learned behaviors were generalized across environments,

people, or time. Therefore, I did not count any of Anna's learned behaviors as having been generalized. Table 9 contains a summary of Anna's performance on the CASLLS.

There were a total of 8 baseline sessions conducted over 15 days, with a range of 1-5 days between sessions. During baseline sessions, Anna mastered 4 of 14 behaviors in the cognitive/play area, 9 of 29 behaviors in the listening area, 15 of 27 behaviors in the social interaction area, 2 of 28 behaviors in the linguistic meaning area, and 4 of 10 behaviors in the expressive syntax area. There were a total of 3 maintenance sessions, conducted over 5 days. By the end of the maintenance sessions, she had gained four behaviors in the cognitive/play area, 10 in the listening area, 1 in the social interaction area, 11 in the linguistic meaning area, and none in the expressive syntax area. Chronologically, Anna was about 2 months older than the recommended age for this assessment. Developmentally, though, this assessment was an appropriate choice for Anna's abilities. She was emerging in or had mastered 35 of 108 behaviors during preintervention sessions, and this number increased to 61 during the maintenance sessions.

Implementation Fidelity

I assessed implementation fidelity at two levels. First, I completed a session protocol checklist (see Appendices P-T for Training and Coaching Protocols) for each session. Then, Dr. Julia Stoner observed video files and checked completed session forms for fidelity assessment (see Appendix W for PiCS Fidelity Assessment Manual). Dr. Stoner reviewed 60% of sessions in each phase; I chose two sessions per phase at random in addition to the first session in each phase (i.e., the sessions with training). I calculated implementation fidelity by tallying the number of items on the coaching and

feedback protocols that Dr. Stoner marked as correct and dividing by the total number of items possible and multiplying this number by 100 to obtain a percentage. The implementation fidelity across nine sessions was 100%. The overall score for training was 100% and for coaching and feedback was 100%. These scores indicate that implementation fidelity was acceptable (Vogt, 2007). Data for implementation fidelity are presented in Table 10.

Table 10.

Implementation Fidelity

	Training	Coaching and Feedback	Video Feedback	**Total by Phase**
Phase		Correct / (Correct + Incorrect) % Implementation Fidelity		
Modeling	23/23 100	40/40 100	4/4 100	**67/67** **100**
Mand-Model	12/12 100	38/38 100	NA	**50/50** **100**
Time Delay	12/12 100	38/38 100	4/4 100	**54/54** **100**
Total by Category	**47/47** **100**	**116/116** **100**	**8/8** **100**	**171/171** **100**

Social Validity

I assessed social validity using quantitative (i.e., descriptive statistics) and qualitative (i.e., interview and open-response survey items) methods. First, the parent completed pre- and postintervention surveys regarding satisfaction with goals, procedures, and outcomes (Wolf, 1978). Second, I interviewed the parent before and after intervention to allow a more open forum for discussion of goals, procedures, and outcomes. For an intervention to be a viable practice, its stakeholders must view the

goals, procedures, and outcomes as socially valid and acceptable (Schwartz & Baer, 1991; Wolf, 1978).

Survey Responses

I assessed the parent's acceptance of intervention goals, procedures, and outcomes using the pre- and postintervention surveys created by Meadan et al. (2014). The parent's responses are presented in Figure 3. Items 1-4 were open-ended questions regarding the parent's perspectives on communication development, knowledge of communication teaching strategies, and current practices for enhancing child communication. Item 5 included two Likert-type questions asking the parent to rate his current knowledge and competence in communication teaching strategies. Bob rated his knowledge of communication teaching strategies at 3 out of 5 before intervention. He reported knowledge of communication teaching strategies (e.g., "bombardment and auditory oral") in the preintervention survey. For the postintervention survey, Bob rated all but one item at a 5 out of 5, including his competence in using the naturalistic teaching strategies. The item rated 4 out of 5 was "*The ease of use of technology for distance sessions (e.g., Skype™).*" This was also a theme that arose during the postintervention interview.

Bob rated his knowledge of communication teaching strategies at 3 out of 5 before intervention. He reported knowledge of communication teaching strategies (e.g., bombardment and auditory oral approach) in the preintervention survey. For the postintervention survey, Bob rated all but one item at a 5 out of 5, including his competence in using the naturalistic teaching strategies. The item rated 4 out of 5 was "*The ease of use of technology for distance sessions (e.g., Skype™).*" This was also an issue that arose during the postintervention interview.

Figure 2.

Items and Parent Responses for Pre- and Postintervention Social Validity Surveys.

Preintervention Parent Survey

Social communication is more than speech and it can be behavior, vocalizations, or gestures that a child uses to interact with others. The following questions are about the social communication behavior of your child and how you interact with your child. Please answer the following questions.

1. To what extent do you think social communication behavior is important for preschool-age children? Please explain.
   Very. Children need to be able to communicate their needs/wants effectively.
2. How would you describe a young child with good social communication behavior?
   Interactive, engaging
3. What strategies do you think are effective in enhancing the social communication behavior of young children?
   Bombardment, consistency, determination
4. What strategies do you currently use at home to enhance your child's social communication behavior?
   Auditory oral, vocal narration, auditory bombardment of sounds and words.
5. How effective are the strategies that you currently use to enhance your child's social communication behavior?
   Anna makes progress in spurts typically developing higher level skills before lower level.
6. On a scale of 1 to 5 (1=*low*; 5=*high*) rate ***your***:
   a. Knowledge of social communication teaching strategies. **3**
   b. Competence in implementing social communication teaching strategies. **3**

Figure 2 cont'd.

Postintervention Survey

On a scale of 1 to 5 (1=*low*; 5=*high*) please rate the following:

1. The information provided to you during training.	**5**
2. The guidance provided to you during coaching.	**5**
3. How satisfied you are with the overall project procedures.	**5**
4. How helpful were the coaching sessions with video feedback?	**4**
5. The benefit of using technology for distance sessions (e.g., Skype™).	**5**
6. The ease of use of technology for distance sessions (e.g., Skype™).	**4**
7. How easy it was to incorporate the strategies into your daily home routine.	**5**
8. How useful the strategies were in meeting your child's goals.	**5**
9. How satisfied you are with the overall project outcomes for your child.	**5**
10. How satisfied you are with the overall project outcomes for you.	**5**
11. Your knowledge of naturalistic teaching strategies (i.e., environmental arrangement, modeling, mand-model, and time delay).	**5**
12. Your competence in implementing naturalistic teaching strategies.	**5**
13. Your enjoyment in implementing naturalistic teaching strategies.	**5**

14. Please add comments/suggestions/feedback:

The only suggestion I have is finding an alternative to Skype, if possible. It would often freeze or crash mid-session and it would take about a minute or so before we realized what was happening and was a small distraction at times.

Videoconferencing Malfunctions

I collected data regarding the functioning of Skype™ and internet connectivity by watching all videos and noting the frequency and duration of dropped calls, screensharing difficulties, and poor audio or visual quality. These data are presented in Table 11 and they add context to Bob's responses in the postintervention survey and interview. There were a total of 69 call freezes/dropped calls. The combination of call freezes/dropped calls and screensharing difficulties was 68 minutes and 32 seconds. These were times when the meeting was interrupted, as opposed to audio and visual quality issues during

which meetings still progressed. Bob mentioned these malfunctions both on the postintervention survey and during the postintervention interview. He attributed the malfunctions to Skype™, but I believe the cause could also have been internet connectivity issues.

Table 11

Summary of Videoconferencing Malfunction Data

Type	Frequency	Duration (mm:ss)
Call Freeze/ Dropped Call	69	31:40
Poor Sound Quality	10	26:40
Poor Visual Quality	1	3:42
Screen-sharing*	15*	36:52
Totals	**95**	**98:49**

Note. The total time for all sessions was 17 hours and 13 minutes.
* Two of the screensharing difficulties were not resolved, and we proceeded without sharing my screen.

Interview Responses

The pre- and postintervention interviews lasted approximately 32 and 28 minutes respectively. I analyzed Bob's comments during both pre- and postintervention interviews by coding them line-by-line, identifying categories that emerged, and continually returning to my data to expand, combine, or delete emerging categories (Creswell, 2012). I confirmed my findings using three methods: member-checking, respondent validation, and expert validation. Member checking was accomplished by asking the parent to verify his statements, while respondent validation was completed by asking the parent to respond and either disagree or agree with the categories from my

findings. The parent verified his comments and confirmed my findings. Finally, I used expert validation by having Dr. Julia Stoner read the interviews and validate my findings. The categories, subcategories, and example statements are presented in Table 12.

Table 12.

Pre- and Postintervention Interview Categories and Sample Statements

Preintervention Interview	
Categories *Subcategories*	Sample quotes
Family quality of life	
Stressors	
Communication frustration	don't know what's bothering her gets frustrated because she knows I'm not getting it
Medical concerns	doctors, geneticists…blood tests…you have the report. You have seen all the things she's gone through.
Uncertainty	everything's inconclusive just to try and figure out what it is she has
Comforts	
Positive interaction	if I get it and I give it to her, she smiles, and she's happy
Developmental progress	it's easier now that she can walk
Hopes/Dreams	try to get her as normal a childhood as we can
Dad's feeling of lack of involvement	
Restrictions of career life	come home for a little bit and catch as much as I can
Restrictions of related services scheduling	meetings…are at times when I don't even catch the smallest bit of it

Table 12 cont'd.

Postintervention Interview	
Categories *Subcategories*	Sample quotes
Benefits of participation in PiCS	
1:1 time with Anna	fun to get to interact one-on-one with Anna
Flexible scheduling allowing his involvement	somebody who doesn't get enough time to spend with their child…a good framework to work off of
Learned strategies	helped my consistency with waiting having it mapped out in the black and white
Negative aspects of PiCS procedures	
Skype™ malfunctions	there's got to be another videoconferencing software
Camera was obtrusive	to kind of keep track of where the camera was aimed
Dad's participation in Anna's education and life	
Dad less involved with Anna than mother	just because of how much time they spend together…she knows Anna's quirks better
Dad less involved with service providers than mother	Sara's more involved with the therapists, so she gets to see Anna at all steps and stages

Preintervention interview. The main categories that emerged during the preintervention interview were family quality of life (Turnbull & Turnbull, 2010), hopes and dreams, and the level of involvement of the parent in his daughter's care. The main subcategories under family quality of life were stressors and comforts. Under hopes and dreams, Bob mentioned the life outcomes he desired for Anna. Finally, regarding Bob's level of involvement in Anna's care, Bob stated that the main issues affecting his involvement with his daughter were (a) restrictions of his work life, and (b) restrictions by those implementing Anna's IFSP (i.e., scheduling practices). In the following

paragraphs I will describe the overall findings from the interview and provide specific examples of Bob's expressions regarding the interview questions.

Family quality of life. Family quality of life has emerged as an important area of research and concern of professionals (Turnbull & Turnbull, 2010) providing services under Part C of the IDEIA. Bob expressed concern for his family's quality of life. Among the stressors Bob mentioned, poor communication has limited his ability to help his daughter. When discussing moments when Anna becomes irritable, takes her hearing aids out, and doesn't want them put back in, Bob explained, "that's one of those things where you just don't know what's bothering her, don't know if she bit her tongue or cheek." He discussed his frustration when he cannot understand Anna; "it's frustrating because I want to do for her whatever I can, the same with our other kids. It's just with her, it takes a little bit more." Bob mentioned that everyday difficulties would be easier to cope with if he knew what was upsetting Anna. For example, when discussing the typical occurrence of one of Anna's siblings picking on her or taking her toy, Bob said, "those are the easy ones; we know why she's upset, but you know they still occur, and those are the ones we have to get past." With young children, Bob said, he expects occasional "hiccups." Difficulty understanding and communicating with Anna compounds the frustration that comes with everyday occurrences that are typical for all children.

Bob also mentioned stressors that impacted Anna, who became frustrated when she could not communicate her needs effectively. Bob described this: "She gets frustrated because she knows I'm not getting it and she's not getting what she wants." If the communication difficulty persists, "… it kind of escalates between the two of us and

she gets more upset and it becomes harder to calm her down even if I get her the object she wants." According to Bob, these stressful interactions could arise "for simple things" and lead to lasting frustration for his daughter. On the other hand, when Bob has been able to understand Anna, the pair was able to "just keep on moving at that point, there's no hiccups, or no stoppage; we just continue what we're doing." It appeared that ineffective communication, resulting in frustration, had the potential to negatively impact the father-daughter relationship.

Another stressor impacting family quality of life was Anna's medical history. As noted in Table 4, Anna has experienced ongoing medical difficulties since her earliest days of life. "But that first morning when the pediatrician came to check on her, [Anna] aspirated some mucus, and they had to resuscitate her. So pretty much from there it's been just different things." Some of these issues had a direct impact on daily life: "For a long time she was a rag doll." Bob noted that delays in her physical development were taxing on him and Sara: "The big one was to make it so she could move on her own, because she's obviously the larger of the two [Anna is a twin]; she's like 36 pounds and almost 3 foot tall at 2 years old." Her independence and autonomy have been a priority for Bob and Sara. According to Bob, "if she wasn't able to bear her own weight" or "play by herself," life would be all the more difficult for all involved. Therefore, as Anna has made progress, family quality of life has improved for her and the family.

Anna's medical needs have been stressful because at times, they have required time and travel to medical experts in various fields. Bob, Sara, and Anna visited audiologists in three different cities to determine the etiology, degree of, and best course of action regarding her hearing loss. "At 4 months she was fitted with her hearing aids."

Anna has experienced many assessments. Bob expressed sympathy for Anna: "Yes, doctors, geneticists. She's had many blood tests; you have the report. You have seen all the things she's gone through." Through these difficulties, the family has had to remain flexible and persistent, "adjusting therapy" and "always trying to meet that next goal. That's pretty much how we look at it."

Bob and Sara are also uncertain about Anna's future development and this has added stress. In all developmental domains, they were unsure of how she would progress: "She, we thought she would never walk, we thought she may never become verbal … some of those big milestones, we weren't sure how far she would get with them." Medical staff informed Bob and Sara that their daughter may never develop muscle strength or coordination to walk and talk, leading them to worry about the long-term quality of Anna's life.

Additionally, Bob and Sara continue to seek input from professionals as exemplified by their request that I share Anna's file with anyone at the university who might help them determine her disability and whether they were doing all they could for Anna and her future. Bob and Sara provided me with a packet containing Anna's medical and developmental history, diagnoses, and medical procedures which I have summarized in Table 4. This documentation supports my impression that these parents are focused on obtaining the best services and working toward the best outcomes for Anna. Anna is progressing, as Bob indicated: "she's starting to catch up a little more, or at least I hope she is." This conveys his desire for but also his uncertainty regarding Anna's progress.

Anna has required more attention than her siblings. Bob seemed to worry that the

other children may have felt neglected: "trouble with getting [Anna's siblings] the attention they would like, and they'll get into a whole bunch of trouble sometimes. For me it's a stress of having three children under a certain age." Bob indicated a belief that family life is typically stressful for most parents. With a child with disabilities, that stress is compounded: "Even if she didn't have an impairment, I think having twin 2-year-olds and a 5-year-old, even with [Anna's twin sister] at 100% communication…it's how things are." Bob mentioned a lack of sleep and challenges of keeping up with daily tasks because of the attention needed by the children.

Conversely, Bob also mentioned several factors that comprised a subcategory of comforts (i.e., factors that enhance family quality of life). For one, according to Bob, Anna has seemed content when she is able to effectively communicate and interact with him and others. "Usually, if I get it [understand what she wants] and I give it to her, she smiles and she's happy." This type of interaction was likely to occur when Bob was able to spend one-on-one time with Anna. "It's just the two of us, there's no one else, she's getting some one-on-one playtime, which she always loves."

Bob also indicated that he understands her nonsymbolic communication. For example, he listed several behaviors along with his perception of their communicative function. "Well if she likes something she smiles and laughs, she gets agitated in a positive way," and "When she wants something she'll point or make a pinching, reaching motion for it, as well as squealing." These statements exemplify Bob's desire and ability to understand Anna's communication and intent.

Bob expressed that Anna is an outgoing child who is happy most of the time. "She's by-and-large in such a good mood, it's pretty rare that she throws a lasting

tantrum or fit" and "she loves her therapists. She'll say 'hi' to them as soon as they come through the door." Anna's ability to cope and remain positive through all her appointments and procedures has been a source of pride for Bob. During the first intervention session, Bob indicated the following characteristics that he loves about Anna: playfulness, sense of humor, independence, and resilience. When referring to all that she has been through, he indicated a strong sense of pride in her positive outlook, that he has seen her "smiling through a blood draw."

A final factor in the subcategory of comforts was Anna's developmental progress. Bob noted that "unassisted walking, standing, a lot of the gross motor skills" were recent accomplishments. These successes have led to improved interaction: "It's easier now that she can walk… I let her walk and try to show me what she's going for." He said, "In some instances, she's starting to catch up a little more, or at least I hope she is."

Hopes and dreams. The second category was Bob's hopes and dreams for Anna. Bob wants normalcy for Anna. "We try to get her as normal a childhood as we can." He stated that he wanted the same for Anna as he does for his other two children. Therefore, he treats her with the same expectations: "Because with [with Anna's siblings], we've worked on them with using 'please' and 'thank you.' Same with Anna, we try to treat her that way." Bob stressed several times during the interview that giving Anna a "normal" life and treating and loving his children equally was his priority.

Dad's feeling of being uninvolved in Anna's care. The third category that arose from the interview was Bob's expression that he was less involved in Anna's related services due to (a) his full-time position at work and (b) the timing of the related service

appointments. Bob noted that Sara spent more time with Anna and thus was more expert at working with her: "I don't know her cadences; I don't know her intonations as well as Sara does, because I'm not with her 24/7." At times when asked about Anna's progress, Bob would hesitate and state that he did not have specific numbers and that he was not able to make it to a meeting where they discussed that area. "She's starting to catch up a little more, or at least I hope she is." Bob was also concerned about relieving his wife from the constant responsibilities of childcare and stated, "That's part of the reason I'm doing this, so that she gets a break. Because she's doing so much therapy with Anna all the time. I can sacrifice some of my time to give her a break."

A large factor in Bob's ability to participate in Anna's IFSP implementation has been the scheduling of related service providers. Bob does attend as many IFSP meetings and related service appointments as he can but stated that many of them "are at times when I don't even catch the smallest bit of it because they're early in the morning or late in the afternoon…so I come home for a little bit and catch as much as I can and I usually miss the part where they're rating her."

When I asked Bob about Anna's communication progress, he stated that he did not know exact numbers or amount of progress and without attending the meetings in full, he might be missing important information about Anna's development. "I have whatever Sara tells me, and there's a smaller portion of what I remember." However, after I prompted him, Bob was able to describe Anna's development and communication from his own observations; yet he seemed to place less credence in his own observations than he did in the observations of the service providers and his wife.

Postintervention interview. Three categories emerged from the postintervention interview: (a) benefits of the procedures in this intervention, (b) factors of the PiCS procedures that Bob perceived as negative, and (c) Bob's satisfaction with his involvement in Anna's life and education. The first three categories relate to Bob's satisfaction with and perspectives on the PiCS goals and procedures. The fourth category was related to Bob's perspective of involvement with Anna and other family members. I will discuss the four categories in the order listed above.

Benefits of participating in the PiCS intervention. Bob identified several benefits of participating in the PiCS intervention. First, he noted that participation offered him one-on-one time with his daughter. Bob and Sara decided before baseline data collection began that Bob would be the parent participating and Sara and the other children would not be involved in the sessions. "It was really fun getting to interact one-on-one with Anna." He expressed that this time was "important" and that Anna enjoyed it also. Bob stated that through their interaction during sessions, communication between him and Anna has "become a little easier."

Bob also stated that participation gave him a chance to be involved in Anna's education. He said that with his busy work schedule, the PiCS project,

> is a good scope; a good set of tools for parents like me… somebody who doesn't get enough time to spend with their child who may have a speech delay or hearing delay. I think it gives them a good framework to work off of.

Specifically the flexible schedule and the teaching materials were identified as beneficial. Bob stated that the flowcharts and laying out of specific steps for each strategy were the most beneficial of the PiCS materials (see Appendix P).

Another concept that emerged in the category of benefits was that Bob learned to be patient and purposeful. Bob specifically identified that he had learned to be patient, wait for Anna to respond, and to try to understand her communicative intentions by interpreting her nonsymbolic communication. Bob also stated that he had learned to be purposeful in his interactions with Anna. For example, he stated he was now consistently providing communication opportunities and requiring Anna to communicate to obtain desired objects and activities.

Bob also identified improvement of his communication skills with Anna:

> "Setting it up in a routine kind of helped me because it helped my consistency with waiting. Sometimes I would say something a couple of times and I would wait too long and then she'd get frustrated because she wouldn't understand what I was trying to do."

He attributed these changes to the structured format of the PiCS learning materials:

> For me it was more about just having the structure, having it mapped out in the black and white, just saying 'try this, this, and this.' You tried it a few times, this doesn't work, go ahead and give the object even if they haven't quote-unquote earned it."

Negative aspects of the PiCS procedures. Bob's main complaint about the PiCS procedures were with Skype™ and the number of dropped calls, this is when the connection between myself and Bob was terminated for an unknown reason. Specifically,

> Bob: There's got to be another videoconferencing software that would be effective.

Marc: Mm-hmmm.

Bob: Something more stable.

Marc: Yeah, it didn't matter what we did.

Bob: No because right now where I am in the house, I am probably 7 feet from the wireless router. And it still crashed twice.

We tried many solutions during the project, including moving near our respective wireless routers. Another negative aspect Bob discussed was distraction of video-recording the sessions. "I think mainly for me, because I always had to kind of keep track of where [the camera] was aimed, if I could remember to think about it. You probably saw me glance at the camera at least five to six times because I would try to get an idea of where I was in relation. And also try to check to see if the [Skype™] signal had dropped." When I asked him how much of the time he was distracted, he replied, "Maybe 2-5%. Not like a huge amount. It was more, kind of like checking your mirrors while driving. You know, it just sort of became part of the landscape."

Bob also noted that he did not prefer the PiCS training videos. His reasoning was that the parents in the videos were encouraging sign language and that one parent used a picture card to encourage her child to request. Bob said that he and his wife believed that use of sign language or picture cards would inhibit verbal communication development. Therefore, he stated that the videos didn't really apply to him and Anna.

Bob's satisfaction with his involvement in Anna's life and education. Finally, the benefit of Bob's involvement with Anna and family members emerged as a theme. Bob mentioned in the preintervention interview that he missed meetings when Anna's progress was discussed in detail, and in the

postintervention interview, he emphasized his wife Sara had more opportunities for interaction with Anna and the other children.

> "As far as Sara and Anna are concerned, it's always been a higher level just because of how much time they spend together. So she knows Anna's quirks better than I do. Plus she's got different strategies than I use. And she has different things she's asked to work with her on (from therapists at the missed meetings)."

Bob felt he was being left out of Anna's IFSP process and implementation of related services. "Sara's more involved with the therapists, so she gets to see Anna at all steps and stages." He noted that participating in the PiCS intervention gave him an opportunity for involvement and he was pleased with that.

Conclusion

The results of data analysis show a positive relation between the PiCS intervention and the quality of Bob's teaching strategy use. Bob's percentage of quality 4 uses of each teaching strategy increased during respective intervention conditions (i.e., coaching and feedback for modeling, mand-model, and time delay). His percentage of quality 4 uses of teaching strategies also maintained higher than baseline levels when intervention conditions (i.e., coaching and feedback) were removed during the maintenance phase. However, he decreased in overall frequency of teaching strategy use during the maintenance phase. According to Tau-U analysis for adjacent conditions, changes in Bob's percentage of quality 4 use of teaching strategies was significant between baseline and intervention conditions. The Tau-U analysis for combined effect size of 93.02% ($p < .001$) indicates a strong relation between the PiCS intervention and

Bob's use of the teaching strategies.

Outcomes for Anna were positive also, but these changes may not be related to the PiCS intervention. For the communication behavior of responding, levels became more stable during modeling and mand-model intervention phases. Her mean level of responding was highest during the baseline phase and mand-model intervention, and lowest during time delay intervention. Anna's mean level of initiation was highest during time delay intervention and lowest during modeling intervention and the baseline phase.

Anna's performance on the CDI and CASLLS improved from the baseline phase to postintervention. Again, these results may not be attributed to the PiCS intervention. In completing the CDI at postintervention, Bob indicated that Anna understood more words and used more gestures than she had during the preintervention phase. The norming properties of the CDI could not be applied to Anna, as she was older than the ages on which the assessment was normed. However, analysis of the CDI completed by Bob shows that Anna may have made gains in her receptive language and use of gestures during the time of the PiCS intervention.

Anna also showed improvement in the areas measured by the CASLLS. Anna made gains in all areas except expressive syntax. Her greatest gains were in linguistic meaning and listening. These results provide useful information regarding the PiCS intervention and for developers of parent-implemented interventions for improving the pragmatic communication skills of children with disabilities.

CHAPTER V

DISCUSSION

Introduction

This study was conducted to examine the effectiveness of the PiCS intervention with a parent of a child who is DHH. In this chapter I answer the research questions and discuss unexpected findings and limitations of this study. I then offer suggestions and implications for practitioners and future research.

Research Questions

Question 1: Is There a Functional Relation between the PiCS Intervention for Parents of Children who are DHH and Rate/Quality of Naturalistic Teaching Strategy Use?

I used a multiple-baseline across teaching strategies design to determine the functional relation between the PiCS intervention and Bob's use of naturalistic teaching strategies (i.e., modeling, mand-model, and time delay). At the onset of intervention, Bob increased his percentage of high-quality use for all teaching strategies, although the percentage of change varied across teaching strategies. This change suggests that the effect of the PiCS intervention was to increase Bob's percentage of high-quality use of naturalistic teaching strategies.

Adjacent-condition analysis showed that Bob decreased his overall frequency of modeling and mand-model, but that he increased his percentage of high-quality uses of

both strategies at the onset of intervention. Bob's decrease in overall frequency of modeling and mand-model use is interesting. He used modeling (at all quality levels) during baseline between seven and 34 times, whereas during modeling intervention he decreased his modeling use to a range of 7-15 uses. During the baseline phase, Bob used mand-model (at all quality levels) between 16 and 39 times, and he decreased to a range of 18-29 uses during mand-model intervention.

The decrease in frequency of low-quality modeling and mand-model seems to account for Bob's improvement in percentage of high-quality modeling. Specifically, Bob used modeling at quality levels 1, 2, and 3 an average of 9.63 times per session in the baseline phase, compared to 3.67 times per session during intervention. He used mand-model at quality levels 1, 2, and 3 an average of 17.57 times per session during baseline and only 6.33 times per session mand-model intervention. By decreasing his low-quality teaching strategy use, Bob improved his percentage of high-quality teaching strategy use.

Several factors may explain Bob's initial high frequency of teaching strategy use. For one, many parents use these teaching strategies daily with their young children without training, albeit with lower quality (e.g., lacking joint attention or wait time; Kaiser & Roberts, 2013; Meadan et al., 2014; Woods et al., 2004). Second, Bob stated during the preintervention interview and on the preintervention survey that he was not familiar with teaching strategies for communication. However, he had learned about auditory bombardment, a language teaching strategy that includes repeating words related to the child's interest without eliciting language in return. If Bob used auditory bombardment during the baseline phase, it was likely counted as low-quality models and

mand-models.

The plots for modeling show a decrease in Bob's overall frequency of modeling during modeling intervention and maintenance I and II. His frequency of modeling decreased about 5.5 per session from baseline to intervention, and continued to decrease through maintenance. This is interesting, since training and coaching should increase his overall use of a targeted strategy. Again, it may be Bob's earlier learning about auditory bombardment and the difference in the way the PiCS training materials teach about modeling. For a high quality model in the PiCS intervention, Bob was required to establish joint attention, present the model, wait for Anna to respond, and present her with positive feedback.

Conversely, in auditory bombardment, parents are taught to model words repeatedly and there is not a focus on the child's responses or on wait time. However, the number of both low- and high-quality models was low throughout both maintenance phases. This may have been due to the focus on other strategies during mand-model and time delay interventions. Further, parents may choose a preferred strategy and fall back on it. Bob's high-quality use of mand-model was higher during maintenance II than it was during time delay intervention.

Auditory bombardment may not be ideal for a child who is DHH. Kouri (2005) found that an intervention that elicited language was more efficient and effective than auditory bombardment combined with adult-child interaction for teaching new words and encouraging spontaneous utterances. In addition, Koester and Meadow-Orlans (1999) found that children who are DHH averted their parents' gaze when parents' communication attempts were too frequent. Through the PiCS intervention, it seems that

Bob reduced his low-quality use of modeling and mand-model and his overall utterances (see Table 9). During intervention, a greater portion of his interaction attempts were high-quality teaching strategy uses.

The effect of the PiCS intervention was most clear with frequency of time delay. During the baseline phase, Bob used time delay a total of four times. Of these, 50% were high-quality uses. During the fifth baseline session, Bob used time delay twice with 100% high quality. In contrast to modeling and mand-model, Bob clearly used time delay with a greater frequency during its respective intervention. The percent of high-quality use of time delay was 100% during four of five intervention sessions. It may be that Bob's prior use, or at least knowledge of auditory bombardment, led him to use time delay with such infrequency during the baseline phase.

Bob's use of the teaching strategies was variable through baseline and maintenance II conditions. For overall frequency, Bob's use of modeling and mand-model was lower during maintenance II than baseline, but his use of time delay was higher in maintenance II than during baseline. For percentage of high quality strategy use, he was higher on average for all three strategies during maintenance II. However, the data in both conditions were highly variable, and were even decelerating for modeling and time delay. Based on visual analysis, it is difficult to draw conclusions because of the overlapping data and variability of the data. It does seem that Bob used all strategies with a higher percentage of high quality during maintenance II than during baseline.

As stated in Chapter 4, Tau-U analysis showed a significant difference between the baseline and intervention phases for percentage of high-quality use of modeling and mand-model. Bob's baseline percentage of high-quality use of time delay was

mathematically undefined (i.e., quality/rate = 0 ÷ 0 = ∅) for all but three sessions. Therefore, a Tau-U analysis could not be used to evaluate the adjacent conditions of baseline and time delay intervention for percentage of high-quality use. Instead, I conducted the Tau-U analysis for Bob's frequency of high-quality teaching strategy use (i.e., modeling, mand-model, and time delay). Individually, Bob's frequency of high-quality use of modeling was not significantly different between the baseline phase and modeling intervention, according to Tau-U analysis. The overall effect size for the PiCS intervention was significant (.6970; $p < .05$; CI = 0.3623 < > 1.0317). The functional relation between the PiCS intervention and Bob's use of naturalistic teaching strategies was to improve his percentage of high-quality teaching strategy use and to reduce his low-quality teaching strategy use.

There was covariation between all of the strategies. At the onset of modeling intervention, Bob's use of mand-model experienced a dramatic level change that remained stable until the end of modeling intervention. Also, at the onset of mand-model, Bob's use of modeling decreased dramatically and remained low throughout the remainder of the study. At the onset of and throughout time delay intervention, Bob's use of mand-model decreased dramatically and remained lower than baseline and intervention levels. It may be natural to decrease one strategy when focusing on another. On the other hand, these naturalistic teaching strategies should complement each other. In a typical interaction, parents should be able to choose among the strategies and use each one when appropriate. Another possible explanation of this is discussed later in the section titled "Additional Findings."

The findings of this study corroborate those of Meadan et al. (2014). In that

study, parents learned to implement naturalistic teaching strategies with fidelity. As with the current study, the changes between baseline and intervention phases in the original study varied in quantity across teaching strategies. Additionally, the parents in both studies maintained their teaching strategy use after intervention. Most interesting is that for both studies, mand-model was the most frequently used teaching strategy during the baseline and maintenance phases.

This preference for mand-model is interesting. Hancock and Kaiser (2006) suggested that parents choose teaching strategies to use with their children based on the context of interaction and the support needs of their children. They described modeling, mand-model, and time delay in terms of support provided. Modeling provides the most support and time delay provides the least verbal support. Mand-model provides more support than time delay but less than modeling. With mand-model, the parent utterances may be longer and can allow child autonomy. Hancock and Kaiser noted the number of options within mand-model that parents can choose to tailor the support they provide to their children: open questions, choices between two named objects, and directives. Parents are often more directive when interacting with their children with disabilities (Venuti et al., 2009), specifically with their children who are DHH (Lam & Kitamura, 2010). For these reasons, it is understandable that parents of children with disabilities often choose to implement the mand-model teaching strategy more often than others.

The criteria for reaching mastery in the teaching strategies were: (a) 75% high-quality use of the targeted teaching strategy for the most recent intervention session *and* (b) parent self-report of "well" or "very well" for the targeted teaching strategy. In addition to these mastery criteria, the single-subject methodology I used required five

intervention sessions per phase plus one intermittent probe. Therefore, the minimum length of each phase was six sessions.

It is clear in Figure 1 that Bob met the 75% high-quality performance criterion quickly for each teaching strategy. For modeling, he reached 100% in the second intervention session; for mand-model he reached 82.8% in the second intervention session; and for time delay, he reached 100% during the first intervention session. Bob completed one self-report form per intervention phase, typically on a day when we did not have an intervention session or on a weekend between sessions. He rated his use of teaching strategies at "well" or "very well" and his frequency of use as "sometimes (3-4 uses)" or "very often (many uses)." We were able to move to the next phase after the minimum six sessions per phase. Therefore, the PiCS training and coaching intervention was highly efficient for this parent.

Again, this finding is supported by Meadan et al. (2014). In that study, the criteria were different, but all parents reached the criteria within three to five sessions. In this study, following the WWC SCRD standards, it was necessary to conduct five sessions per phase. Additionally, in this study I used data from the coding videos of parent-child interaction as criteria rather than data from live observation.

Question 2: How Acceptable are the Goals, Procedures, and Outcomes of the PiCS Protocols, Including Distance Training and Coaching for the Parent who Participated in this Study?

I assessed the acceptability of the goals, procedures, and outcomes for the PiCS protocols using the pre- and postintervention surveys and interviews. On the preintervention survey, Bob stated that communication was important: "Children need to

be able to communicate their needs/wants effectively." He also stated that a child with good social communication behavior is "interactive, engaging." On the postintervention survey, Bob assigned a 5 out of a possible 5 for items when rating the PiCS intervention's usefulness in meeting Anna's goals and satisfaction with project outcomes for both him and Anna.

Bob felt that he gained in knowledge and competence regarding social communication teaching strategies. He rated his knowledge of and competence in implementing social communication strategies at 3 out of a possible 5 on the preintervention survey. On the postintervention survey, Bob rated both of these items at 5 out of a possible 5.

Bob's postintervention comments during the interview and responses on the survey regarding the acceptability for the PiCS intervention were overwhelmingly positive. He seemed grateful for the opportunity to participate in Anna's education. Based on his answers during the preintervention interview, he had been feeling isolated from Anna and out of the loop concerning her progress. I believe for this reason, Bob appreciated the ability to participate so actively.

Furthermore, Bob may have reacted positively because the PiCS intervention was designed to meet recommendations for early intervention and specifically included parents. Hancock and Kaiser (2006) listed challenges to home visits and parent training. Among these, when parents receive training to implement strategies, they may feel they are acting more as service providers than as parents. Also, they may feel threatened by the presence of experts who may be critical of the support parents provide. To remedy these conditions, Hancock and Kaiser suggested that coaches and trainers work

"collaboratively with parent[s]," and "plan content and activities of individual sessions and the sequence of sessions to insure [*sic*] mastery of key behaviors" (p. 14). Basu, Salisbury, and Thorkildsen (2010) advised coaches to "let parents make decisions about what to do during the session" (p. 134). The PiCS intervention included items such as "acknowledge that the parent is the expert on the child" and "discuss what the parent is doing well with their child" (see Appendix P). These attempts to establish a safe learning environment may have led to Bob's positive report.

While Bob appreciated the benefits of distance technology (e.g., Skype™), he was less positive regarding its ease of use. At the bottom of the survey, Bob wrote that an alternative to Skype™ should be found. He mentioned Skype™ during the postintervention interview as well. In Chapter 2, I proposed physical absence of the coach/trainer a possible benefit of distance training and coaching. However, as Bob stated, the unreliability of Skype™ and the need to monitor the camera positioning were distractions due to distance training and coaching.

Bob's preferences for learning materials were interesting. He listed desirable materials (i.e., flowcharts and specific steps) and less desirable materials (i.e., training videos). Specifically, he would have preferred videos where all children were being asked to vocalize rather than using sign language or visuals (i.e., picture cards) to communicate. Hancock and Kaiser (2006) noted that videos of parents using teaching strategies with children were found to be more effective than live, verbal explanations from coaches. However, Bob's preference was that the parents use the targeted teaching strategies in the exact modality (i.e., children's spoken language) that he was targeting. Sandlin, Wright, and Clark (2011) examined adult learning theory in the context of the

current digital age of technology in which adults are more connected with each other and with sources of information. They stated that adult educators (e.g., service providers for parents of children with disabilities) must allow for the "modernist principles of rationality and individual agency and autonomy" (p. 7) in order to enhance the learner-educator discourse. In this, the varied formats of the PiCS protocols served Bob by providing material in his chosen format. However, the protocols also included the use of less desirable materials (i.e., video feedback and training videos).

Finally, Bob enjoyed the scheduling flexibility that the PiCS intervention provided. Specifically, we were able to schedule our meetings after Bob's work day. During both pre- and postintervention interviews, Bob noted the difficulty in attending meetings scheduled with other service providers. These meetings were always scheduled during Bob's work day. This finding is consistent with those of Turbiville and Marquis (2001) who surveyed 318 fathers regarding desirable strategies for encouraging fathers' participation in their children's service delivery programs. The fathers were asked to select strategies they found helpful, and they identified "scheduling for evening or on weekends" as desirable, with 62% of fathers stating that scheduling flexibility would encourage their participation. Noting a lack of paternal involvement in children's service delivery programs, Ingber and Most (2012) also found that fathers' number of working hours correlated negatively with their level of involvement with their children's service delivery. This is not surprising, as working hours typically align with service delivery hours. Many parents experience career interruption due to this reality (Stoner & Stoner, 2014). In two-parent households it is often the case that one parent, usually the mother, temporarily leaves a full-time position to fulfill the needs of the family (Baker & Drapela,

2010). The other parent is typically less involved in service delivery. With the ability to hold meetings at night and adjust meeting times at a moment's notice, Bob's ability to participate was enhanced.

Evaluating the Impact of this Study

The impact of an SCRD study can be shown through research design, analysis of data, and social validity. For SCRD, I consulted the WWC standards for rigorous designs. The design for this study met all of the WWC standards: (a) manipulation of the IV, (b) DV repeatedly measured, (c) IOA measured in more than 20% of sessions, (d) overall IOA measured at greater than 80% agreement, (e) at least 3 attempts to demonstrate intervention effect, and (f) five data points per phase. Therefore this study meets the criteria for a rigorous design.

Through analysis of the data, this study may not have shown a great impact. Horner et al. (2005) established a criterion for demonstrating experimental control. With the overlapping data between conditions and the variable nature of the data within conditions, any conclusions about the functional relation between the intervention and Bob's use of the teaching strategies must be qualified.

Finally, regarding social validity and the impact of the PiCS intervention, Bob seemed to approve of the goals, procedures, and outcomes of this study. It is important to determine whether these are acceptable to all stakeholders. In this study I only collected social validity data from Bob.

Additional Findings

In addition to answering the research questions set forth in Chapter 1, there were additional findings from this study. These included (a) changes in Bob's communication

behaviors, (b) distance technology and late cancellations, (c) single-case design and the opportunity cost of targeting teaching strategies, and (d) Anna's receptive and expressive vocabulary growth. I will discuss these findings in the following paragraphs.

Changes in Bob's Communication Behaviors

First, from the language sample analysis, Bob's total language production and MLU decreased from preintervention to postintervention. These are secondary outcomes that cannot be attributed directly to the PiCS intervention. However, the definitions and examples of teaching strategy use provided in the PiCS teaching materials do suggest limiting parent utterances to manageable words and phrases for the child to imitate. Therefore, it is likely that by following the PiCS procedures, Bob decreased his overall language production and MLU.

According to Kuder (2008), parents exhibit "motherese" or "child-directed speech" (p. 59) with their young children in the language development phase. Characteristics of child-directed speech include "higher overall pitch, exaggerated intonation and stress, slower speech, more reference to here and now, fewer broken or run-on sentences, fewer complex sentences, more questions and imperatives, shorter conversations" (p. 59). Bob did exhibit many of these characteristics. I did not assess these directly, but through the language sample analysis, it seems that Bob used more child-directed speech during the postintervention session. Mean turn length is a measure of the average number of words that a speaker says in a given turn. A speaker may produce more than one utterance per turn. Bob's mean turn length reduced from 6.85 to 5.40 and his MLU decreased by 0.45, suggesting sentences that were less complex. He also reduced his quantity of utterances by 21 where both language samples had 34

utterances by Anna.

Kuder's (2008) definition of child-directed speech was also observed in Bob's use of the mand-model teaching strategy, which includes questions and imperatives. Bob used mand-model during the baseline and maintenance phases with a higher frequency than he used modeling and time delay. This may indicate that Bob already had learned to use child-directed speech in some ways. Based on visual analysis, mand-model was Bob's teaching strategy of choice, especially since he maintained his high-quality use of mand-model in the final maintenance sessions. This finding is congruent with those of Meadan et al. (2014) who found that parents tended to maintain use of teaching strategies they used more frequently during the baseline phase.

The above changes in Bob's communication behaviors are positive. However, it is not possible to attribute them to the PiCS intervention directly. I did not collect data to observe them throughout the study. Furthermore, these behaviors were not the target of the PiCS intervention. Bob was able to spend regular quality time with Anna during the intervention, and it is entirely possible that this extra interaction time changed Bob's communication behavior. On the other hand, through the PiCS intervention, we targeted teaching strategy use with instructions that included responsiveness (e.g., following the child's lead and allowing wait time). The possible impact of the PiCS intervention should not be overlooked.

On a related note, Bob's low-quality uses of modeling and mand-model teaching strategies decreased through intervention. The goal of the PiCS intervention is to teach parents to use the teaching strategies with high quality during daily routines. While the overall frequency of modeling and mand-model use did not differ significantly, the

percentage of high-quality use increased for both teaching strategies. Therefore, it appears that an effect of the PiCS intervention was to reduce the frequency of low-quality teaching strategies that Bob used. This may relate to parental responsiveness, which has been found to predict children's language and academic outcomes later in life (Harrison & McLeod, 2010; Warren & Brady, 2007).

It is interesting to view Bob's reduced use of modeling and mand-model in light of the language sample analysis. As shown in Table 9, Bob uttered about 90 fewer words in the postintervention language sample and decreased his MLU by 0.45 morphemes per utterance. Parents who adjust their MLU to match their children's receptive abilities lead to language gains for children who are DHH (Pressman et al., 1999; Roberts & Kaiser, 2011). Past research has also found that interventions aimed at improving parent responsivity have led parents to produce fewer words in relation to their children's language production (Hancock, Kaiser, & Delaney, 2002), allow the children to direct their own play (Hancock et al., 2002; Haney & Klein, 1993), and allow wait time for children to respond and initiate (Haney & Klein, 1993).

The PiCS intervention may have affected the frequency with which Bob distracted Anna from her attentional interest. Cielinski et al. (1995) described "intrusiveness" as times when "the infant's attention is broken due to the parent's directiveness" (p. 166). I did not collect data on Bob's directiveness. However, it may be that Bob's decrease in word production, resulting from the responsivity education components (e.g., establishing joint attention, following the child's interest, and allowing wait time; Cabell et al., 2011) of the PiCS intervention, led him to interrupt Anna less frequently and to attend to her interests. Likely, parent-child interaction benefited from

fewer and shorter utterances from Bob, increased contingency on Anna's attentional interest, increased wait time for Anna's responses and initiations, and consistent praise for Anna's communication attempts.

Changes in Anna's Communication Behaviors

There were some changes in Anna's communication behaviors. These cannot be attributed to the PiCS intervention because the intervention targeted Bob and did not target Anna directly. There did seem to be a steady increase in Anna's responding behavior, but these data were highly variable with high overlapping data, so limited conclusions can be made about them. Anna's frequency of spontaneous initiations seemed to be highest during time delay intervention. These data were also variable and had high overlapping data in each phase. However, her overall average was higher by about one initiation in time delay intervention than during baseline.

Distance Technology and Late Cancellations

The convenience of distance technology may have increased late cancellations. Regarding the scheduling flexibility of the PiCS intervention, it seems true that using distance technology was more convenient for both Bob and me. Late cancellations occurring up to a few minutes before a scheduled meeting did not result in lost travel time. While there is no basis for comparison, it also may be that this convenience made late cancellations more frequent. Moments before one meeting, Bob sent me a text message saying that we needed to reschedule because they had decided to go out to eat. Late cancellations also occurred if Bob was late coming home from work, for after-school activities involving the children, or if Anna was having a bad night or was sick. This did not impact the study schedule since our goal was two to three meetings per week

and Bob could usually meet the next day. It may be a concern for service providers who have larger caseloads and less flexibility in their schedules. Therefore, any positive effects of my flexibility for Bob may not be available from service providers with busy schedules.

Single-Case Design and the Opportunity Cost of Targeting Teaching Strategies

Multiple-baseline designs call for researchers to choose target behaviors that are functionally unrelated. This is necessary for internal validity, so that when the intervention is introduced to one behavior, the other target behaviors are not impacted until the intervention is introduced to them. While modeling, mand-model, and time delay are functionally unrelated, it may be that the targeting of one teaching strategy necessarily decreased Bob's use of the others. In economics, this phenomenon is referred to as opportunity cost: when choosing to engage in one activity detracts from the ability to engage in another (Volk, 2013).

Throughout the interaction sessions during intervention, each time Bob chose to use modeling, he was necessarily precluding the use of mand-model and time delay for at least that amount of time. Also, using modeling with quality included allowing wait time, repeating models, giving verbal praise, and allowing Anna to enjoy the activity or object she had requested. Finally, each decision to use a strategy (or not), required time for Bob to think. The time to think about how the strategy is meant to be used according to the PiCS protocols adds to this total. These activities further precluded his use of mand-model and time delay. This opportunity cost phenomenon may explain the decrease in mand-model use during modeling coaching and the decrease in modeling during mand-model training. Bob's use of both modeling and mand-model decreased

during time delay coaching as well, when he was required to wait 5-15 seconds for a high-quality use of the teaching strategy. According to single-subject design, the data showing Bob's use of teaching strategies should not have covaried. The fact that they did covary was likely a function of the time involved in using the targeted teaching strategy.

Anna's Receptive and Expressive Vocabulary Growth

Based on the results of the CDI and CASLLS assessments, Anna's receptive vocabulary improved between pre- and postintervention, whereas her expressive vocabulary did not change significantly. It is common for receptive language acquisition to precede expressive language for children with and without disabilities (Kuder, 2008). So while Bob chose to encourage vocalizations and verbalizations from Anna, and while I was observing Anna's expressive language growth, her expressive vocabulary did not improve. It is promising that her receptive vocabulary improved. These are secondary data and, therefore, cannot be attributed directly to the PiCS intervention. However, it may be that Bob's more structured, high-quality use of teaching strategies, his decreased low-quality use of the teaching strategies, and his decreased MLU contributed to Anna's increase in receptive vocabulary. Over time, this more responsive communication from Bob may lead to gains in both receptive and expressive vocabulary.

Conclusions

Limitations

As with all single-subject studies, a limitation of this study was the small sample size. While intervention effect was demonstrated three times, a criterion of WWC SCRD recommendations for rigorous single-subject studies, this study should be replicated with other families. Future studies should seek families with diverse characteristics, varying

factors such as parent education level, parent marital status, family income, child's disability, and history of parent training in social-pragmatic communication strategies. One parent characteristic that Bob displayed was an aptitude for internet technologies. This propensity could have led to a more relaxed learning situation. Further, Bob's comfort with internet technologies may have impacted the acceptability of the PiCS procedures for distance training and coaching. Demonstrating the intervention effect with individuals diverse in the areas described above would strengthen the generalizability of the PiCS intervention. Implementing the intervention with parents with varying talents for internet technologies would strengthen the findings regarding acceptability of procedures.

Another limitation of single case research design is that there is no generally accepted method for calculating an effect size. In this study, I used the Tau-U Calculator for Nonoverlapping Data. According to Parker et al. (2011), this method has not been demonstrated in complex single case design studies. Parker and Davis (2013) noted that "long baselines and short treatments may skew values and care should be used to check findings in those instances" (p. 104). There were extended baselines for the mand-model and time delay teaching strategies. With these cautions, it seems that the effect size in this study has limitations.

The coding system for this study may present an issue. When parent use of strategies was coded, the quality of the strategy use depended on the parent's delivering feedback to the child. In the coding rules, Dr. Stoner and I agreed that after a strategy use, if the child did not respond appropriately and the parent used the strategy again, this second strategy use would count as both feedback *and* a new strategy. We felt that the

second strategy use was both implied feedback to the child and encouragement to respond correctly. Other observers may not agree with this decision.

Another limitation of this study was that Bob and Anna interacted in a room separated from the rest of the family. Bob and Sara decided that the best way to approach the training and coaching meetings was for Sara to be with the children during the collaboration and feedback portions of the meeting. They would bring Anna into the room with Bob while Sara remained with the other two children. Of course, the most naturalistic, inclusive environment for both Bob and Anna is to be with their family. It cannot be determined whether Bob has been able to generalize his improved frequency and percentage of high-quality teaching strategy use to environments when other family members are present. The PiCS intervention procedures allow parents to choose the interaction settings in their homes, and I did not feel comfortable asking him to change the family's plan for allowing him to participate in this intervention. Bob stated several times in the preintervention interview that he felt uninvolved in Anna's life and service provision. This arrangement allowed him the time to interact with Anna and to be trained to interact with greater responsiveness.

Regarding Bob's perceptions of the goals, procedures, and outcomes of this study, it may be that he was not comfortable sharing negative perceptions with me. I interviewed him myself, and because any negative comments may have been a reflection on me, Bob may have withheld these. Ideally an interview for this purpose would have been conducted by a third party.

The use of Skype™ raises issues of client confidentiality and compliance with the Health Insurance Portability and Accountability Act (HIPAA). Whether Skype™ is

secure enough to provide confidentiality is under debate (Quashie, 2012). HIPAA rules require "integrity (previously titled data authentication), person or entity authentication, and transmission security" (45 C.F.R., p. 8335). There are other requirements, but these are three requirements of HIPAA that apply to Skype™ and the PiCS procedures.

In the PiCS intervention procedures, it is required that the trainer/coach visit the family in person before the Skype™ sessions begin. Therefore, person or entity authentication is not an issue. The other two HIPAA requirements may be problematic. No personal identification data (e.g., social security numbers) are transmitted during sessions, but there is no guarantee that the video footage of PiCS participants is secure. According to Quashie, Skype™ does not meet these HIPAA requirements. Therefore, it may be necessary for service providers to find a HIPAA-compliant videoconferencing platform, if one exists.

Implications for Service Providers

The implications for service providers based on this study relate to Bob's comments on the acceptability of the PiCS procedures. Bob noted that in most facets of Anna's service delivery, he is isolated from meetings by nature of his work schedule and the scheduling tendencies of service providers. Through the flexibility of the PiCS intervention and by using internet technologies, Bob was able to participate in his daughter's education and learn teaching strategies to improve his interaction with her. Service providers, and those responsible for hiring and training them, may consider offering flexible scheduling, especially for parents who work outside the home.

Service providers should also encourage and be open to the participation of fathers. The research literature teems with mother participants who participate in service

delivery and receive training to implement evidence-based interventions with their children. It is far less common for fathers to have an active role in their children's service delivery (Basu, Salisbury, & Thorkildsen, 2010). The father in this study expressed that he desired to share in his daughter's education and to relieve his wife's workload. It is likely that this sentiment is shared by other fathers who work fulltime outside the home. Furthermore, with more flexible service delivery scheduling, families with parents working outside the home may find relief. Stoner and Stoner (2014) found that parents of children with ASD may experience career disruption as a result of intensive needs of their children. While some parents may be willing to interrupt their career for the wellbeing of children, Stoner and Stoner noted that one's career is often "an integral part of their self-identity" (p. 9). Losing this important life activity may detract from family quality of life.

According to Bob, he was distracted by having to operate the camera (i.e., his smartphone) on his own while also interacting with Anna. This may have impacted his ability to follow Anna's interests and implement the teaching strategies with fidelity. If possible, the parent interventionist should be free of the task of monitoring the camera. This may be accomplished by having another person operate the camera or by using a video game platform with a camera that follows people (e.g., Xbox™). In Bob's situation, having his wife Sara operate the camera would have meant adding the distraction of the other two children to the parent-child interaction. An Xbox™ limits session activities to one room and if the parent and child move away from each other, the Xbox™ is required to "choose" one or the other to follow. Perhaps future technology will address these current issues.

Implications for Future Research

Research should be conducted to validate the findings of this study. Some changes may be made based on parent outcomes, especially regarding the procedures involved in the PiCS intervention. Regarding the PiCS procedures and the autonomy of adult learners, it may be interesting to replicate the PiCS intervention while allowing parents to choose preferred components. For example, Bob preferred the flowcharts and step-by-step instructions in the informational handouts and he found video feedback and the training videos less helpful. Researchers might implement the first phase of the intervention and allow the parent to choose portions to keep and remove for future sessions. It may be helpful to conduct pre- and postintervention learner preference surveys and assess any changes in preference throughout the study. Wetherby and Woods (2006) considered adult learning preference when they taught parents strategies for social interaction with their children with ASD. "Parents could choose from easy-to-read handouts, videos, or demonstrations of specific strategies and examples of their use in family-identified routines" (p. 74). Encouraging learner autonomy may further enhance the safe and productive learning environment that the PiCS intervention was designed to promote. There is also a need to improve connectivity and confidentiality (i.e., HIPAA compliance). Connectivity may not be within researchers' or families' control to impact. But it does seem that improvements can be made over the connectivity performance experienced in this study. There are websites that allow users to test their internet speed, which would allow researchers to rule out or confirm internet connectivity as a problem. Overall, there is a need to test the effectiveness and confidentiality provided by various platforms in each geographic area.

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APPENDIX A

APPROVAL FROM THE INSTITUTIONAL REVIEW BOARD

February 17, 2014
Julia Stoner
5910 Special Education

Thank you for submitting the IRB protocol titled **"Parent-implemented Communication Strategies (PiCS) with Children who are DHH"** for review by the Illinois State University Institutional Review Board (IRB). The IRB has **Approved** this research protocol following an **Expedited Review** procedure. You may begin this research.

This protocol has been given the IRB number **2014-0045**. This number should be used in all correspondence with the IRB. You may proceed with this study from **2/17/2014** to **2/8/2015**. You must submit a continuation request and receive approval prior to continuing your research beyond this expiration date. Please also note that research protocols may be approved for continuation for a maximum of three years from the original date of approval in periods not to exceed one year. Research protocols having had three years of approval must be resubmitted and reviewed as new proposals. This approval is valid only for the research activities, timeline, and subjects described in the above named protocol. IRB policy requires that any changes to this protocol be reported to, and approved by, the IRB before being implemented. You are also required to inform the IRB immediately of any problems encountered that could adversely affect the health or welfare of the subjects in this study. Please contact Kathy Spence, Director of Research Ethics & Compliance at 438-2520 or myself in the event of an emergency. All other correspondence and questions should be addressed to:

Institutional Review Board

Thank you for your assistance, and the best of success with your research.

Gary Creasey, Chairperson
Institutional Review Board
cc: Mark Zablocki, Department Rep, SED

APPENDIX B

PERMISSION TO RECRUIT PARENTS FROM AGENCIES/SERVICE PROVIDERS

Hello,

My name is Marc Daczewitz, and I am a doctoral candidate at Illinois State University. I am looking for participants for a research project. The project is called **Parent-Implemented Communication Strategies**, or PiCS.

I have described the project below and hope that you will contact me if you have any questions. Please consider passing the attached invitation to families to participate in this project. You may also choose to post the attached flyer in public spaces as a way of inviting interested families. I am also attaching a "Permission to Contact" form that you can return to me if parents wish to be contacted by me.

Title of the Project: Parent-Implemented Communication Strategies (PiCS) project

Purpose of the Project: This research project focuses on improving the communication skills of young children who are deaf or hard of hearing. The project involves teaching and coaching parents in their homes to use strategies that may promote and enhance the communication skills of their young children. We feel this project is important since it will lead to the development of intervention strategies for your child and will provide information that we will use to develop communication interventions that many parents can use in their homes with their young children who are deaf or hard of hearing.

Potential Participants: Families with young children (between the ages of 2 and 3) who are deaf or hard-of-hearing and have 10 or fewer words in their functional vocabulary. If you are interested, please contact us.

Illinois State University
Department of Special Education

Marc Daczewitz mdaczewitz@gmail.com 309-252-2541

APPENDIX C

RECRUITMENT FLIER WITH PERMISSION TO CONTACT FORM

Hello,

My name is Marc Daczewitz, and I am a doctoral candidate at Illinois State University. I am looking for participants for a research project. The project is called **Parent-Implemented Communication Strategies**, or PiCS.

I have described the project below and hope that you will contact me if you have any questions and/or would like to take part in this project.

Thanks for considering participating in our project!

Title of the Project: Parent-Implemented Communication Strategies (PiCS) project

Purpose of the Project: This research project focuses on improving the communication skills of young children who are deaf or hard of hearing. The project involves teaching and coaching parents in their homes to use strategies that may promote and enhance the communication skills of their young children. We feel this project is important since it will lead to the development of intervention strategies for your child and will provide information that we will use to develop communication interventions that many parents can use in their homes with their young children who are deaf or hard of hearing.

Potential Participants: Families with young children (between the ages of 2 and 3) who are deaf or hard-of-hearing and have 10 or fewer words in their functional vocabulary. If you are interested, please contact us.

Illinois State University
Department of Special Education
Marc Daczewitz mdaczewitz@gmail.com 309-252-2541

Permission-to-Contact Form
Potential Parent Participants for PiCS Project

Yes, I would like more information about your PiCS project. My name is

_____

You can reach me at _____ (phone number) or

e-mail me at _____.

I am the parent of _____ (#) child(ren), ages _____, _____, _____ (*please fill in ages of children*).

At least one of my children is between 2 and 5 years of age. The name of my child whose communication skills I would like to improve is named

_____ and has been diagnosed with the following disability or delay:_____.

I understand that by returning this form I am giving my permission to the researchers to contact me to arrange an initial meeting. During that meeting they will explain the study to me, answer my questions about my role in the research, and gain my informed consent if I choose to participate in the study. I understand that my participation in the study is voluntary. Neither parent support group leaders nor staff at my child's school or early childhood program will know that I agreed to participate and the researchers will not know my name until they receive this form. The researchers will not use my real name or my child's real name in any written and verbal discussions of the study.

_____
Parent/Guardian

[Please sign above and we will contact you when we receive this form. Thank you in advance for agreeing to participate! Please feel free to contact Marc Daczewitz (mdaczewitz@gmail.com/309-252-2541) if you have any questions.]

APPENDIX D

SCRIPT FOR INTRODUCTORY PHONE CALL

Hello, my name is Marc Daczewitz. I have received a permission-to-contact form (or a phone call) from you. Is this _____?

Is this a convenient time to explain my research and determine if you would like to participate or shall we set up another time?

If the potential participant indicates that he/she would like me to explain the study at this time then I will use the script in Attachment F.

If the potential participant wants me to call back later I will give them the option of talking with me over the phone or setting up a Skype™ meeting. Then I will follow the script in Attachment F.

Phone Meeting: My phone number is _____. Please feel free to call me on _____ at _____.

Skype™ Meeting: My Skype™ username is Marc.daczewitz. You can find and add me as a contact. (Explain how to register for Skype™ if they are not already registered).

Ok, then I will see you on Skype™ on (Month, Day, Time). Thank you!

APPENDIX E

SCRIPT FOR DESCRIBING PROJECT TO POTENTIAL INTERVENTIONIST

PARTICIPANTS

Thank you for agreeing to meet with me to discuss the PiCS Project.

I'm going to send a copy of this script so that after we talk, you can review it – and feel free to contact me with any questions or concerns you have about our study. For now, though, I want to give you a general idea of what I hope to do with this project and how I think I can help you and your child.

The title of this project is "Parent-Implemented Social-Pragmatic Communication Intervention for Young Children with Developmental Disabilities", which is also known as PiCS. It is a project that was developed with federal funding and tested with parents of children with Down syndrome and autism. I was the project manager and now I want to implement the PiCS project with parents of children who are DHH or deaf.

I am recruiting parents and their children who are DHH, who are between two and five years old and who have 10 or fewer words in their functional vocabulary, to participate in this project. I'll ask you and your child to participate for about three months. After the intervention phase has been completed I will ask you to allow us to observe you and your child a once a week for a month to assess parent-child interaction after participating in this project. In the PiCS project, we worked with parents to use naturalistic teaching strategies to enhance their children's social communication.

If you're willing to participate in this project, we'll ask you to do the following:

AT THIS POINT I WILL REFER TO THE INFORMED CONSENT FORM (ATTACHMENT G) to inform the parent about the project.

Do you have any questions for me?
Are you interested in meeting with me to sign an informed consent form?
If no - Thank you for your time.
If yes – Great, can we set up a time that is convenient for you?
Thank you and I look forward to meeting you.

APPENDIX F

INFORMED CONSENT FORM: PARENT INTERVENTIONIST

APRIL, 2014

Dear Parent,

I am Marc Daczewitz, a doctoral candidate from the Department of Special Education at Illinois State University. I would like you to participate in a research project that focuses on improving the communication skills of young children who are DHH and have 10 or fewer words in their functional vocabulary. I hope the information gained from this project will assist in establishing an effective communication intervention that parents can use in their homes with their young children who are DHH. If you are willing to participate in this project, I will ask you to do the following:

First, I will ask you to grant permission for your child to participate in the study with you. I also will ask you for permission to video record you and your child interacting. I will also ask you to fill out a family information form that will help personalize this intervention for you and your child. Part of this form will require that you provide me with a copy of your child's audiogram from their most recent hearing assessment.

Second, I will ask you to answer some interview questions, which will take 25-40 minutes. I would like to audiotape this interview. I will not use your real name and will assign you a fake name for my research purposes. This interview will take place during my first visit to your home. During this meeting I will also observe you and your child in order to complete a language and communication assessment (i.e., the CASLLS) on your child. I will ask you to complete an assessment (i.e., the CDI) based on your knowledge of your child's communication skills as well.

Third, I will meet with you over Skype™ to observe and assess your child's communication behavior and observe the strategies you use to promote communication with your child in your home. Next, I will meet with you over Skype™ and together we will identify communication objectives appropriate for your child's home routines (e.g., meal times, free play). I would like to video record the sessions in which I work with you and your child and the sessions in which you work with your child. I will ask you to interact with your child 2 to 3 times a week while remaining in view of your webcam on Skype™ (a password-protected service) for about 15 minutes. I will observe this interaction live and also record the interaction using a software program called Camtasia™. I will train you on the use of all equipment and technologies associated with the project.

Recording our sessions will allow me to go back and accurately measure your child's responses and interactions. I would like to present the findings of this study at conferences for practitioners in the area of early intervention. For that purpose, I may like to use video segments of you and your child interacting to demonstrate practical uses of the strategies you will be taught. To accomplish that part of our project, I will ask you to sign the attached Release Forms for Reproduction of Personal Images for you and your child. Because of the young age of your child, I will ask you to speak for your child as his or her legal representative and sign the attached Release Form for Parent of Participating Child.

I may present the findings of this research at a conference attended by researchers and practitioners who also work with parents and their children who are DHH. If so, I would like to show exemplary video segments of parents using the strategies with their children.

Your agreement to release your and your child's personal images for my presentations will require no more of your time than you have already committed to the research project, because I will use the video that I will be taking throughout the project. Your decision to release your and your child's images for this purpose is absolutely voluntary. If you prefer not to participate in this aspect of our project or wish to withdraw your permission at any time before I present my findings at a conference, all you have to do is tell me and I will not use any video clips that involve you or your child. There will be no penalties of any kind if you make this decision.

Fourth, I will train and coach you in the use of the research-based, naturalistic teaching strategies that support and promote communication. I anticipate that it will require three 20-minute training sessions to cover the content. We will conduct all training meetings over Skype ™. Following each training session, we will begin the coaching phase. The coaching phase for each naturalistic teaching strategy will last about 2 weeks, consisting of at least four sessions conducted over Skype ™. Together we will identify communication objectives appropriate for your child's home routines (e.g., meal times, free play), and discuss ways to use newly learned strategies. Coaching, in the form of prompts (assistance) and feedback, will be provided by me until you and I feel you have mastered the intervention.

Fifth, I will assess your use and your child's response to the strategies you learned. I will observe, through video recordings, about two-three times a week during our 45-minute coaching sessions. After the intervention, I'll ask you to spend 20-45 more minutes with me to complete a survey and answer some postintervention questions (this interview will be recorded over Skype ™ using Camtasia ™).

Overall, your and your child's participation in this study will take place for approximately 2-3 months, depending on your child's communication skills and progress as well as naturally occurring facilitators and/or barriers to intervention implementation. Following completion of the intervention, I will continue to visit with

you over Skype™ weekly for one month to briefly observe you and your child interacting.

Please be assured that your participation in this study is absolutely voluntary. If you prefer not to participate or wish to withdraw at any time from the study, the interventions, videotape, interview, assessment, or questionnaire will be stopped. There will be no penalties of any kind.

I do not foresee more than minimal risks to you or your child as you participate in this study. The risks I potentially see are loss of time as you participate in the activities, discomfort in completing forms and being interviewed, discomfort with being video recorded, and risk of loss of confidentiality. I will attempt to minimize these risks.

To minimize the risk of loss of time due to participation, I am informing you of the time required for participation in the project. I also hope that you will find participation in the project worth the time you spend. To minimize the potential risk to the loss of confidentiality I will take all necessary precautions to ensure protection of your and your child's complete confidentiality. I will use no real names on any written or verbal reports. We'll assign you and your child code names and I will be the only one who will have access to the master list containing your real names and corresponding code names. I will store all interview and assessment results on a password protected hard drive on my computer which is in my home. Written documents will be shredded and audio/video tapes will be manually destroyed 5 years after I publish or present the findings.

Regarding discomfort in filling out forms and being interviewed, if I notice any signs of discomfort or if you express discomfort, we can stop to take a break and address any questions you have. If there are any questions you don't want to answer just tell me and don't answer the question.

Finally, regarding discomfort with being video recorded, there are two possible solutions. First, if you are uncomfortable with my sharing any video of you or your child you can decline permission for release of video footage and you can still participate in the study. Secondly, discomfort with being on video may be reduced since I will not be present in your home. If I see that you or any of your family members shows any signs of discomfort, stress, fatigue, or frustration during instructional sessions, questionnaire completion, or interviewing sessions I will immediately address these signs and take steps to ease the condition (e.g., take a break, turn off the video recorder, skip interview questions, talk about the discomfort, stop the session, or postpone the session for another time or day).

There are also potential benefits to your participation in this study. I hope that includes an improved of your child's social communication skills, and improved interactions with your child. I feel these benefits will outweigh any potential minimal risks.

I hope that the benefits of your child's improved communication skills, and your improved interactions with your child will outweigh any potential risks such as

inconvenience in having someone in your home or meeting over Skype™ or possible frustration with slower-than-anticipated or desired progress. I will take all necessary precautions to ensure protection of your and your child's complete confidentiality. I will use no real names on any written or verbal reports of my project. I'll assign you and your child code names and I will be the only one who will have access to the master list containing your real name and corresponding code name. Dr. Julia Stoner or her graduate assistant will be viewing approximately 30% of all the video I collect so that my coding of the video can be verified. All video data will be stored on password protected computers and all the interview and assessment information will be in a locked office at ISU. Written documents will be shredded and audio/video tapes will be manually destroyed 5 years after we publish or present the findings.

If you have any questions about this study, please feel free to contact Marc Daczewitz at mdaczewitz@gmail.com/309-252-2541 or Dr. Julia B. Stoner at jbstone@ilstu.edu/309-438-5993.

If you have any questions about your rights as a participant in this study, please contact the Chairperson of the Institutional Review Board (IRB) at the Research Ethics & Compliance Office at (309) 438-2529.

I, _____ (printed name) will participate in this study.

Signature of Participant _____ Date_____

Signature of Researcher_____ Date_____

Video Release Consent: Video Recording of Adult

I, _____, (please print) hereby assign all rights to the video recording made of me on this date, _____, by **Illinois State University,** and I hereby authorize the exhibition of said video only at research and practitioner conferences.

I hereby certify that I am (circle one) OVER / UNDER 18 years of age, and competent to contract in my own name in so far as the above is concerned.

I have read the foregoing release, authorization and agreement, before affixing my signature below, and warrant that I fully understand the contents thereof.

_____ _____
Signature Witness

_____ _____
Address Date

_____
City, State, Zip

APPENDIX G

PARENT PERMISSION FORM: PARENT/CHILD

APRIL, 2014

Dear Parent,

Since you have agreed to participate in our study, you know that I am Marc Daczewitz from the Department of Special Education at Illinois State University. If you agree to allow your child to participate with you in this project, s/he will be assessed and observed. I would require a copy of your child's audiogram from their most recent hearing assessment. We will use the *CASLLS & CDI protocols* to assess your child's communication skills. If your child refuses to work with and in any way indicates fatigue, discomfort, or the desire to end the session, we will stop the intervention or assessment session immediately.

Following your child's assessment, *you* will be trained in using research-based, naturalistic teaching strategies that support and promote communication. I anticipate that it will require three 20-minute training sessions to cover the content and allow you to practice the strategies you learn.

Once you have been trained in the intervention strategies, I will begin coaching you and observing your use of the strategies and your child's communication behavior. Coaching and observations will take place two to three times per week over Skype™ and will be recorded using Camtasia™, a software program. During this phase, you will be encouraged to use the teaching strategies with your child. Coaching, in the form of prompts (assistance) and feedback, will be provided by me until I feel you have mastered the intervention. All coaching sessions will be conducted through Skype™.

Please be assured that your and your child's participation in this study is absolutely voluntary. If you prefer not to participate or wish to withdraw at any time from the study, the interventions, videotape, interview, assessment, or questionnaire will be stopped. There will be no penalties of any kind.

I do not foresee more than minimal risks to you or your child as you participate in this study. The risks I potentially see are loss of time as you participate in the activities, discomfort in completing forms and being interviewed, discomfort with being video recorded, and risk of loss of confidentiality. I will attempt to minimize these risks.

To minimize the risk of loss of time due to participation, I am informing you of the time

required for participation in the project. I also hope that you will find participation in the project worth the time you spend. To minimize the potential risk to the loss of confidentiality I will take all necessary precautions to ensure protection of your and your child's complete confidentiality. During the Skype ™ sessions no one will be in my office with me. The only other persons who will be viewing the videotapes will be Dr. Julia B. Stoner and/or her graduate assistant. Both of these individuals have training in research methods. They will be viewing about 30% of the Skype ™ videotapes to make sure I am coding the videos correctly.

I will use no real names on any written or verbal reports of our project. We'll assign you and your child code names and I will be the only ones who will have access to the master list containing your real names and corresponding code names. I will store all the interview and assessment results on a password protected hard drive in my home. Written documents will be shredded and audio/video tapes will be manually destroyed 5 years after I publish or present the findings. Regarding discomfort in filling out forms and being interviewed, if I notice any signs of discomfort or if you express discomfort, we can stop to take a break and discuss the reasons for the discomfort.

Finally, regarding discomfort with being video recorded, there are two possible solutions. First, if you are uncomfortable with my sharing any video of you or your child you can decline permission for release of video footage and you can still participate in the study. Secondly, discomfort with being on video may be reduced since I will not be present in your home. If I see that you or any of your family members shows any signs of discomfort, stress, fatigue, or frustration during instructional sessions, questionnaire completion, or interviewing sessions I will immediately address these signs and take steps to ease the condition (e.g., take a break, turn off the video recorder, skip interview questions, talk about the discomfort, stop the session, or postpone the session for another time or day).

There are also potential benefits to your participation in this study. I hope that includes an improved of your child's social communication skills, and improved interactions with your child. I feel these benefits will outweigh any potential minimal risks.

I hope that the benefits of your child's improved communication skills and your improved interactions with your child will outweigh any potential risks such as inconvenience in having someone in your home and or meeting over Skype™ or possible frustration with slower-than-anticipated or desired progress. I will take all necessary precautions to ensure protection of your and your child's complete confidentiality. I will use no real names on any written or verbal reports of my project. I'll assign you and your child code names and I will be the only one who will have access to the master list containing your real name and corresponding code name. Dr. Julia Stoner will store all the interview and assessment information under lock and key. Written documents will be shredded and audio/video tapes will be manually destroyed 5 years after we publish or present the findings.

If you have any questions about this study, please feel free to contact Marc Daczewitz at

mdaczewitz@gmail.com/309-252-2541 or Dr. Julia B. Stoner at jbstone@ilstu.edu/309-438-5993, please contact the Chairperson of the Institutional Review Board (IRB) at the Research Ethics & Compliance Office at (309) 438-2529.

Parental Permission for Participation of Child with DHH

I give permission for my child, _____, to participate in the study described above. I understand that instructional sessions involving my child will be videotaped. I know that all information will be kept confidential, and that my child's full name and my name will not be used in any reports or presentations of this study. Finally, I understand that I have the right to withdraw my child from the study at any time and that my child has the right to withdraw from the study at any time.

Child's Name:_____ Child's Age: _____

Date:_____

Signature of Parent/Guardian:_____

Signature of Primary Investigator_____

Video Consent (Parent/Child)

I, _____, (please print) hereby certify that on this date, _____, I am the parent and/or guardian of:_____ a child under the age of 18 years, and I hereby consent that any videos which have been, or are about to be made by **Illinois State University**, may be used for the purposes set forth in the release statement above, signed by the child model or talent, with the same force and effect as if executed by me.

_____ _____

Signature of parent and/or guardian Date

_____

Address, City, State, Zip

Research at Illinois State University that involves human participants is carried out under the oversight of the Institutional Review Board. Questions or problems regarding these activities should be addressed to Kathy Spence, Assistant Director of Research Ethics and Compliance, Illinois State University, Campus Box 3330, Normal, IL 61790-3330, or phone (309) 438-2529.

APPENDIX H

CHILD ASSENT FORM (IF APPLICABLE)

Script for Securing Assent from Participating Child with DD

Hi, _____! My name is _____. I would like to play with you today. Would you like to play with me? (Pause. Watch for refusal behavior.)

If you want to stop playing, you can let me know. (Pause. Watch for refusal behavior.)

I'm going to come to your house on some days to play with you and your (Mom/Dad).

Sometimes I'll play with you and other times I'll use my video camera and take pictures of you playing with your (Mom/Dad). Sometimes I'll have to talk to your (Mom/Dad) about how you're playing together. Is that OK with you?

[Assume child assent (verified by parent who is present) if child indicates no refusal behaviors.]

APPENDIX I

FAMILY INFORMATION FORM

Please note: All questions/blanks are optional.

Father's Name: _____

Father's age: (Check one)
□ younger than 25 □ 25-35 □ 36-45 □ 46-55 □ older than 55

Father's highest educational level or degree: (Check one)
□ High School or GED □ Associate Degree □ Bachelor's □ Master's □ Doctorate □ Other _____

Father's race/ethnicity:
□ African American □ White Caucasian □ Black
□ Native American/American Indian □ Asian American □ Other
□ Biracial/Multiracial □ Latina/Latino/Hispanic

Father's marital status: (Check one)
□ Single □ Married □ Divorced □ Widowed

Mother's Name: _____

Mother's age: (Check one)
□ younger than 25 □ 25-35 □ 36-45 □ 46-55 □ older than 55

Mother's highest educational level or degree: (Check one)
□ High School or GED □ Associate Degree □ Bachelor's □ Master's □ Doctorate □ Other _____

Mother's race/ethnicity:
□ African American □ White Caucasian □ Black
□ Native American/American Indian □ Asian American □ Other
□ Biracial/Multiracial □ Latina/Latino/Hispanic

Mother's marital status: (Check one)
□ Single □ Married □ Divorced □ Widowed

Family income level (optional): Please use the following categories to provide an approximate estimate of your family's annual income.

□ Less than $10,000
□ Between $10,000 and $25,000
□ Between $25,000 and $45,000
□ Between $45,000 and $65,000
□ Between $65,000 and $85,000
□ Between $85,000 and $100,000
□ Greater than $100,000

Children:

1. Child's name: _____ Gender: M___F ___
   Date of Birth: _____ Disability: □No □Yes If yes, describe:

2. Child's name: _____ Gender: M___F ___
   Date of Birth: _____ Disability: □No □Yes If yes, describe:

3. Child's name: _____ Gender: M___F ___
   Date of Birth: _____ Disability: □No □Yes If yes, describe:

4. Child's name: _____ Gender: M___F ___
   Date of Birth: _____ Disability: □No □Yes If yes, describe:

Name of focus child with disability: _____
Disability of focus child: _____
Age of diagnosis: _____
Hearing Loss (Pure Tone Average): _____ dB

Type of Amplification Device _____
Age at Installation/Receipt of Device

Please check all support services your focus child with disability currently receives:
□ Speech Therapy □ Personal Assistance □ Physical Therapy
□ Occupational Therapy □ Developmental Therapy □ Other_____

How many hours a week does your focus child receive services in the home environment:
_____
How many hours a week does your focus child receive services outside the home:
_____

The following information will help us to better know your child.

1. How does your child usually communicate (e.g., gestures, sounds, words, phrases, a combination)?
2. How does your child let you know what he/she likes and wants (i.e., requesting)?
3. How does your child let you know what he/she doesn't like or want (i.e., rejecting)?
4. How does your child get your attention to something he/she noticed (i.e., commenting)?

5. Does your child like to play with you or with other adults? Which games? How does he/she ask to play with you or keep games going?
6. Does your child like to play with other children? Which games? How does he/she ask to play with other children or keep games going?
7. What are some of your child's likes and dislikes?

	Likes	**Dislikes**
Places		
People		
Object and Toys		
Food and Drinks		

The following information will help us to better know your family's routines.

1. What is your child's daily schedule?
2. Please describe your family's daily routines (e.g., dinner time, bed time, free play)?

What are good times for us to come and work with you and your child?

Please include a copy of your child's most recent audiogram.

APPENDIX J

PREINTERVENTION SURVEY

We would like to know what you think about social communication behavior (i.e., the use of communication to carry out interactions in social environments) and what strategies you are using to enhance your child's social communication behavior of. Please complete the following short questionnaire.

7. To what extent do you think social communication behavior is important for preschool-age children? Please explain.

   How would you describe a young child with good social communication behavior?

8. What strategies do you think are effective in enhancing the social communication behavior of young children?

9. What strategies do you currently use at home to enhance your child's social communication behavior?

10. How effective are the strategies that you currently use to enhance your child's social communication behavior?

11. On a scale of 1 to 5 (1=*low*; 5=*high*) rate your:

    a. Knowledge of social communication teaching strategies.
       1 2 3 4 5

    b. Competence in implementing social communication teaching strategies.
       1 2 3 4 5

APPENDIX K

PRE- AND POSTINTERVENTION INTERVIEW QUESTIONS

Interview Questions for Parents of Children who are DHH

"Please note: All questions are optional."

1. Tell me about your child.
2. Describe your child's communication skills.
3. What is it like to experience difficulty understanding your child?
4. Describe any difficulties that may arise when you don't understand your child.
5. Describe what you do when you don't understand your child's communication efforts.
6. Is not understanding your child stressful? And is so, can you describe how?
7. How do you handle this stress, if it exists?
8. Describe how things go when you do understand your child's communication efforts.

Parent Interview Questions (Postintervention):

Please note: All questions are optional.

1. Tell me about your experience so far with the PiCS project.
2. Describe your overall perspective on the goals of the PiCS project.
3. Please describe what was effective about the intervention (i.e., training and coaching).
4. Please describe what was ineffective about the intervention (i.e., training and coaching).
5. Describe your overall perspective on the outcomes of the intervention, for both you and your child.
   Is there anything you would change about the PiCS project?

APPENDIX L

PARENT SELF-REPORT FORM: MODELING PHASE

Date: _____ Family: _____

Environmental Arrangement:

How often did you use the environmental arrangement strategy today?

- o Not Used
- o Rarely Used (1-2 times)
- o Sometimes (3-4 times)
- o Often Used (many times)

In which routine(s) did you use the environmental arrangement strategy today?

- o Free Play
- o Snack
- o Other. Please specify _____

How did you use the environmental arrangement strategy today?

- o Pick materials/toys/activities _____
- o Present materials/toys/activities _____
- o Play with materials/toys/activities _____

How well do you think you used the environmental arrangement strategy today?

- o Not Well
- o Fairly Well
- o Well
- o Very Well

Modeling:

How often did you use the modeling strategy today?

- Not Used
- Rarely Used (1-2 times)
- Sometimes (3-4 times)
- Often Used (many times)

In which routine(s) did you use the modeling strategy today?

- Free Play
- Snack
- Other. Please specify _____

How did you use the modeling strategy today?

_____

_____

_____

How well do you think you used the modeling strategy today?

- Not Well
- Fairly Well
- Well
- Very Well

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APPENDIX M

PARENT SELF-REPORT FORM: MAND-MODEL PHASE

Date: _____ Family: _____

Environmental Arrangement:

How often did you use the environmental arrangement strategy today?

- o Not Used
- o Rarely Used (1-2 times)
- o Sometimes (3-4 times)
- o Often Used (many times)

In which routine(s) did you use the environmental arrangement strategy today?

- o Free Play
- o Snack
- o Other. Please specify _____

How did you use the environmental arrangement strategy today?

- o Pick materials/toys/activities

  _____
- o Present materials/toys/activities

  _____
- o Play with materials/toys/activities

  _____

How well do you think you used the environmental arrangement strategy today?

- o Not Well
- o Fairly Well
- o Well
- o Very Well

Modeling:

How often did you use the modeling strategy today?

- o Not Used
- o Rarely Used (1-2 times)
- o Sometimes (3-4 times)
- o Often Used (many times)

In which routine(s) did you use the modeling strategy today?

- o Free Play
- o Snack
- o Other. Please specify _____

How did you use the modeling strategy today?

- o _____
- o _____
- o _____

How well do you think you used the modeling strategy today?

- o Not Well
- o Fairly Well
- o Well
- o Very Well

Mand-Model:

How often did you use the mand-model strategy today?

- o Not Used
- o Rarely Used (1-2 times)
- o Sometimes (3-4 times)
- o Often Used (many times)

In which routine(s) did you use the mand-model strategy today?

- o Free Play
- o Snack
- o Other. Please specify _____

How did you use the mand-model strategy today?

- o _____
- o _____
- o _____

How well do you think you used the mand-model strategy today?

- o Not Well
- o Fairly Well
- o Well
- o Very Well

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APPENDIX N

PARENT SELF-REPORT FORM: TIME DELAY PHASE

Date: _____ Family: _____

	Environmental Arrangement	**Modeling**	**Mand-Model**	**Time Delay**
How often did you use the strategy today?	o Not Used o 1-2 times o 3-4 times o Many times	o Not Used o 1-2 times o 3-4 times o Many times	o Not Used o 1-2 times o 3-4 times o Many times	o Not Used o 1-2 times o 3-4 times o Many times
In which routine(s) did you use the strategy today?				
How did you use the strategy today?				
How well do you think you used the strategy today?	o Not Well o Fairly Well o Well o Very Well	o Not Well o Fairly Well o Well o Very Well	o Not Well o Fairly Well o Well o Very Well	o Not Well o Fairly Well o Well o Very Well

Comments:

_____

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APPENDIX O

PARENT HANDOUTS FOR EACH TEACHING STRATEGY

Environmental arrangement includes a variety of strategies that set up opportunities for communication between you and your child. You can **pick** toys and materials that are of interest to your child and provide a reason for your child to communicate, **present** the materials and toys in a way that increases the probability that your child will communicate (e.g., put a preferred toy in sight, but out of reach), and **play** with the materials in a way that will require your child to communicate (e.g., give your child a puzzle with a missing piece). If your child is initiating verbal or nonverbal communication, respond by using **one of the** strategies that I will be teaching you. Another part of environmental arrangement includes checking that your child's amplification is functioning properly.

Examples:

Pick materials/toys/activities that will motivate the child to communicate.

- Toys/materials/activities that are highly preferred by the child
- Activities/games that require more than one player

Present the materials/toys/activities in a way that will increase the likelihood the child will communicate.

- Place the child's preferred toys on a shelf that is in view, but out-of-reach.
- Place the child's favorite snack in a clear container that is difficult to open.
- Provide the child with only a few of the materials needed to complete a task.

Play with the materials/toys/activities in a way that will increase the likelihood the child will communicate.

- Blow a few bubbles, close the bottle, and place the bottle in front of the child.
- Spin a top or activate a toy and leave it on the table or floor until the motion stops, with the assumption that the child cannot re-activate the toy by himself.

Other Examples:

_____

_____

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Modeling is a simple teaching strategy in which we use demonstrations to teach children **new** words, phrases, signs, or gestures. Modeling is especially helpful if we exaggerate words, phrases, signs, or behaviors we want children to use while we are doing activities they really enjoy. The first step in modeling is to **establish joint attention** by focusing attention on the child and maintaining eye contact. Next, you need to present a model that is related to the child's interest. If your child responds correctly to your model by imitating what you said or did, give your child **immediate positive feedback** including verbal praise and the toy or activity she/he requested. If your child does not respond or responds incorrectly, establish joint attention and repeat the word, phrase, sign, or gesture. If your child responds incorrectly more than two times, give your child the object she/he requested, and work on the skill at a later time.

Modeling Example:
Nicole and her mom are playing together with colorful balls. Nicole is looking at her mom who is holding a big ball (establishing joint attention).
Mom: "Big ball!" (model)
Nicole: "Ball!" (incomplete imitation)
Mom: "*Big* ball!" (repeated model)
Nicole: "Big ball!" (correct imitation)
Mom: "Yes, you told me you want the big ball! Here's your *big* ball!" (positive feedback)

Modeling Example:
Josh and his dad are eating pretzels for snack. Josh alternates his gaze between his dad and the clear container with the pretzels (establishing joint attention).
Dad: signs "more" (model)
Josh: signs "more" (correct imitation)
Dad: "You asked for more pretzels; here are a few more pretzels" (positive feedback)

Other Examples:

_____
_____

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The **mand-model** strategy is very similar to the modeling strategy. Mand-model differs from modeling by including a verbal prompt in the form of a **question** (e.g., "What do you want?"), a **choice** (e.g., "Do you want an apple or a banana?"), or a **mand** (e.g., "Tell me what you want" or "Say 'more, please'").
The first step in the mand-model strategy is to **establish joint attention** by focusing attention on the child and maintaining eye contact. Next, you need to present a mand that is related to the child's interest. If your child responds correctly to your mand by imitating what you said or did, give your child **immediate positive feedback** including verbal praise and the toy or activity she/he requested. If your child does not respond or responds incorrectly, establish joint attention, and repeat the mand. If your child responds incorrectly more than two times, give your child the object she/he requested, and work on the skill at a later time.

Mand-Model Example:
Erin is finishing her snack of goldfish crackers and looking at her dad holding the goldfish box (establishing joint attention).
Dad: "Tell me what you want." (mand)
Erin: No response (incorrect response)
Dad: "Tell me what you want." (repeat mand)
Erin: No response (incorrect response)
Dad: Signs "more" and says "want more" (model)
Erin: Signs "more" (correct imitation)
Dad: "Yes, you told me 'more;' here are some more goldfish." (positive feedback)

Mand-Model Example:
Dejohn is taking a bath before bed time. He looks at him mom and start whining (establishing joint attention).
Mom: Says and signs "Say 'all done'" (mand)
Dejohn: Signs 'all done' (correct imitation)
Mom: "Thanks for telling me that you're all done; let's get you out of the bathtub." (positive feedback)

Other Examples:

_____

_____

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Department of Education Institute for Education Sciences

Time delay is a strategy that encourages children to initiate communication. This strategy is especially helpful in encouraging children to ask for help, to ask for food or toys, or to ask for permission. The first step in time delay is to **establish joint attention**. Once you have established joint attention, **look expectantly** at the child, and **wait** 5 to 15 seconds to see if your child will request help or the object she/he wants. If your child requests correctly, give your child immediate positive feedback, including verbal praise and the toy or activity she/he requested. If your child does not answer or answers incorrectly, you can then use **modeling** or the **mand-model** procedure to give him or her an example to imitate.

Time Delay Example:
Every morning Sam's mother helps him pick out cereal to eat for breakfast after helping Sam get dressed. Most mornings Sam races to the cupboard and his mother lifts him up to point to the cereal box he wants. This morning, Sam's mother decides to wait for Sam to request before lifting him up to the countertop.

Mom: walks to the cupboard with Sam but then stops and looks at him expectantly for 10 seconds (time delay)
Sam: "Up" (incomplete response)
Mom: "Up, please" (model)
Sam: "Up, please" (correct response)
Mom: "Yeah, that's right! Up we go!" (positive feedback)

Nonverbal Example:
In the afternoons Kaila and her dad go to the playground. Kaila's favorite activity is swinging on the swing set. Kaila's dad says, "Ready, set, go" and swings Kaila high up to the sky. This afternoon Kaila's father decides to wait for Kaila to request more by signing "more" before swinging her.

Dad: Puts Kaila in the swing, says, "Ready, set, go" and looks at her expectantly for 10 seconds (time delay)
Kaila: Does not respond (incorrect response)
Dad: Signs "more" (model)
Kaila: No response (incorrect response)
Dad: Says and signs "Say 'more'" (mand)
Kaila: Signs "more" (correct response)
Dad: "Good job! You want to swing more! Up to the sky!" (positive feedback)

Other Examples:

_____

_____

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APPENDIX P

PROTOCOL FOR FIRST SESSION IN EACH PHASE

Date:_____ Family:_____ Coach:_____

Check each procedure after it is completed.

_____ Turn on audio recorder and state the date, the family name, and the type of coaching session.

Build a relationship with the parent (Only complete the steps in this portion during the first coaching session, not during Mand-model/Time delay):

_____Explain to the parent the format of the training and coaching session and ask the parent to feel free to stop the session at any time to ask questions and share his/her feelings

_____Learn about the family and review information from the Family Information Form.

_____Acknowledge that the parent is the expert on the child.

_____Discuss what the parent is doing well with the child.

Develop a vision for the child's future (First Naturalistic Strategies Coaching Session Form):

_____Ask what characteristics the parent loves about the child.

_____Ask what the parent's hopes and dreams are for the child in the next 2-3 years.

_____Ask what concerns the parent has regarding the next 2-3 years.

Identify the top three-four target behaviors for the next few weeks/months:

_____Collaborate with the parent to identify 3-4 behaviors/skills related to communication the intervention will focus on.

Identify the hopes and dreams of the parent as related to the PiCS project:.

_____Ask what the parent hopes to achieve through the PiCS project.

Explain the training and coaching process:

_____ Explain that you will meet over Skype™ or in the home two-three times a week.

_____ Explain that during the first coaching session of each phase, you will teach the parent about a new strategy.

_____ Explain that you will talk with the parent for 10 minutes before and after each observation to discuss goals and provide feedback.

Training Introduction

_____Many young children with disabilities have *delays and/or impairments* in their social and communication behavior.

_____Training in social and communication skills must begin *as early as possible* to decrease possible long-term negative social effects.

_____Various interventions cited in the literature target the communicative and social behavior of school-aged children with disabilities; however, there is limited information about these types of interventions for *very young* children with disabilities.

_____An important component of current approaches to facilitating social and communication development of children with disabilities is teaching children in their *natural environments* (e.g., home). By using the naturalistic teaching strategies parents can build on children's interests in the natural environment and enhance their children's communication skills.

ENVIRONMENTAL ARRANGEMENT AND MODELING TRAINING

Introduction to Environmental Arrangement and Modeling (10 minutes)

_____The purpose of our training is to learn how to use environmental arrangement and modeling, two naturalistic teaching strategies.

_____Move the flowcharts and handouts for modeling and environmental arrangement to the parent's Dropbox folder.

_____Review the handout and flowchart for modeling and environmental arrangement. Remind the parent that the first step in the use of any strategy is to establish joint attention by focusing attention on the child and maintaining eye contact.

_____Add an example for each strategy, based on a discussion with the parent.

_____Watch video clips that demonstrate the use of the strategies, commenting on the way the parent or caregiver in the clips used the strategies. Stop the video between environmental arrangement chapters and ask the parent if there are any questions.

Action plan (5 minutes)

_____Review the *action plan handout* (i.e., setting/routine, material/arrangement, strategy to use).

_____Help the parent think about how to use each of the strategies with his/her child to enhance communication in the natural environment.

Questions and Concerns (5 minutes):

_____Answer parent's questions and discuss any concerns.

_____Remember to save the completed protocol/forms on the external hard drive.

Move on to "protocol for each coaching session."

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MAND-MODEL TRAINING
Date:_____ Family:_____ Coach:_____

Check each procedure after it is completed.
Introduction
_____Explain that you are moving on to the mand-model strategy and that it will proceed much the same way that the modeling strategy coaching sessions did.
_____Many young children with disabilities have *delays and/or impairments* in their social and communication behavior.
_____Training in social and communication skills must begin *as early as possible* to decrease possible long-term negative social effects.
_____Various interventions cited in the literature target the communicative and social behavior of school-aged children with disabilities; however, there is limited information about these types of interventions for *very young* children with disabilities.

_____An important component of current approaches to facilitating social and communication development of children with disabilities is teaching children in their *natural environments* (e.g., home). By using the naturalistic teaching strategies parents can build on children's interests in the natural environment and enhance their children's communication skills.

Introduction to Mand-Model (10 minutes)
_____The purpose of our training is to learn how to use the mand-model strategy, another naturalistic teaching strategy.
_____Move the flowchart and handout for mand-model to the parent's Dropbox folder.
_____Review the handout and flowchart for mand-model. Remind the parent that the first step in the use of any strategy is to establish joint attention by focusing attention on the child and maintaining eye contact.
_____Add an example for the mand-model strategy, based on a discussion with the parent.

_____Watch video clips that demonstrate the use the mand-model strategy, commenting on the way the parent or caregiver in the clips used the strategies. Stop the video after the mand-model chapter and ask the parent if there are any questions.

Action plan (5 minutes)
_____Review/revise the *action plan handout* (i.e., setting/routine, material/arrangement, strategy to use).
_____Help the parent think about how to use each of the strategies with his/her child to enhance communication in the natural environment.
Questions and Concerns (5 minutes):
_____Answer parent's questions and discuss any concerns.
_____Remember to save the completed protocol/forms on the external hard drive.
Move on to "protocol for each coaching session."
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TIME DELAY TRAINING

Date:_____ Family:_____ Coach:_____

Check each procedure after it is completed.

Introduction

_____Many young children with disabilities have *delays and/or impairments* in their social and communication behavior.

_____Training in social and communication skills must begin *as early as possible* to decrease possible long-term negative social effects.

_____Various interventions cited in the literature target the communicative and social behavior of school-aged children with disabilities; however, there is limited information about these types of interventions for *very young* children with disabilities.

_____An important component of current approaches to facilitating social and communication development of children with disabilities is teaching children in their *natural environments* (e.g., home). By using the naturalistic teaching strategies parents can build on children's interests in the natural environment and enhance their children's communication skills.

Introduction to Time Delay (10 minutes)

_____The purpose of our training is to learn how to use the time delay strategy, a naturalistic teaching strategy.

_____Move the flowchart and handout for time delay to the parent's Dropbox folder.

_____Review the handout and flowchart for time delay. Remind the parent that the first step in the use of any strategy is to establish joint attention by focusing attention on the child and maintaining eye contact.

_____Add an example for the time delay strategy, based on a discussion with the parent.

_____Watch video clips that demonstrate the use the time delay strategy, commenting on the way the parent or caregiver in the clips used the strategies. Stop the video after the time delay chapter and ask the parent if there are any questions.

Action plan (5 minutes)

_____Review/revise the *action plan handout* (i.e., setting/routine, material/arrangement, strategy to use).

_____Help the parent think about how to use each of the strategies with his/her child to enhance communication in the natural environment.

Questions and Concerns (5 minutes):

_____Answer parent's questions and discuss any concerns.

_____Remember to save the completed protocol/forms on the external hard drive.

Move on to "protocol for each coaching session."

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APPENDIX Q

NATURALISTIC STRATEGIES ACTION PLAN

Date: _____ Family: _____ Trainer: _____

Naturalistic Strategies Training – Action Plan

Routine/ Activity	Goal(s)	Strategy to Use	Action Steps	Materials and Resources	Comments

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APPENDIX R

PROTOCOL FOR EACH COACHING SESSION

Date:_____ Family:_____ Coach:_____

Check each procedure after it is completed.

_____Establish a connection over Skype™. Make sure the parent has your phone number in case the connection is lost.

____Turn on Camtasia™ and audiotape-recorder and state the date, the family name, and the type of coaching session.

Goal setting/action planning (5-10 minutes, before observation):

___Review parent's self-report form on the use of the strategies, if available.

___Collaborate with the parent to develop personal goals for the session.

____ Ask parent to check that the child's amplification device is functioning properly.

___Specify and identify opportunities within the routine to use the targeted teaching strategy (Action Planning Form).

____Share computer screens with the parent over Skype™ fill out the Action Planning Form form.

____Save the completed form in the parent's Dropbox folder so s/he can have it for home use.

___Review handout / flowchart / examples of the targeted teaching strategy.

Observation (15- 20 minutes of observation):

___Observe the parent and write notes related to the goals and use of strategies (Coaching Feedback Form).

___Write information about a few of the times the parent used the targeted strategy and rate the quality 1, 2, or 3.

___ Make note of 2-3 instances of environmental arrangement.

Feedback (5-10 minutes, following the observation):

___Ask the parent to reflect on the session related to the identified goal.

___Discuss observations and share the information on the Coaching Feedback Form.

___Provide supportive and corrective feedback.

___Review the Action Plan and make adjustments, if needed. (Even in the training session where they have just reviewed this, they have now had a chance to try the strategy and may have other ideas.)

____Set time and date for next meeting.

_____Turn off audio recorder.

_____ Save the completed protocol and forms on the external hard drive .

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APPENDIX S

NATURALISTIC STRATEGIES COACHING ACTION PLANNING FORM

Date: _____ Family: _____ Coach:_____

Child's Target Behavior:

_____

Parent's Target Teaching Strategy:

_____

Routine/Activity:

_____

Opportunities Within the Routine for Using the Targeted Strategy:

1. _____
2. _____
3. _____

Materials/ Resources/ Environment Arrangement: _____

Review of Targeted Teaching Strategy:

1. Environmental arrangement/Joint attention
2. _____
3. _____
4. _____

Comments: _____

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APPENDIX T

PROTOCOL FOR VIDEO FEEDBACK

Date:_____ Family:_____ Coach:_____

Planning for the Session:

Date of Clip Used:	Times from the video (mm:ss-mm:ss)	What will you tell the parent about this clip?
	___:___ - ___:___	
	___:___ - ___:___	
	___:___ - ___:___	

Check each procedure after it is completed.

_____**Turn on audiotape-recorder and state the date, the family name, and the type of coaching session.**

Review video clips.

_____ Review with the parent a short video clip of the parent and the child.

_____Ask the parent what he/she thought about the clips he/she just watched and take notes. _____
_____

_____ Acknowledge positive use of the strategies. _____
_____

_____ Discuss needed changes.
_____
_____

Complete the "Protocol for Each Coaching Session"

APPENDIX U

NATURALISTIC STRATEGIES COACHING FEEDBACK FORM

Date: _____ Family: _____ Coach:_____

Child's Target Behavior: _____

Parent's Target Teaching Strategy: _____

Routine/Activity: _____

Parent Use of the Targeted Strategy:

1. Context_____ (1,2,3)
   Comment/Feedback_____
2. Context_____ (1,2,3)
   Comment/Feedback_____
3. Context_____ (1,2,3)
   Comment/Feedback_____
4. Context_____ (1,2,3)
   Comment/Feedback_____
5. Context_____ (1,2,3)
   Comment/Feedback_____

Make a note of 2-3 examples of environmental arrangement: _____

_____

General Feedback/Comments: _____

Plan/Goals: _____

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APPENDIX V

PICS CODING MANUAL

PIs: Hedda Meadan, Maureen E. Angell, Julia B. Stoner

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Codes and Rules

The codes and rules in this manual are meant to help analyze both the social context for communication and the communication itself between parent and child. You will use the codes, definitions, and rules to code videos of parent-child interaction.

The following code groups correspond to the data grid in ProcoderDV (See *PiCS ProcoderDV Manual*). This section describes the codes to use, how to use them, and when to use them. Some of the groups have several rules for deciding how to code complex interactions. Remember, it is important to keep the context of the interaction in mind while coding.

1. **Environmental Arrangement (Group 0)**
    a. Code quality of the environmental arrangement strategy as 1, 2, or 3.
    b. Code one time at the beginning of the observation session, after completing the entire observation and completing Appendix B, Environmental Arrangement Checklist.
2. **Activity Type/Context (Group 1)**
    a. Code type of activity/routine: Snack, free play, reading, bath-time, other, or no activity/structure.
    b. Code one time at the beginning of the session and any time the activity/structure changes.

3. **Parent use of Naturalistic Teaching Strategy (Group 3)**
    a. Code to indicate the type of teaching strategy Modeling, Mand-Model, or Time Delay (See pages 8-10 for definitions of these strategies).
    b. Code, on a new line, one strategy each time the parent uses a naturalistic teaching strategy.
    c. If the parent is responding to a child initiation with a naturalistic teaching strategy, code the initiation on one line, and begin a new line to record the strategy use and the remainder of the interaction.
    d. If the parent uses a naturalistic teaching strategy, and within one second repeats it or uses another, code these as one naturalistic teaching strategy use:
        i. If one of these teaching strategies was a mand-model, code as a mand-model.
        ii. Time delay does not fit into this rule. Because the procedure of establishing joint-attention and looking expectantly for 5-15 seconds without giving explicit instruction, time delay cannot be used within 1 second of a mand/model.
    e. If the parent uses a naturalistic teaching strategy and uses another naturalistic teaching strategy between 1-2 seconds after the end of the first strategy, code the first use as one strategy with a quality of 1, and begin a new line to record the second strategy use and the remainder of the interaction.
    f. If the parent repeats a naturalistic teaching strategy because someone (the child or a third party) was talking, do not code the first use and code the repeated use.

4. **Quality of Naturalistic Teaching Strategy Use (Group 4)**
    a. Code quality of naturalistic teaching strategy use as 1, 2, or 3.
    b. Code quality each time the parent uses a naturalistic teaching strategy.
5. **Child's Communication Behavior (Group 5)**
    a. Code child's communication behavior as initiation, response, or none, each time the parent uses a naturalistic strategy.
    b. Code child's communication behavior:
        i. Code the child's communication behavior as a response when:
            1. the parent has used a mand-model and the child communicates in return.
            2. the parent has used modeling and the child communicates in return.
            3. Remember to allow the child time to respond to a strategy use.
        ii. Code the child's communication behavior as none when:
            1. the parent has used a mand-model and the child does not communicate in return and does not change his behavior in response to the parent communication act.
            2. the parent has used modeling and the child does not communicate in return and does not change his behavior in response to the parent communication act.
        iii. Code the child's communication behavior as initiation when:
            1. The parent has used a time delay and the child communicates in return.
            2. Three seconds have passed from the last communication act between the parent and the child and the child communicates with the parent.

Operational Definitions

1. **Environmental Arrangement (Group 0) –** The parent sets up the environment to increase the likelihood that the child will communicate. (See Appendix B for the Environmental Arrangement Score Sheet)
2. **Activity/Context (Group 1) –** Each family will identify specific routines for observations. Activity type will be individualized for each family. The routines will be included as codes for the activity/context (i.e., snack/meal time, book reading, bath-time, free play, or no activity/structure).
    a. Snack/Meal Time: Sitting at the table for snack/meal. The main activity is eating.
    b. Book Reading: Parent and child reading a book. The main activity is reading.
    c. Bath-time: Child is being given a bath. The main activity is bath.
    d. Free play: The parent and child are playing various games or with various toys/objects. The child is allowed to choose among various games/toys/objects.
    e. No Activity/Structure: The parent and child are not engaged in any specific activity aside from communicating with each other.

3. **Parent use of Naturalistic Teaching Strategy (Group 3) –** Parents use one of three types of naturalistic teaching strategies (i.e., modeling, mand-model, and time delay). See *Training and Coaching Manual* for more specific information about each strategy.
    a. Modeling: Modeling is a teaching strategy in which the parent uses demonstrations to teach the child new words, phrases, signs, or gestures. The first step in modeling is to establish joint attention by focusing attention on the child and maintaining eye contact. Next, the parent presents a model that is related to the child's interest. If the child responds correctly to the model by imitating, the parent gives the child immediate positive feedback.
        i. Examples:
            1. The parent says, "Big ball!" (Parent expects the child to imitate.)
            2. The parent says, "More, please." (Parent expects the child to imitate.)
            3. The parent says, "Yes." (Parent expects the child to imitate.)
            4. The parent says, "No." (Parent expects the child to imitate.)
            5. The parent says, "All done." (Parent expects the child to imitate.)
        ii. Nonexamples:
            1. The parent asks, "What do you have?" (Code as a mand-model).
            2. The parent asks, "Are you all done?" (Code as a mand-model).
            3. The parent says, "Say 'more please.'" (Code as a mand-model).
    b. Mand-model: The mand-model strategy is very similar to the modeling strategy. Mand-model differs from modeling by including a verbal prompt in the form of a question (e.g., "What do you want?"), a choice (e.g., "Do you want an apple or a banana?"), or a mand (e.g., "Tell me what you want" or "Say 'more please'"). The first step in the mand-model strategy is to establish joint attention by focusing attention on the child and maintaining eye contact. Next, the parents say a mand that is related to the child's interest. If the child responds correctly, the parent gives the child immediate positive feedback.
        i. Examples:
            1. The parent asks, "Are you hungry?"
            2. The parent asks, "Do you want an apple or a banana?"
            3. The parent says, "Put the cup on the table, please."
            4. The parent asks, "Do you want to play ball?"
            5. The parent says, "Say 'more please.'"
            6. The child points to an object (child initiates) and the parent asks, "What do you want?"
            7. The parent says, "1, 2, ___." (The parent wants the child to

say 3)
8. When reading a book, the parent points to pictures and asks, "What's this?" or "How about this?"

ii. Nonexamples:
1. The parent says, "Ball." (Parent expects the child to imitate. Code as modeling).
2. The parent says, "Yes." (Parent expects child to imitate. Code as modeling).
3. The parent says, "No." (Parent expects child to imitate. Code as modeling).
4. The parent says, "More." (Parent expects child to imitate. Code as modeling).
5. The parent says, "All done." (Parent expects child to imitate. Code as modeling).

c. Time Delay: Time delay is a strategy that encourages children to initiate communication within a routine or regular activity where the child understands the expectations based on past patterns. This strategy is especially helpful in encouraging children to ask for help, to ask for food or toys, or to ask for permission. The first step in time delay is to establish joint attention. Once the parent has established joint attention, he or she looks expectantly at the child, and waits 5 to 15 seconds to see if the child will request help or the object she/he wants. If the child requests correctly, the parent gives the child immediate positive feedback.

i. Examples:
1. The child walks to the table when it is time to eat. She always needs help getting into the chair. The parent looks at the child expectantly for 5 to 15 seconds until the child says, "Up, please!"
2. The parent and child are taking turns blowing bubbles. The parent holds the bubble wand and looks at the child expectantly until the child says, "My turn!"

ii. Nonexamples:
1. The child walks to the table when it is time to eat. He always needs help getting into the chair. The parent looks expectantly at the child and says, "Tell me what you need?" (Code as mand-model).
2. The parent and the child are painting and focusing on separate papers. The child initiates by saying "pink." (Code as initiation, with no teaching strategy use).

4. **Quality of Naturalistic Teaching Strategy Use (Group 4) –** The quality of the parent's use of a naturalistic teaching strategy depends on several criteria. Joint attention is the process of sharing one's experience of observing an object or event via nonverbal means, such as following another's eye gaze or pointing. If the child responds to the parent or the referent object, you can assume joint attention exists, even if the child was not looking at the parent or referent object.

a. When parent uses modeling:

i. Quality 1 – The parent establishes joint attention by focusing attention on the child's specific interest AND presents a verbal, a sign, or a gestural model that is related to the child's interest.
ii. Quality 2 – The parent establishes joint attention by focusing attention on the child's specific interest AND presents a verbal, a sign, or a gestural model that is related to the child's interest AND waits 2-3 seconds for the child to respond.
iii. Quality 3 – The parent establishes joint attention by focusing attention on the child's specific interest AND presents a verbal, a sign, or a gestural model that is related to the child's interest AND waits 2-3 seconds for the child to respond AND responds to the child's behavior by providing verbal feedback, repeating the model, or using the mand-model strategy.

b. When parent uses a mand-model:
i. Quality 1 – The parent establishes joint attention by focusing attention on the child's specific interest AND presents a verbal prompt in the form of a question, a choice, or a mand.
ii. Quality 2 – The parent establishes joint attention by focusing attention on the child's specific interest AND presents a verbal prompt in the form of a question, a choice, or a mand AND waits 2-3 seconds for the child to respond.
iii. Quality 3 – The parent establishes joint attention by focusing attention on the child's specific interest AND presents a verbal prompt in the form of a question, a choice, or a mand AND waits 2-3 seconds for the child to respond AND responds to the child's behavior by providing verbal feedback, repeating the mand-model or using the modeling strategy.

c. When parent uses time delay:
i. Quality 1 – The parent establishes joint attention by focusing attention on the child's specific interest and looks expectantly at the child.
ii. Quality 2 – The parent establishes joint attention by focusing attention on the child's specific interest AND looks expectantly at the child for 5-15 seconds.
iii. Quality 3 – The parent establishes joint attention by focusing attention on the child's specific interest AND looks expectantly at the child for 5-15 seconds AND responds to the child's behavior by providing verbal feedback, or using the mand-model or modeling strategy.

5. **Child's Communication Behavior (Group 5) –** The child's communication behavior can include responding to the parent's communication act, initiating a new communication exchange, or not responding to the parent's communication act (i.e., none).
a. Initiation: When a child initiates a communication act, he/she uses a communicative behavior to begin a communication exchange with the parent. Many communication behaviors may look like initiation, but to be

coded as initiation, the child's communication act must either be within the use of a time delay strategy by the parent or begin 3 seconds or more after the end of the last communicative act by anyone else in the room, including the child.

i. Examples:
    1. After 5 seconds of no communication exchanges between the parent and the child, the child points to a snack and says "Mom."
    2. After playing for 6 seconds, a child holds up a picture card of a doll and says, "Baby."
    3. Within the use of a time delay strategy by the parent, the child says, "More please."
    4. When finished cleaning the play area, the child says, "All done."
    5. While the parent is singing "The Wheels of the Bus" and does not expect a response from the child, the child looks at the parent and says "Milk."

ii. Nonexamples:
    1. The parent says, "Say more," and the child responds after 1-2 seconds with "Please". (Code the child's "Please" as a response,).
    2. The parent says, "Say more," and the child looks at the parent for 6 seconds and then says, "More." (Code as response).

b. Response: When a child responds, he/she uses a communication behavior to communicate due to the parent's use of a teaching strategy.

i. Examples:
    1. The parent asks, "Do you want to play ball?" and the child says, "Yes" or nods or puts his hands up to catch the ball.
    2. The parent asks if the child wants more to eat and, within less than 3 seconds, the child requests to have her shirt sleeve pulled up.
    3. The parent has established joint attention and says, "Put the puzzle piece in," and the child gets up and walks away to choose another activity.

ii. Nonexamples:
    1. The parent uses a strategy and the child begins crying. (Code the child's communication behavior as none).
    2. The parent says "I am going to put this puzzle piece here" and the child says, "No." (This is not a response because the parent's communication was not a teaching strategy).

c. None: When a child's communication behavior is none, the child is not responding to the parent's use of a teaching strategy, although joint attention was established.

i. Examples:
    1. The parent has established joint attention and asks, "Do you

want to play ball?" and the child only continues to look at the parent.
2. The parent has established joint attention and says, "Say more," and the child looks around the room.

ii. Nonexamples:
1. The parent has established joint attention and asks, "Do you want more bubbles?" and the child makes an audible utterance with no intelligible words, but the utterance has meaningful intonation. (Code as response).
2. The parent has established joint attention and says, "Say more," and the child says, "No." (Code as response).
3. The parent has established joint attention and says, "Put the puzzle piece in," and the child gets up and walks away. (Code as response + negative rejoinder + gesture).

- ☐ Refer to the *PiCS ProcoderDV Manual* to correctly begin your code file.
- ☐ Observe the entire video one time while only filling out "Environmental Arrangement Checklist"
- ☐ Check the Video Maintenance File in Sharepoint for the specific minutes to code for this session.
- ☐ Use **Pre-coding Observation Worksheet** to observe the ten minute portion of video while writing down significant communication between the parent and child, and noting the times of the communications.
- ☐ Use ProcoderDV to watch the 10 minute portion of the video session and record the codes while referring to your notes in the Pre-coding Observation Worksheet.
- ☐ Remember to code environmental arrangement and activity type on the first line and mark the video on the first line at the exact beginning
  - ☐ E.g., if you are beginning at 3 minutes, mark the time exactly at 00:03:00.00.
- ☐ Slow down the playback of the video when the interactions become complicated.
- ☐ Refer to the *PiCS ProcoderDV Manual* for tips and reminders of how to enter data in the "File info" and "Data" tabs
- ☐ Save your file.
- ☐ Export your file to "Reliability and Exported Procoder Files."
- ☐ Upload this exported file to SharePoint.
- ☐ Refer to the *PiCS Technology Manual* for tips about navigating and the G-Raid External Hard Drive.
- ☐ Store your handwritten copies of coding worksheets in your coding folder on G-raid.
- ☐ Update the child's list of approximations and signs in your coding binder and in SharePoint.

Parent: _____ Child: _____ Session Date: _____

Name of coder: _____ Code Date:

Mark the environmental arrangement strategies the parent uses during the observation:

Pick materials/toys/activities that will motivate the child to communicate:
___ Parent picks toys/materials/activities that are highly preferred by the child
___ Parent picks activities/games that require more than one player
___ Other _____

#_____Comment_____

Present the materials/toys/activities in a way that will increase the likelihood the child will communicate:
___ Parent places the child's preferred toys on a shelf that is in view, but out-of-reach
___ Parent places the child's favorite snack in a clear container that is difficult to open
___ Parent provides the child with only a few of the materials needed to complete a task
___ Other _____

#_____Comment_____

Play with the materials/toys/activities in a way that will increase the likelihood the child will communicate:
___ Blow a few bubbles, close the bottle, and place the bottle in front of the child
___ Spin a top or activate a toy and leave it on the table or floor until the motion stops, with the assumption that the
child cannot re-activate the toy by himself/herself
___ Other _____

#_____Comment_____

Total number of time used environmental arrangement strategies _____

If total # is 0-1 code quality 1
If total # is 2-3 code quality 2
If total # is 4 or more code quality
Comment_____

Subject: ____________ Date__________ Coder___________ Video Code Date__________ Times Coded___________

Time	Parent Utterances/Child Utterances/Observations Notes	M,D, or T	Qual.	Child Behavior

APPENDIX W

PICS PROCEDURAL FIDELITY ASSESSMENT MANUAL

General Information about Fidelity of Implementation

Fidelity of implementation or treatment integrity refers to the extent to which a program or intervention is implemented as originally planned or as intended by the program or intervention developers. Dusenbury, Brannigan, Falco, and Hansen (2003) suggested four reasons why studying fidelity of implementation is important. All four reasons are related to gaining an understanding of how the quality of implementation can be improved when research-based programs are disseminated. First, if the researchers fail to implement the program as planned, there is a potential for a Type III error (i.e., concluding, wrongly, that the findings are related to the intervention). If the intervention was not implemented with fidelity, data from the intervention are difficult to interpret. Second, studying fidelity of implementation often helps to explain why specific interventions succeed and fail. Interventions can succeed or fail depending on the dose or quality of the interventions and this is crucial information for future implementation. Third, an assessment of fidelity of implementation allows researchers to identify what has been changed in a program and how changes impact outcomes. Understanding how fidelity moderates such effects can be crucial to guiding refinements of the interventions. Fourth, fidelity of implementation reveals important information about the feasibility of an intervention (i.e., how likely it would be to implement the intervention as planned).

PiCS Plan for Assessment of Fidelity of Implementation

Fidelity of parent training session. To assess the fidelity of implementation of parent training sessions (i.e., naturalistic strategies training and visual strategies training I) all training sessions will be videotaped and two types of activities will be conducted: (a) the trainer will follow a scripted protocol (See *Training and Coaching Manual*) for each training session and will use the protocol checklist to monitor the completion of each component of the training and (b) one of the PiCS team members (other than the trainer) will review the videotaped training sessions and use the Fidelity Checklist for Naturalistic Strategies Training or the Fidelity Checklist for Visual Strategies Training I to indicate which component was covered in the session.

Fidelity of parent coaching session. To assess the fidelity of implementation of parent coaching sessions (i.e., naturalistic strategies coaching and visual strategies coaching) all coaching sessions will be audiotaped and two types of activities will be conducted: (a) the coach will follow a scripted protocol (See *Training and Coaching Manual*) for each coaching session and will use the protocol checklist to monitor the completion of each component of the coaching and (b) one of the PiCS team members (other than the coach) will listen to the audiotapes of all first coaching sessions (i.e., first

naturalistic coaching session and first visual coaching session) and to the audiotapes of 50% of the coaching sessions in each phase and use the Fidelity Checklist Forms to indicate which component was covered in the session.

Fidelity of parent use of the targeted strategies. To assess the fidelity of implementation of the targeted strategies by the parents the quality (1, 2, or 3) of the targeted strategies will be coded (see *PiCS Coding Manual* for more information).

Procedures for Assessment of Fidelity of Implementation

1. All training sessions (except for visual strategies training II) are be videotaped and all coaching sessions will be audiotaped so fidelity checks can be completed.
2. Fidelity checks are completed for all training sessions (except for visual strategies training II).
3. Fidelity checks are completed for all first coaching sessions (i.e., first naturalistic strategies coaching session and first visual strategies coaching session).
4. Fidelity checks are completed for 50% of the coaching sessions in each phase (i.e., environmental arrangement/modeling, mand-model, time delay, visual strategies).
5. A member from the PiCS team (other than the trainer/coach) randomly chooses 50% of the coaching sessions in each phase and places a star (*) next to the chosen sessions in the Family Sessions Table on SharePoint.
6. The person who is assigned to complete fidelity checks is responsible for viewing the videotapes and listening to the audiotapes of the selected sessions and for reviewing all the forms completed by the trainer/coach in each session in order to complete the fidelity checks.
7. To calculate fidelity of implementation the person who is assigned fidelity checks counts the number of steps that were completed accurately and divides that number by the total number of possible steps.
8. In the fidelity checklist for the coaching sessions there are two steps that might not be completed in each session (review of the Parent's Self-Report Form on the use of the strategies and review of the Action Planning Form and making adjustments). If these steps were not completed, the N/A box should be checked. When calculating the overall fidelity the steps with the checked N/A box should not be counted as part of the total number of steps in the session.
9. The person who is assigned to complete fidelity checks is responsible for adding the completed fidelity checklists to the fidelity binder in the PiCS office and for adding the calculated fidelity to the Family Sessions Table on SharePoint.

Fidelity Checklist Forms

1. Fidelity Checklist for Naturalistic Strategies Training
2. Fidelity Checklist for Visual Strategies Training
3. Fidelity Checklist for First Coaching Session
4. Fidelity Checklist for Each Coaching Session

Family: _____ Session Date: _____ Person Completed _____

First Modeling Coaching Session	
Explain to the parent the format of the training and coaching session and ask the parent to feel free to stop the session at any time to ask questions and share his/her feelings	YES NO
Learn about the family and review information from the Family Information Form.	YES NO
Acknowledge that the parent he/she is the expert for their child.	YES NO
Discuss what the parent is doing well with the child.	YES NO
Ask what characteristics the parent loves about the child.	YES NO
Ask about the parent's hopes/dreams for the child in the next 2-3 years	YES NO
Identify the top 3-4 target behaviors for the next few weeks/months.	YES NO
Identify the hopes and dreams of the parent related to the PiCS project.	YES NO
Explain that you will meet on Skype™ or in the home 2-3 times/week.	YES NO
Explain that you will talk with the parent for 10 minutes before and after each observation to discuss goals and provide feedback.	YES NO
Explain that during the first coaching session of each phase, you will teach the parent about a new strategy.	YES NO
Many young children with disabilities have *delays and/or impairments* in their social and communication behavior.	YES NO
Training in social and communication skills must begin *as early as possible* to decrease possible long-term negative social effects.	YES NO
Various interventions cited in the literature target the communicative and social behavior of school-aged children with disabilities; however, there is limited information about these types of interventions for *very young* children with disabilities.	YES NO
An important component of current approaches to facilitating social and communication development of children with disabilities is teaching children in their *natural environments* (e.g., home). By using the naturalistic teaching strategies parents can build on children's interests in the natural environment and enhance their children's communication skills.	YES NO
The purpose of our training is to learn how to use environmental arrangement and modeling, two naturalistic teaching strategies.	YES NO
Move the flowcharts and handouts for modeling and environmental arrangement to the parent's Dropbox folder.	YES NO

Review the handout and flowchart for modeling and environmental arrangement. Remind the parent that the first step in the use of any strategy is to establish joint attention by focusing attention on the child and maintaining eye contact.	YES NO
Add an example for each strategy, based on discussion with the parent.	YES NO
Watch video clips that demonstrate the use of the strategies, commenting on the way the parent or caregiver in the clips used the strategies. Stop the video between environmental arrangement chapters and ask the parent if there are any questions.	YES NO
Review the *action plan handout* (i.e., setting/routine, material/arrangement, strategy to use).	YES NO
Help the parent think about how to use each of the strategies with his/her child to enhance communication in the natural environment.	YES NO
Answer parent's questions and discuss any concerns.	YES NO
Collaborate with the parent to develop personal goals for the session.	YES NO
Specify and identify opportunities within the routine for the parent to use the targeted strategy (Action Planning Form).	YES NO
Share computer screens with the parent over Skype™, fill out the action planning form	YES NO
Save the completed form in the parent's Dropbox folder so s/he can have it for home use.	YES NO
Review handout / flowchart examples of the targeted teaching strategy.	YES NO
Observe the parent and write notes related to the goals and use of strategies (Coaching Feedback Form).	YES NO
Write information about a few of the times the parent used the modeling strategy and rate the quality 1, 2, or 3.	YES NO
Make note of 2-3 instances of environmental arrangement.	YES NO
Explain that you will need to review the uploaded session video before the feedback portion of the meeting.	YES NO
Ask the parent to reflect on the session related to the identified goal.	YES NO
Discuss observations and share the information on the Coaching Feedback Form.	YES NO
Provide supportive and corrective feedback.	YES NO
Review the Action Plan and make adjustments, if needed.	YES NO NA
Totals: Yes ___ No___ Yes/(Yes+No) X 100= ___	

Family: _____ Session Date: _____ Person Completed _____

First Mand-Model Coaching Session	
Explain that you are moving on to the mand-model strategy and that it will proceed much the same way that the modeling strategy coaching sessions did.	YES NO
Many young children with disabilities have *delays and/or impairments* in their social and communication behavior.	YES NO
Training in social and communication skills must begin *as early as possible* to decrease possible long-term negative social effects.	YES NO
Various interventions cited in the literature target the communicative and social behavior of school-aged children with disabilities; however, there is limited information about these types of interventions for *very young* children with disabilities.	YES NO
An important component of current approaches to facilitating social and communication development of children with disabilities is teaching children in their *natural environments* (e.g., home). By using the naturalistic teaching strategies parents can build on children's interests in the natural environment and enhance their children's communication skills.	YES NO
The purpose of our training is to learn how to use mand-model, another naturalistic teaching strategies.	YES NO
Move the flowchart and handout for mand-model to the parent's Dropbox folder.	YES NO
Review the handout and flowchart for mand-model. Remind the parent that the first step in the use of any strategy is to establish joint attention by focusing attention on the child and maintaining eye contact.	YES NO
Add an example for the mand-model strategy, based on a discussion with the parent.	YES NO
Watch video clips that demonstrate the use of mand-model, commenting on the way the parent or caregiver in the clips used the strategies. Stop the video after mand-model and ask the parent if there are any questions.	YES NO
Review/revise the *action plan handout* (i.e., setting/routine, material/arrangement, strategy to use).	YES NO
Help the parent think about how to use each of the strategies with his/her child to enhance communication in the natural environment.	YES NO
Answer parent's questions and discuss any concerns.	YES NO
Collaborate with the parent to develop personal goals for the session.	YES NO
Specify and identify opportunities within the routine routine for the parent to use the targeted strategy (Action Planning Form).	YES NO

Share computer screens with the parent over Skype™, fill out the action planning form	YES NO
Save the completed form in the parent's Dropbox folder so s/he can have it for home use.	YES NO
Review handout / flowchart / examples of the targeted teaching strategy.	YES NO
Observe the parent and write notes related to the goals and use of strategies (Coaching Feedback Form).	YES NO
Write information about a few of the times the parent used the mand-model strategy and rate the quality 1, 2, or 3.	YES NO
Make note of 2-3 instances of environmental arrangement.	YES NO
Explain that you will need to review the uploaded session video before the feedback portion of the meeting.	YES NO
Ask the parent to reflect on the session related to the identified goal.	YES NO
Discuss observations and share the information on the Coaching Feedback Form.	YES NO
Provide supportive and corrective feedback.	YES NO
Review the Action Plan and make adjustments, if needed.	YES NO NA
Totals: Yes ___ No___ Yes/(Yes+No) X 100= ___	

Family: _____ Session Date: _____ Person Completed _____

First Time Delay Coaching Session	
Explain that you are moving on to the time delay strategy and that it will proceed much the same way that the modeling strategy coaching sessions did.	YES NO
Many young children with disabilities have *delays and/or impairments* in their social and communication behavior.	YES NO
Training in social and communication skills must begin *as early as possible* to decrease possible long-term negative social effects.	YES NO
Various interventions cited in the literature target the communicative and social behavior of school-aged children with disabilities; however, there is limited information about these types of interventions for *very young* children with disabilities.	YES NO
An important component of current approaches to facilitating social and communication development of children with disabilities is teaching children in their *natural environments* (e.g., home). By using the naturalistic teaching strategies parents can build on children's interests in the natural environment and enhance their children's communication skills.	YES NO
The purpose of our training is to learn how to use time delay, another naturalistic teaching strategies.	YES NO
Move the flowchart and handout for time delay to the parent's Dropbox folder.	YES NO
Review the handout and flowchart for time delay. Remind the parent that the first step in the use of any strategy is to establish joint attention by focusing attention on the child and maintaining eye contact.	YES NO
Add an example for the time delay strategy, based on a discussion with the parent.	YES NO
Watch video clips that demonstrate the use of time delay, commenting on the way the parent or caregiver in the clips used the strategies. Stop the video after time delay and ask the parent if there are any questions.	YES NO
Review/revise the *action plan handout* (i.e., setting/routine, material/arrangement, strategy to use).	YES NO
Help the parent think about how to use the time delay strategy with his/her child to enhance communication in the natural environment.	YES NO
Answer parent's questions and discuss any concerns.	YES NO
Collaborate with the parent to develop personal goals for the session.	YES NO
Specify and identify opportunities within the routine routine for the parent to use the targeted strategy (Action Planning Form).	YES NO
Share computer screens with the parent over Skype™, fill out the action planning form	YES NO

Save the completed form in the parent's Dropbox folder so s/he can have it for home use.	YES NO
Review handout / flowchart / examples of the targeted teaching strategy.	YES NO
Observe the parent and write notes related to the goals and use of strategies (Coaching Feedback Form).	YES NO
Write information about a few of the times the parent used the time delay strategy and rate the quality 1, 2, or 3.	YES NO
Make note of 2-3 instances of environmental arrangement.	YES NO
Explain that you will need to review the uploaded session video before the feedback portion of the meeting.	YES NO
Ask the parent to reflect on the session related to the identified goal.	YES NO
Discuss observations and share the information on the Coaching Feedback Form.	YES NO
Provide supportive and corrective feedback.	YES NO
Review the Action Plan and make adjustments, if needed.	YES NO NA
Totals: Yes ___ No___ Yes/(Yes+No) X 100= ___	

Family: _____Session Date: _____ Person Completed _____

Fidelity Checklist for Each Coaching Session

Each Coaching Session	
Review parent's self-report form on the use of the strategies.	YES NO NA
IF VIDEO FEEDBACK IS CONDUCTED: Review with the parent some short video clips of the parent and the child.	YES NO NA
Ask the parent what he/she thought about the clips he/she just watched and take notes	YES NO NA
Acknowledge positive use of the strategies	YES NO NA
Discuss needed changes	YES NO NA
Collaborate with the parent to develop personal goals for the session	YES NO
Ask parent to check that the child's amplification device is functioning properly.	YES NO
Specify and identify opportunities within the routine to use the targeted teaching strategy	YES NO
Share screens with the parent on Skype™, fill out the action planning form	YES NO
Save the completed form in the parent's dropbox folder so he/she can have it for home use.	YES NO
Review the handout/flowchart examples of the targeted teaching strategy	YES NO
Observe the parent and write notes related to the goals and use of strategies (Coaching Feedback Form).	YES NO
Write information about a few of the times the parent used the time delay strategy and rate the quality 1, 2, or 3.	YES NO
Make note of 2-3 instances of environmental arrangement.	YES NO
Explain that you will need to review the uploaded session video before the feedback portion of the meeting.	YES NO
Ask the parent to reflect on the session related to the identified goal.	YES NO
Discuss observations and share the information on the Coaching Feedback Form.	YES NO
Provide supportive and corrective feedback.	YES NO
Review the Action Plan and make adjustments, if needed.	YES NO NA
(Do not count any items checked "N/A") Totals: Yes ___ No ___ Yes/(Yes+No) X 100 = ___ %	

References

Dusenbury, L., Brannigan, R., Falco, M., & Hansen, W. B. (2003). A review of research on fidelity of implementation: implications for drug abuse prevention in school settings. *Health Education Research, 18*(2), 237-256.

APPENDIX X

PICS INTEROBSERVER AGREEMENT ASSESSMENT MANUAL

PIs: Hedda Meadan, Maureen E. Angell, Julia B. Stoner

PiCS is a project conducted at Illinois State University and funded by the U.S. Department of Education Institute for Education Sciences

Overall Procedures for Training/Achieving Reliability

- There are two coders for each family: a primary coder and a secondary coder.
- The two coders should work together to establish reliability and maintain reliability.
- The primary coder is responsible for coding ALL sessions.
- The secondary coder is responsible for coding 30% of the sessions in each phase and calculating and monitoring interrater reliability.
- Interrater reliability is achieved when there is 80% or higher agreement on each coded category.

Procedures for Reliability Checks

- The coders should familiarize themselves with the *PiCS Coding Manual* and understand all codes.
- The coders should watch a 3-min video together, discuss the codes they would assign during the 3-min video, and note any idiosyncratic rules they agree to apply to the family. This is a practice session and will not count toward reliability. The coders should keep a list of all new rules and discuss them with Marc and Hedda.
- The primary coder chooses a 3-min video, with at least 30 entries (i.e., 30 coded lines of communication), and tells the secondary coder the times on the video to code. For example, "Code H family on 3-31 from 2:00 min to 5:00 min." The coders code the video independently.
- The coders meet and transfer their codes to the *Worksheet for Calculating Reliability* (see **Appendix A**).
- Once 80% reliability in all categories has been achieved for the 3-min video (with at least 30 entries), one or two additional 3-min video segments on different dates should be coded with at least 80% reliability in all categories. If during the coding of the 3-min videos 80% reliability is not achieved, another date is chosen, and the process continues until reliability of 80% or higher is achieved for three 3-min video segments
- Once the coders have achieved reliability on at least two 3-min videos and feel confident about their agreements, a 10-min video segment from a different date is chosen. The coders follow the same procedures, described in detail above, to achieve reliability. Once reliability is achieved at 80% or higher in all categories, another 10-min video segment is chosen and reliability is calculated. This process continues until two 10-min videos, from different dates, have been coded with 80% or higher reliability in all categories. These two10-min videos count toward the total reliability for ALL sessions.
- Once reliability has been reached at 80% or higher for the two 10-min sessions, the primary coder should enter them into ProcoderDV and code all subsequent sessions in ProcoderDV. The secondary coder can code sessions by hand using the *Pre-coding Observation Worksheet.* (See *PiCS Coding Manual*)
- The secondary coder will randomly choose 30% of the sessions for each phase to code for reliability. The chosen sessions will be starred in the Family Session Table in SharePoint. The secondary coder is responsible for calculating the reliability and making sure that

reliability remains at 80% or higher in all categories. If reliability falls below 80% the secondary coder must contact the primary coder, choose the session where reliability fell below 80%, discuss issues, especially noting recurring disagreements, and reestablish reliability in another session. Remember that 30% of the sessions for each phase must have reliability of 80% or higher in all categories.

- Helpful tips when coding:
  - Watch the segment in its entirety prior to coding.
  - Watch the video on slow speed.
  - Wear headphones during coding to facilitate confidentiality and to ensure that you hear the interactions well.

Rules for Calculating Reliability

- You can use the *Worksheet for Calculating Reliability* to enter each coder's codes. The secondary coder can insert his/her codes next to the primary coder's codes (in the same column) or insert his/her codes in a column to the right of the primary coder's (see Appendix B for examples). The primary coder codes are always on the left and the secondary coder codes are on the right. Enter the codes on the same line under the correct category. First, c*ompare the codes in the Time column o*n the *Worksheet for Calculating Reliability.* If there is a disagreement and the primary coder has coded a time and the secondary coder has not, change the font for that row to red. See the example of row 3:01 below. If the secondary coder has coded a time that the primary coder has not, insert a new row and make the font red. Red is the color used whenever a disagreement occurs.

3:01			T	3	r	p	u	a
3:08					i	r	u	a

- At the bottom of the *Worksheet for Calculating Reliability* tally all agreements, tally all disagreements, divide agreements over agreements + disagreements, and multiply by 100 to obtain the reliability percentage for the time column.
- Continue this procedure for each column and for the total agreement.
- If one coder has a time for communication and the other coder has not coded communication within +/- 2 seconds of that time tally a disagreement on time, but do not calculate reliability for the remaining columns.
- If one coder has a code of "none (n)" and the other coder has a code of "response (r)" in the Child Communication Behavior column, tally a disagreement on child communication behavior, but do not calculate reliability for the three remaining columns in that row, Child Communication Function, Topography of Child Communication, and intelligibility.
- If one coder codes a Time Delay (T) and another coder does not code the Time Delay, but both coders code a child initiation (i) under the Child Communication Behavior column, and each coder's time is within 7 seconds, match up the lines and calculate reliability for all the categories except for the quality. For example,

10:01			T	3	i i	r r	u u	aa
10:08					i	r	u	a

Procedures for Updating Activities/Data on SharePoint/G-Raid (See the PiCS Technology Manual for instructions in accessing SharePoint and using the G-Raid External Hard Drive).

- Once reliability has been reached for the two 10- min videos, the secondary coder should enter the total agreement into the Family Session Table in SharePoint.
- Make a Record of what you've finished:

In SharePoint:

- Update the video maintenance table (Research—Data-—Intervention Schedules and Timeline) and session table (Research--Data) with your reliability score
- Upload your reliability calculations to Sharepoint (Research--Data - reliability folder for the appropriate family)

On the G-Raid:

- Upload your reliability calculations to the G-Raid in the corresponding family's "Reliability and Exported Procoder Files"

Worksheet for Calculating Reliability

Subject: _____

Coder: _____

2nd Coder: _____

Video Date: _____

Code Date: _____

	Time	Env Arang	Activity	Strategy	Quality	Child Comm Behavior
		0	1	3	4	5
Agreements						
Agreements + Disagreements						
Agreements /(Agreements + Disagreements) *100						

Overall Reliability

Example of a completed *Worksheet for Calculating Reliability*

	Time	Env Arr ang	Activit y	Strategy	Quality	Child Behavior
		0	1	3	4	5
Subject: FAMILY NAME	3:09 (T)	3 3	SS			i
	3:13			DD	32	rn
Coder: Trisha(T)	3:44			TT	33	ii
	3:46			DD	32	nn
Coder 2: Marc (M)	3:49			DD	33	nr
	3:51			DD	33	rr
Video Date: 2-22-10	3:56			DD	33	rr
	4:09			TT	33	ii
Code Date: 3-17-10	4:30 (M)					i
	4:36 (T)					i
	4:43 (T)			D	3	n
	4:50			TT	33	ii
	5:06			DD	33	rr
	5:18 (T)					i
	5:28			DD	22	ro
	5:38			DD	33	nn
	5:43 (M)			M	3	n
	5:46			MM	13	nn
	5:49 (M)			T	3	n
	6:24 (M)			T	3	n
	6:38			DD	33	rr
	6:45			DD	33	rr
	6:48			DD	33	rr
	6:52			DD	33	rr
Agreements	17			16	12	13
Agreements + Disagareements	24			16	16	16
Agreements /(Agreements + Disagareements) *100	71%			100%	75%	81%

Overall Reliability	99	/

APPENDIX Y

POSTINTERVENTION SURVEY

I would like to know what you think about the PiCS project you participated in. Please complete the following short survey. For each item (1=*low*; 5=*high*) rate the following:

1. The information provided to you during training (beginning of coaching phases).
   1 2 3 4 5
2. The guidance provided to you during coaching.
   1 2 3 4 5
3. How satisfied you are with the overall project procedures.
   1 2 3 4 5
4. The ease of use of technology for distance sessions (e.g., Skype™, Dropbox).
   1 2 3 4 5
5. How easy it was to incorporate the strategies into your daily home routine.
   1 2 3 4 5
6. How useful the strategies were in meeting your child's goals.
   1 2 3 4 5
7. How satisfied you are with the technology used for distance sessions (e.g., Skype™, Dropbox).
   1 2 3 4 5
8. How satisfied you are with the overall project outcomes for your child.
   1 2 3 4 5
9. How satisfied you are with the overall project outcomes for you.
   1 2 3 4 5
10. Your knowledge of naturalistic teaching strategies (i.e., environmental arrangement, modeling, mand-model, and time delay).
    1 2 3 4 5
11. Your competence in implementing naturalistic teaching strategies.
    1 2 3 4 5
12. Your enjoyment in implementing naturalistic teaching strategies.
    1 2 3 4 5
13. Please add comments/suggestions/feedback: (Use back side of paper if necessary).