Using Remote Coaching to Promote Caregiver-Friendly NDBI Strategies

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Abstract

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Naturalistic Developmental Behavioral Interventions (NDBIs) refers to interventions grounded in behavioral learning and developmental sciences. These interventions are commonly implemented in natural settings with children with autism and intellectual developmental disabilities. Although NDBI is a relatively new term in the behavior analytic literature, several models already exist that fall under this term, such as Pivotal Response Treatment (PRT), Incidental Teaching (IT), Early Start Denver Model (ESDM), Project Improving Parents as Communication Teachers (Project ImPACT), Enhanced Milieu Teaching (EMT), and Joint Attention Symbolic Play Engagement and Regulation (JASPER). These models rest on the core tenet that caregivers of children with disabilities are children's first and best teachers. One of the many benefits of NDBIs is the naturalistic nature of the intervention, creating numerous opportunities for caregivers to serve as key implementers. A remote coaching package focused specifically on validated, caregiver-friendly NDBI strategies has yet to be implemented with caregivers of children with disabilities. This study examines the effects of a remote caregiver coaching package incorporating implementation of NDBI strategies at home. Results suggest this intervention increased caregivers' implementation of NDBI strategies. Limitations and future research are discussed.

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Dedication

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Chapter 1: Introduction

Social Communication as a Barrier for Children with Autism

Autism spectrum disorder (ASD) is a social communication disorder characterized by engagement in restricted or repetitive behaviors (American Psychiatric Association, 2013). Individuals diagnosed with autism may experience barriers with social-emotional reciprocity; non-verbal communicative behaviors; and developing, maintaining, and understanding relationships (American Psychiatric Association, 2013). Compared to their neurotypical developing peers (American Psychiatric Association, 2013), individuals diagnosed with autism may face barriers to back-and-forth conversations; sharing of interests, emotions, or affect; or responses to social interactions. Nonverbal communicative barriers might include nonconformities in eye contact and body language or difficulties understanding gestures. Because of these barriers, individuals with autism may have difficulty adjusting their behavior to match social contexts, engaging in imaginative play, or making friends (American Psychiatric Association, 2013). Given these social communication barriers for individuals with autism, intervention is needed.

Discrete Trial Teaching (DTT) was developed in the 1970s to teach language skills to individuals with ASD and individuals with intellectual and developmental disabilities (IDD). DTT takes a complex skill and breaks it down into smaller components, each of which is taught one at a time until the learner has mastered the complex skill (Lovaas, 1987). This highly structured behavioral approach has shown to be an effective intervention (Lovaas, 1987). But in the early 1980s, researchers, teachers, speech therapists, and parents found DTT ineffective for learners with diagnoses of ASD and IDD (Schwartz, 1987). Following intervention, learners engaged in rote, unnatural, and non-functional language (Schwartz, 1987).

The shortcomings of the intervention were partly due to the nature of this highly structured learning environment; because learners were not taught functionally appropriate language during their routines in their natural environment, they would respond only to stimuli used in the decontextualized setting/highly structured environment. During DTT, learners were taught one type of response, with specific stimuli, in a specific environment, and/or with a specific implementer (Halle, 1982; Hart & Rogers-Warren, 1978). For example, initially, a learner might be taught to identify colors using two-dimensional picture cards in a small cubby or isolated therapy room with a small table and chairs; but once the learner is asked to identify a color outside of the small cubby with a novel material such as a colored block, the learner may not be able to generalize the skill of identifying colors without the 2-D picture card present or outside of the cubby.

Introduction to Early Naturalistic Interventions

Given these concerns, researchers developed an intervention that would address the shortcomings of DTT, explicitly targeting the importance of generalization for learners with ASD and IDD. In this intervention, implementers such as teachers, researchers, and parents were instructed to teach learners to use language functionally but practice in the natural environment where their language would be used (Schwartz, 1987). As a result of this work, researchers developed a new line of language research known as milieu teaching (Hart, Rogers-Warren, 1978).

There are two goals of milieu teaching. The first goal is to make language functional for the learner and then teach advanced forms of that language. The second goal of milieu teaching is to teach in settings where children use their language naturally, eliminating the need to train learners in a decontextualized environment such as a cubby or therapy room. Following the

introduction of milieu teaching, other naturalistic training techniques were established; these included the mand model (in which environments are arranged to attract a child's interest), time delay, and incidental teaching (Warren et al., 1980).

Basic naturalistic interventions typically include three components: (1) creating a need for language in the environment, (2) making language functional for the learner, and (3) reinforcing all language use (Warren et al., 1980). In the mand model, for example, an adult focuses on setting up a language opportunity for the learner to either request help or mand for an activity or object. If the learner correctly responds to a communicative opportunity, the learner's communication behavior is then reinforced by either receiving help or gaining access to an activity or object (Hart & Rogers-Warren, 1978).

In the time delay technique, the adult initiates the time delay without vocal communication; for example, the adult may restrict access to an item or activity the learner is interested in and wait 5-10 seconds while holding the item. Once the learner correctly requests the item within the 5-10 seconds, they are immediately given access to the item. With this language opportunity, the learner is responding to the item within the environment and not the spoken language of the adult, resulting in less vocal prompting from the adult (Halle et al.,1979).

Incidental teaching—in contrast to the mand model and time-delay procedure—is led by the learner, not the teacher. During incidental teaching, the learner will request using one word, but then the adult expands on the learner's communication attempt; thus, the learner acquires more language because the implementer had provided the learner with an adjective or descriptor of the item or activity the learner is requesting. Incidental teaching can also include a request, instruction, model, and time delay (Hart & Risley,1968).

Review of Naturalistic Interventions

Due to the emergence of naturalistic language interventions for individuals with ASD and IDD, a review of the literature was warranted to identify child language interventions that were classified as naturalistic (Hepting & Goldstein, 1996). From this review, it found that several authors used the same names and terms for their naturalistic interventions. For example, one author would label an intervention as "interactive," but a different author could use the same label (interactive) and describe their procedure differently (Hepting & Goldstein, 1996). This review found that although researchers used the term "naturalistic" to describe their intervention, they did not include a set of common characteristics. In addition, some naturalistic interventions may share common procedural elements but are named differently. Consequently, this overlap in interventions and characteristics of interventions has caused uncertainty for behavior analysts to select the "right" naturalistic intervention for their clients (Frost et al., 2020).

Several naturalistic models exist with common procedural elements in the behavior analytic literature but have different intervention names. Therefore, behavior analysts may have little or no knowledge of the different types of models that fall under Naturalistic Developmental Behavioral Interventions (Hampton & Sandbank, 2021).These models include Incidental Teaching/Walden Toddler Program (IT; Hart & Risley, 1968; 1975), Pivotal Response Treatment (PRT; R. Koegel & L. Koegel, 2006), Early Start Denver Model (ESDM; Rogers & Dawson, 2010), Enhanced Milieu Training (EMT; Kaiser & Hampton, 2017), Project Improving Caregivers as Communication Teachers (Project ImPACT; Ingersoll & Dvortcsak, 2019), and Joint Attention, Symbolic Play, Engagement, and Regulation (JASPER; Kasari et al., 2008). These interventions have improved receptive and expressive communication for individuals with autism and have achieved progress in early language development, prepositions, receptive language, increased spontaneous speech, social phrases, social initiations, reciprocal interactions

with peers, and assertiveness (Bruinsma et al., 2020). Each of these models are discussed in detail later in this paper.

Elements and Principles of Naturalistic Developmental Behavioral Interventions

The umbrella term Naturalistic Developmental Behavioral Interventions was coined to indicate if a model includes all procedural elements to be classified as naturalistic. NDBIs is a set of scientifically validated interventions that combine Applied Behavior Analysis (ABA) and developmental psychology (Schreibman et al., 2015). A naturalistic model must include three procedural elements to be considered an NDBI: 1) manualized practice, 2) treatment fidelity, and 3) ongoing measurement. In addition, for a model to be identified as an NDBI, it must include three guiding principles: 1) teaching of functional skills in the natural environment in developmental order, 2) engaging parents as key stakeholders, and 3) inclusion within the least restrictive environment with typically developing peers in the community (Bruinsma et al., 2020).

Along with meeting the three procedural elements and three guiding principles, a naturalistic intervention must also include nine instructional strategies to be considered an NDBI. These nine instructional strategies are: 1) the use of three-part contingency, 2) environmental arrangement, 3) shared control and natural reinforcement, 4) prompting and prompt fading, 5) balanced turns within teaching routines, 6) model behaviors and routines, 7) imitation of child 8) broadening attentional focus, and 9) use of child initiations (Bruinsma et al., 2020; Schreibman et al., 2015). As mentioned, NDBIs integrate behavioral and developmental approaches into early intervention (Schreibman et al., 2015). The five instructional strategies associated with ABA are using the three-part contingency, environmental arrangement, shared control and natural reinforcement, broadening of attentional focus, and prompting and prompt fading. The

remaining four strategies are related to developmental psychology: child initiations, balanced turns, imitation of the child, and modeling. In addition, a recent meta-analysis found NDBIs support the development of social communication, language, and play skills for individuals with autism (Sandbank et al., 2020).

Benefits of NDBIs

One benefit of NDBIs is that a wide range of skills can be targeted simultaneously, including across a range of developmental domains. These domains include language and communication, social skills, play, self-regulation, and adaptive skills (Schreibman et al., 2015). NDBIs also address generalization because the intervention can be implemented in any context; the opportunity to generalize is already embedded within the intervention (Schreibman et al., 2015). Furthermore, several NDBI metanalyses using group designs have shown an increase in social engagement and cognitive development in language, social communication, play skills, and cognition (Crank et al., 2021) as well as significant advances in social engagement and cognitive development for children diagnosed with autism (Tiede & Walton, 2019).

Given that one of the strategies of NDBIs is to follow the learner's motivation, communication opportunities are provided only during activities that are meaningful to learners, allowing for more meaningful social engagements (Schwartz & Kelly, 2021). This type of intervention aligns with the neurodiversity approach because the individual's autonomy drives the intervention. Thus, the autistic individual interacts with the world around them based on their preferences and cognitive functioning (Schuck et al., 2021). Because NDBIs are centered on the individual and their family, NDBIs can be adapted to the culture and values of each family to better support their quality of life (Wang et al., 2022).

Other benefits of implementing an NDBI include the fact that no specific settings,

materials, or persons are required to implement the intervention. This lack of restrictions results in a more equitable intervention for families who may not have access to high-intensity services (D'Agostino et al., 2023). Because communication is a pivotal skill, generalizing the skill with other people in the child's environment and different settings is an ongoing practice and benefit to this type of intervention. And since NDBIs can be implemented with a wide range of practitioners, it further supports interdisciplinary collaboration (D'Agostino et al., 2023). Caregiver implementation of NDBI has been shown to promote social communication and engagement for children with autism (Vibert et al., 2020).

One key feature of most NDBIs is that the caregiver implements the intervention (Schreibman et al., 2015); this is especially important because active parent participation and education are critical components of treatment for children with autism (Dunlap et al., 2001; Epley et al., 2011). Given that caregivers spend more time with their children in various contexts than a clinician or teacher, caregivers are often the most effective implementers (Kaiser et al., 1998; Kaiser et al., 2000); consequently, this approach increases communication opportunities in the contextualized setting (Wetherby et al., 2018). For example, the caregiver can provide language opportunities during daily routines, such as going to the grocery store, bathing, and playing at home (Schwartz, 1987). In addition, many skills can be intervened upon during caregiver coaching for the child and family receiving ABA services. Caregiver-implemented interventions have been shown to promote the caregiver's skill generalization and maintenance, reduce stress, and increase their quality of life (Koegel et al., 1996; Minjarez et al., 2013).

Coaching Caregivers to Implement NDBI

Coaching has been used to teach caregivers how to implement naturalistic strategies

during play, which have resulted in some children demonstrating increased initiations and responses during communication opportunities (Lane et al., 2016). Researchers have also found that by coaching parents to use higher-level questions during reading time, their children increased the mean number of words per communication unit (Ritchotte & Zaghlawan, 2019). Caregiver coaching has also been found to increase the child's spontaneous imitation (Penney & Schwartz, 2019), teach children to complete household tasks (Oliver & Brady, 2014), improve interactions between the child and parent (Oliver & Brady, 2014), teach parents to implement Functional Communication Training (FCT; Benson et al., 2018; Seuss et al., 2014), teach the child daily living and self-care skills (Boutain et al., 2020; Gerow et al., 2021), teach caregivers to train others to work with their child (Symon, 2005), and lastly, teach the parent to implement a preference assessment, a functional analysis, and functional communication training (Hoffman et al., 2019).

In addition to achieving promising findings for the child, coaching has achieved positive outcomes for caregivers. Parent coaching can decrease parental stress, increase parental confidence, and improve the parent's quality of life and empowerment (Brookman-Frazee & Koegel, 2004; Todd et al., 2010). Furthermore, caregiver-centered coaching allows the caregiver to engage in self-reflection and self-evaluation, allowing the caregiver to generalize intervention strategies to new materials, activities, and routines (Siller et al., 2018). Research indicates positive outcomes in teaching caregivers to implement a variety of NDBI models (e.g., Project ImPACT, Ingersoll & Berger, 2015; Ingersoll et al., 2016, e.g., ESDM, Estes et al., 2014; Vismara et al., 2009, 2012, 2013, 2018, e.g., PRT, Hardan et al., 2015; Schwartzman et al., 2021; Vernon et al., 2019). Consequently, NDBIs have demonstrated efficacy in promoting positive outcomes for caregivers and children (Vibert et al., 2020). For instance, the Early Start Denver

Model has shown strong outcomes for interventions implemented by parents. In 2015, researchers conducted a systematic literature review of the ESDM (Waddington et al., 2016) and identified 15 articles indicating positive outcomes for parents, therapists, or children diagnosed with autism after receiving the ESDM intervention.

Much of the literature examining the implementation of NDBIs has occurred in the home or clinic settings. However, researchers have begun to explore delivering interventions via remote coaching as well as identifying the advantages of delivering services remotely; especially given the versatility and effectiveness of remote intervention and coaching (Hao et al., 2021). Project ImPACT has been delivered remotely and resulted in an increase the parent's delivery of instructional strategies while meeting fidelity of implementation (Ingersoll et al., 2016). Additionally, Ashburner and colleagues (2016) found remote technology aided parents, service providers and ASD specialists with more opportunities to practice skills, reduced the cost of time and travel, provided flexible support, enabled families to access support from home and enhanced connections between team members. Therefore, the benefits of remote coaching will be further explored.

Benefits of Remote Coaching

Not only has coaching been shown to be an effective approach to delivering effective intervention strategies for children diagnosed with ASD and IDD, but it has also been effective when delivered remotely (D'Agostino et al., 2019). Researchers provided telehealth training to general education teachers and found practitioners met fidelity of implementation and increased expanded their delivery of communication opportunities. Furthermore, the children exposed to the intervention demonstrated increased communication behaviors (D'Agostino et al., 2019). Because this treatment package was shown to be effective for general education teachers, future

researchers should consider the practical outcomes of delivering a remote online NDBI treatment package to caregivers of children with disabilities, especially since caregiver involvement in early intervention is considered best practice (Wong et al., 2015; Zwaigenbaum et al., 2015).

Growing evidence supports telehealth as a service delivery model for families seeking ABA-based services for their child with a disability (Rooks-Ellis et al., 2020; Unholz-Bowden et al., 2020). Delivering interventions in the home is particularly important since caregiver training should occur in the context of caregiver-child interactions and their daily routines (Vismara & Rogers, 2018). Some of the NDBI models successfully taught remotely to caregivers using an online platform include the ESDM (Vismara et al., 2016, 2018), Community ESDM (C-ESDM; Rogers et al., 2022), EMT (Quinn, 2018), parent training for Project ImPACT (Ingersoll & Berger, 2015; Ingersoll et al., 2016), and JASPER (Shire et al., 2020). Telehealth also allows caregivers to receive services remotely, especially if they encounter barriers related to equity and reside in rural communities.

Barriers Experienced by Caregivers

Caregivers of children with autism experience higher anxiety, depression, and sleep disorders than parents of children with IDD or parents of typically developing children (Weiss et al., 2002). Relatedly, mothers of children with autism experience higher levels of parenting stress and psychological distress than mothers of children with developmental delays (Estes et al., 2009). Not only do caregivers experience these mental health concerns, but they also experience several barriers to accessing services for their child with autism. These barriers include finding a credentialed behavior analyst to provide parent coaching (Ferguson et al., 2019), the time and travel spent getting to and from the clinic (Rogers et al., 2022), the time spent on a waiting list to receive services, and the time spent handling the complexities of insurance and billing for

services. Families who reside in rural communities often face greater barriers to receiving services in the home setting, creating more stress for the parents of a child with a disability (Hoffman et al., 2019). For example, the therapist provider might not serve families who live outside a specific radius of the clinic, creating even more of a challenge for families to receive services in their homes (Bearrs et al., 2018).

The costs associated with interventions are a key issue for many families. Parents of a child with autism will spend an estimated $1.4 to $2.4 million in services over their lifetime (www.Autism Speaks.org, 2022). Remote delivery of NDBI strategies could address this and other concerns of caregivers. For example, researchers have found telehealth to produce comparable results to traditional in-person training resulting in behavior change or practical assessment outcomes for clients (Baharav & Reiser, 2010; Tomlinson et al., 2018). Additionally, parents of children with autism have found telehealth highly acceptable (Fisher et al., 2020); and by using telehealth, the cost of services decreases for both families and service providers (Little et al., 2018; Rogers et al., 2022).

Given the positive implications of remote coaching, research has examined the benefits of coaching caregivers to implement NDBIs via a web-based format. One such NDBI model is Project ImPACT (Ingersoll et al., 2016). Researchers compared two groups that were coached remotely to implement Project ImPACT, a self-directed group and a therapist-assisted group. This study found that, through remote coaching, both groups improved their intervention fidelity, self-efficacy, stress, and positive perceptions of their child. But for the therapist-assisted group, they found greater gains in the caregiver's use of the intervention and an increase in social skills for their child (Ingersoll et al., 2016).

Growing evidence confirms the benefits of remote coaching of NDBI strategies. For example, caregivers have achieved fidelity in implementing the ESDM (Vismara et al., 2012, 2016), learned to implement Reciprocal Imitation Training (RIT; Ingersoll & Schreibman, 2006; Wainer & Ingersoll, 2015), and learned to implement PRT (McGarry et al., 2020). Furthermore, caregiver-implemented NDBIs can be delivered through remote coaching to families who may not have access to high-intensity services but nonetheless would receive high-quality and equitable care (D'Agostino et al., 2023).

Development of a Universal NDBI Fidelity Tool

With these promising results of different types of NDBI models, Frost and colleagues (2020) developed a tool to measure the implementation of the common elements across all NDBIs. They created this fidelity tool using a multi-stage process. First, they defined all the elements of NDBI. Then NDBI experts completed a survey to identify common elements using an observational rating scheme. Finally, from the rating scheme, they developed a set of common elements of the fidelity tool, NDBI-Fi. This research found that the NDBI-Fi was sensitive to change, related to similar measures, and demonstrated adequate agreement between raters (Frost et al., 2020). In addition, this study illustrated there might not be a need for extensive training in each NDBI model because of the overlap across treatment models (Frost et al., 2020).

The NDBI-Fi tool provides a manualized fidelity tool that identifies the common elements of all NDBIs; thus, it can be used with any NDBI model. Subsequently, this universal tool can be used by practitioners to collect fidelity on their implementation of any of the NDBI models. Because of the extensive overlap across NDBI models, using remote coaching to promote caregiver-friendly NDBI strategies could alleviate the complexities of selecting the "best" model for a caregiver and their child with a disability.

Purpose of this Study

This study addresses the needs of families of children with ASD and IDD that uses remote coaching to promote caregiver-friendly NDBI strategies. This caregiver-friendly treatment package has several advantages. The first advantage is eliminating the confusion for practitioners or caregivers to select the "best" NDBI. Secondly, because this treatment package includes caregiver-friendly NDBI strategies and is not a specific NDBI model with a manualized treatment package, caregivers will not be required to participate in an intensive intervention; instead, caregivers will be taught simplified strategies grounded in applied behavior analysis and developmental psychology that can be implemented with their child while waiting for services. Third, because this coaching is delivered remotely, caregivers would be incurring the costs of traveling to a clinic. Finally, this caregiver-friendly treatment package is a simplified way for caregivers to recall instructional strategies while playing with their children. This intervention will be delivered in two blocks, each with a corresponding acronym.

This remote coaching includes an acronym created by the researcher based on the NDBI literature, delivered in a two-block approach (see Table 2). The first block focuses on the caregiver following their child's lead by copying their child's actions and toys, narrating their child's affect and play (CATNAP). The second block focuses on the caregiver asking their child to add more, first by saying something back to their child's appropriate request or initiation, then setting up an opportunity, hearing a response, and once their child responds, rewarding their child with an item or praise along with time to celebrate their child's success and think about the next opportunity (SSHORT).

The current interventions building block approach is relatively similar to Project ImPACT (Ingersoll & Wainer, 2013). The current intervention will target multiple strategies for

each session with a specified block of strategies, but Project ImPACT teaches one or two strategies a session. For example, session three of Project ImPACT focuses on the caregiver following the child's lead and imitating their child, but due to the brevity of the current intervention, the researcher taught the caregiver to follow their child's lead by copying their child's actions and toys and narrating their child's affect and play (CATNAP) during block one. In addition, caregivers were provided with a handout illustrating CATNAP SSHORT, which has been supported in the adult learning literature (Knowles, 1973).

Project ImPACT video clips were provided as part of the didactic training in conjunction with therapist-directed coaching. First, caregivers learned about NDBI strategies while viewing Project ImPACT videos with the researcher, which allowed the caregiver to ask questions and reflect on the videos shown in the modules. Then, during the coaching portion of the session, the researcher implemented adult learning principles by answering questions in the moment and providing designated time for reflection and discussion with the caregiver (Artman-Meeker et al., 2015; Hanft et al., 2004, Rush & Shelden 2011). Due to the success and alignment of adult learning theory, according to Brown and Woods (2016), a modified version of the ESDM coaching planning sheet was utilized (Rogers et al., 2021; Vismara et al., 2012, 2013). Some of the ESDM planning sheet activities include the caregiver observing and reflecting on their interaction with their child. The research aimed to deliver a treatment package consisting of remote coaching to promote caregiver-friendly NDBI strategies to caregivers whose children receive birth to three services, are diagnosed with a disability, or are at risk for a developmental disability.

Research Questions

This study seeks to answer the following questions:

1) What is the effect of remote caregiver coaching on the implementation of caregiver-friendly NDBI strategies with young children with disabilities?

2) What impact does the caregivers' implementation of the CATNAP SSHORT model have on child behavior?

Chapter 2: Literature Review

History of NDBIs

Since the 1930s, the field of Applied Behavior Analysis (ABA) has continued to evolve and improve lives. ABA is defined as "the science in which tactics derived from the principles of behavior are applied systematically to improve socially significant behavior, and experimentation is used to identify the variables responsible for behavior change" (Cooper et al., 2020, p.19). One behavioral approach in ABA is Discrete Trial Teaching (DTT). In DTT, a complex skill is broken down into smaller components and taught one at a time until the learner has mastered the skill (Lovaas, 1987). This highly structured behavioral approach has shown to be an effective intervention (Lovaas, 1987). But in the 1980s, researchers found limitations of DTT, such as children failing to generalize newly learned skills across multiple contexts. Therefore, researchers looked to another field, developmental science.

Developmental sciences conflicted with the highly structured teaching strategies of DTT. For example, Piaget (1952), Bruner (1978), Vygotsky (1962), Snow (1977), and Gibson (1973) found that children learn best when they are active participants in developmentally appropriate learning experiences and learn in contexts that are meaningful to them (Kuhl et al., 2003, Moes

& Frea, 2002). Therefore, Naturalistic Developmental Behavioral Interventions (NDBIs) take a constructionist approach, which is designed to engage the child's attention, connect new experiences with existing knowledge, teach within developmental sequences, and systematically increase the complexity of their learning experiences (Schreibman et al., 2015). Consequently, in 2015, a group of diverse autism researchers came together to develop a consensus statement for the empirical and theoretical bases for NDBI (Schreibman et al., 2015).

The goal of Schreibman and colleagues 2015 paper was to explain how behavioral psychology and developmental science came together to develop early interventions for individuals with autism and how these interventions developed into effective evidence-based interventions. Several models—Incidental Teaching/Walden Toddler Program (IT; Hart & Risley, 1968; 1975), Pivotal Response Treatment (PRT; R. Koegel & L. Koegel, 2006), and Early Start Denver Model (EDSM; Rogers & Dawson, 2010; Rogers et al., 2012)—exist in the developmental and behavioral literature. Because of the many models, it has been challenging for policymakers, families, researchers, physicians, and other treatment providers to recognize that they are all the same effective ABA interventions. Therefore, the authors coined the term NDBI to bring clarity to families, service providers, and agencies (Schreibman et al., 2015).

Models that Fall Under NDBI

For an intervention model to be considered an NDBI, it must meet several criteria. The first criterion of NDBI is utilizing a three-part contingency (antecedent-behavior-consequence). This contingency helps the child know when to respond and when the implementer should provide feedback to the child (Schreibman et al., 2015). The second criterion is a manual that clearly describes procedures. The third criterion is an assessment of fidelity to ensure the model is implemented with integrity. The following six models met the three criteria for being

categorized as an NDBI: Incidental Teaching/Walden Toddler Program (IT; Hart & Risley, 1968; 1975), Pivotal Response Treatment (PRT; R. Koegel & L. Koegel, 2006), Early Start Denver Model (ESDM; Rogers & Dawson, 2010), Enhanced Milieu Training (EMT; Kaiser & Hampton, 2017), Project ImPACT (Ingersoll & Dvortcsak, 2019), and Joint Attention, Symbolic Play, Engagement, and Regulation (JASPER; Kasari et al., 2008). In the next section, these models will be discussed further.

Incidental Teaching

Incidental teaching (IT) is a process in which the child learns the skill of labeling and describing during naturally occurring adult-child interactions (McGee et al., 1999). These interactions can occur naturally in an unstructured setting, such as free play. During this interaction, the adult provides information or gives the child practice developing a skill. Betty Hart and Todd Risley developed incidental teaching at the University of Kentucky in 1968 to reduce language delays in children from disadvantaged backgrounds. For a model to be considered an NDBI, it must have a manual, treatment fidelity, and ongoing measurement. But these guides for IT are unavailable to the public (Bruinsma et al.,2020).

Of the six different NDBI models, IT is considered the earliest NDBI model and is used in the Walden Toddler program. Of the nine instructional strategies of NDBI, IT encompasses eight: use of a three-part contingency, arranging the environment, shared control and natural reinforcement, prompting and prompt fading, balanced turns, modeling, broadening of attentional focus (not specifically), and child initiations. IT does not incorporate imitation of the child. But of the six different models that meet NDBI criteria, IT is one of the few that requires the child to initiate a communication bid and emphasizes child-initiated teaching interactions (McGee et al., 1999).

The research on IT has shown to increase the receptive and expressive communication of individuals with autism, early language development, prepositions, receptive language, spontaneous speech, social phrases, social initiations, reciprocal interactions with peers, and assertiveness (Bruinsma et al., 2020). IT has been implemented in school settings with teachers and children who attend Walden model preschools and parents who receive in-home training in IT. Researchers have also taught interventionists to implement IT via telehealth using the pyramidal model (Neely et al., 2019). IT has also been successfully taught to teachers in the classroom using bug-in-ear coaching (Rosenberg et al., 2020).

Pivotal Response Treatment

Similarly to IT, PRT occurs in an unstructured environment. This contrasts with DTT, which occurs in a highly structured, decontextualized environment. Teaching opportunities are presented to the child in natural environments. The child is given access to an activity or interaction contingent upon a communicative response. PRT was developed at the University of California Santa Barbara by Robert and Lynn Koegel in the 1970s. The goal of PRT is to improve social and communication skills for children with autism, reduce stereotypic behavior (R. Koegel & L. Koegel, 1990, Koegel et al., 1992), and improve social interactions (Koegel et al., 2009). A recent analysis of NDBIs found PRT to lead to increased spontaneous verbalizations for children with autism (Lane et al., 2016).

All three procedural elements of NDBI are publicly available for PRT, but if one wants to become credentialed in PRT, fees are associated with each credential level. Autism Focused Intervention Resources and Modules (AFIRM) offers a complimentary three-hour PRT module. As with IT, PRT encompasses eight of the nine instructional strategies of NDBI but does not incorporate imitation of the child. Typically, the primary agents who implement PRT have been

the parents of children with autism, and typically, PRT focuses on the parents setting up as many language opportunities as possible. Yet teachers have also been taught to implement PRT in the classroom (Stahmer et al., 2016), and groups of parents have been successfully taught to implement PRT (Minjarez et al., 2011).

The research on PRT has shown to be effective in teaching social communication and play behaviors (Cadogan & McCrimmon, 2015). These social skills include question-asking, spontaneous language, peer interactions, social initiations, conversation skills, play skills, and engagement. The method has been shown to achieve increases in communication skills including the number and length of utterances, vocabulary, and functional communicative utterances (Koegel et al., 2009). Researchers have also found a reduction in challenging and repetitive behaviors (Koegel et al., 1992; R. Koegel & L. Koegel, 1990). A recent systematic review of the PRT literature found that of five randomized controlled trials included in the review, a significant effect of expressive language skills was found for children with autism (Ona et al., 2020).

Early Start Denver Model

The ESDM is a comprehensive treatment model for infants to preschool-age children with ASD that incorporates ABA with developmental and relationship-based approaches. The ESDM was developed at the University of California Davis by Sally Rogers and Geraldine Dawson in the 1980s. The ESDM was created for children with autism five years or younger.

All three procedural elements of the ESDM are available to the public, which includes a curriculum checklist to identify developmentally appropriate goals. Similar to PRT, fees are associated with certification and introductory workshops for the model. ESDM encompasses all nine instructional strategies and is also one of the few models to have conducted a randomized

controlled trial that demonstrated methodologically rigorous support.

This randomized controlled trial found that individuals in the treatment condition had significant gains in IQ scores, adaptive behavior, communication skills, and reduced ASD symptoms (Dawson et al., 2010). The ESDM has strong outcomes for interventions implemented by parents. A recent meta-analysis of the ESDM found young children with autism demonstrated improvements in cognition and language compared to children in the control group (Fuller et al., 2020).

Enhanced Milieu Training

EMT is a naturalistic conversation-based intervention that uses child interests and initiations as opportunities to model and prompt language in everyday contexts. EMT was initially designed for young children with intellectual disabilities or language delays. EMT is considered a blended approach of ABA, IT, and Natural Language Paradigm; as such, it was not developed by a single researcher or research team. Nonetheless, Terry Hancock and Ann Kaiser have produced a considerable amount of research on EMT (Kaiser et al., 2007). EMT does have a manual and treatment fidelity, but it is not available to the public; an ongoing measurement tool is publicly available. This NDBI model is primarily used in research settings instead of the child's home (Kaiser & Hester, 1994).

Of the instructional strategies, EMT encompasses all nine, except for not explicitly mentioning broadening the attentional focus of the learner. Children with ASD have significant cognitive and language delays, and those from high-risk or low-income families benefit from EMT (Hancock & Kaiser, 2002). In addition, studies have shown that individuals trained in EMT can generalize skills to other settings and communicative partners (Hemmeter et al., 1994; Kaiser et al., 2000).

Project ImPACT

Improving Parents as Communication Teachers aims to provide short-term parent education for parents of children with autism. In 2010, Brooke Ingersoll and Anna Dvortcsak created a manual for parents to implement Project ImPACT. This NDBI is one of the few models focusing on specific strategies for teaching joint attention through parent education. Project ImPACTs manual, treatment fidelity, and ongoing measurement are available to the public. The online tutorial is available to the public but does come with a purchase fee, as does PRT and ESDM. Project ImPACT encompasses all nine strategies and emphasizes parent education and joint attention more than other NDBI models.

Project ImPACT has also been successfully implemented in the preschool setting and via telehealth (Ingersoll & Wainer, 2013b). It has also been shown to increase the parent's delivery of instructional strategies while meeting fidelity of implementation (Ingersoll & Wainer, 2013a), and significant gains in communication for children with ASD have been achieved (Stadnick et al., 2015). But data suggest that Project ImPACT might not be appropriate for parents with high-stress levels, especially if their child has slow progress (Bruinsma et al., 2020).

Joint Attention, Symbolic Play, Play, Engagement, and Regulation

JASPER was developed by Connie Kasari at the University of California, Los Angeles, in 2006. This NDBI model was designed to target social-communication behaviors for children diagnosed with autism and prelinguistic individuals. Of the different NDBIs discussed here, JASPER is not considered a comprehensive treatment model, but an intervention focused on social communication, play, and engagement. Additionally, JASPER is the NDBI that is most firmly rooted in developmental strategies and foundations of social-communication behaviors and especially the spontaneous use of joint attention initiation (coordinated joint-looking,

showing and giving objects to share interest, and pointing to show or request) (Kasari et al., 2008). The JASPER model has also been used with other NDBI models, such as EMT, and other behavior analytic strategies, such as DTT.

The JASPER model has a manual and treatment fidelity tool available to the public but does not include ongoing measurement. The JASPER model meets all nine instructional strategies similarly to EMT, ESDM, and Project ImPACT. The JASPER workshop is free for parents and practitioners, and practitioners can earn free continuing education units.

Researchers have conducted randomized controlled trials of JASPER with promising results. JASPER effectively teaches joint attention, symbolic play, engagement, and regulation (Kasari et al., 2006, 2015). Furthermore, children who received JASPER showed an increase initiation, responding to joint attention, more diversifying symbolic play, and a higher level of play than control groups (Kasari et al., 2015).

Procedural Elements

All these NDBI models share common procedural elements and instructional strategies. The three procedural elements of NDBI include manualized practice, treatment fidelity, and ongoing measurement. Each NDBI model has a manual describing how to implement the model and train others to implement the strategies within the model. Collecting treatment fidelity ensures the intervention is implemented accurately and effectively for the individual receiving services. Ongoing measurement tracks individual progress and whether modifications are needed. All NDBIs have three guiding principles; these include 1) teaching functional skills in the natural environment in developmental order, 2) parents as key stakeholders and 3) inclusion in the least restrictive environment with typically developing peers in the community (Bruinsma et al., 2020). These types of functional skills will be addressed next.

Skills Addressed with NDBIs

NDBIs can simultaneously target a wide range of skills, including an extensive range of developmental domains, which is one of the two core components of NDBI. These domains include language and communication, social skills, play, self-regulation, and adaptive skills. Furthermore, skills are selected for their cascading effects; essentially, the target skill is taught by starting at the rudimentary level and then progressively teaching toward the more challenging level of that specific skill.

One defining feature of an NDBI teaching session is that more than one domain can be targeted during a play session, whereas a more structured teaching method, such as discrete trial, targets one domain or skill at a time. For example, during a DTT session, the learner might be taught to identify colors in a field of three using 2-D picture cards, but if the practitioner is implementing NDBI during free play and the child and practitioner are playing with blocks, the practitioner could set up a variety of opportunities that include color but also target an additional domain such as cognition and fine motor skills. For instance, a practitioner could ask a learner for a green block or ask what block tower is shorter or taller.

Language and Communication

Language and communication opportunities can be expressive or receptive and embedded throughout a session in a variety of ways. Language opportunities can be evoked by setting up an echoic or model prompt, time delay, choice, question, or carrier phrase. Regardless of the modality of communication, Augmentative and Alternative Communication (AAC) device or Picture Exchange Communication System (PECS), the child's motivation must be high, so the likelihood of the child responding to the communication opportunity is high.

Social Skills

Social initiations can be taught using four different strategies. These strategies include sensory social routines, object play routines, environmental arrangements, and time delay strategies. Sensory social routines involve repeated routine exposure that incorporates a sensory aspect into the routine. A sensory social routine involves a parent and child; for example, a child is sitting in their parent's lap singing "Wheels on the bus," and each time the parent sings the lyric "The people on the bus go up and down," the parent bounces their legs to the song. The parent recites this lyric and routine several times and then pauses for the child to initiate with eye contact, an utterance, or a word or phrase to continue the interaction.

Imitation

For children with autism, imitation can often be a barrier to communication, but when this skill is intervened upon, it has promising effects (Ingersoll & Schreibman, 2006). Four strategies used to teach imitation include: reciprocal imitation training (RIT), turn-taking, modeling, and prompting. The order in which a child is taught using RIT first begins with object imitation, play skills, and then gesture imitation (Ingersoll & Lalonde., 2010).

Play Development

Play can be targeted either for independent play or with a group of children. Play development begins around three months, and as the individual gets older, play development becomes more complex, especially socially. Various types of play exist; these include exploratory, presymbolic, functional, animated, autosymbolic, symbolic (levels 1-7), constructive play, gameplay, and gameplay with rules. Nevertheless, to properly teach play, it needs to be targeted in the natural environments in which it occurs (Bruinsma et al., 2020).

Self-regulation

Individuals with autism may face challenges with regulating their emotions or complying

with instructions, which could result in aggression, self-injurious behaviors, and property destruction (Bruinsma et al., 2020). Therefore, several NDBIs address challenging behaviors by encompassing the science of applied behavior analysis. The tools of ABA include a functional behavior assessment (FBA), identifying replacement behaviors, and positive behavior support (PBS).

Adaptive Skills

Adaptive skills might include mealtime or feeding, hygiene or self-care, school behaviors, executive functioning behaviors, and community behaviors. These adaptive skills can be broken down into smaller sub-skills, a concept known as a task analysis. Handwashing, for example, can be developed into a task analysis, with each step clearly written for the parent or practitioner to implement. This skill can be presented by first teaching the learner to turn on the faucet handle, then place their hands under the faucet, and so on. A task analysis can be implemented to teach any skill in the natural environment in this case, handwashing at home or handwashing at the mall.

NDBI Implementers and Settings

In a recent review of the NDBI literature, implementers have included teachers (D'Agostino et al., 2020), caregivers (Ingersoll et al., 2016; Sengputa et al., 2020 Stahmer et al., 2016), therapists/providers (Ingersoll et al., 2007) and researchers (Ingersoll et al., 2020). NDBI has been taught in-person at clinics, preschools, homes, communities, and schools. But the extent to which NDBI has been taught via telehealth to caregivers is limited. In 2020, Tomeny and colleagues systematically reviewed caregiver-implemented interventions that met all coaching components (collaborative planning, building on caregiver competence, guided practice, and collaborative reflection and decision-making). Of the 26 articles that met the inclusion criteria,

only two research articles taught caregivers to implement an NDBI model via telehealth (Meadan et al., 2016; Vismara et al., 2012).

Chapter 3: Method

Interviews

To ensure the intervention reflected the perspectives of BIPOC consumers and autistic adults, brief interviews were conducted to ask about the appropriateness and completeness of the intervention. Two interviews were conducted over Zoom® with staff members from Open Doors for Multicultural Families (ODMF) and Arc of King County. The people interviewed included three providers one of whom was a parent of a child of a disability, and one autistic adult. Individuals provided recommendations, potential barriers to the intervention, and support for the implementation of NDBIs for individuals with autism and other related disabilities.

Recruitment

Caregivers were recruited by sending flyers to local agencies, parent support groups, disability organizations, behavior analytic and early intervention agencies, and social media websites such as LinkedIn®. Organizations were asked to share the flyer with families on their waiting lists. Potential participants interested in the study were asked to contact the researcher by email for more information regarding the study as well as to schedule an initial screening and information meeting over Zoom®. During the meeting, the study was explained in more detail; if the caregiver verbally consented to participate in the study, a digital consent form, demographic survey, and the Social Communication Checklist (SCC) were emailed to the caregiver using the secure web application Research Electronic Data Capture (REDCap®).

Participants

Three caregiver-child dyads participated in this study. Caregivers were between 33-46

years old and had not received previous behavior analytic one-on-one training from either a Registered Behavior Technician (RBT) or Board-Certified Behavior Analyst (BCBA). The child participants were between 2 and 6 years old.

Participants were assigned pseudonyms, which are used throughout this paper. The caregiver-child dyads included Elizabeth and Hazel, Cathy and Melanie, and Bart and Eli (see Table 1 for details about the participants). Each caregiver-child dyad attended weekly one-hour coaching sessions, with the child only attending for the last 10 minutes of the one-hour session. Depending on the participant's preference for session reminders, text messages were provided the day before or an hour before the session started.

Elizabeth was a 33-year-old white female who resided in the Pacific Northwest with her husband and three children in their home. She had a high school diploma and never received one-on-one coaching from a BCBA or RBT. Elizabeth's daughter Hazel was two years old and diagnosed with a Global Developmental Delay (GDD) and communicated vocally or using American Sign Language (ASL). Elizabeth reported on the SCC Hazel did not or rarely used single words spontaneously, usually communicated using gestures, eye contact, facial expressions, or sounds, and did not yet engage in longer imitative interactions when taking turns. During and prior to the study, Hazel received Occupational Therapy services in-person and speech therapy over Zoom®.

Cathy was a 43-year-old white female who resided in the Pacific Northwest with her husband and four children in their home. She held a master's degree, worked full-time outside of the home, and never received one-on-one coaching from a BCBA or RBT. Cathy's daughter Melanie was two years old and diagnosed with down syndrome and communicated vocally or using American Sign Language (ASL). On the SCC, Cathy reported Melanie did not or rarely

used single words spontaneously and sometimes used speech-like sounds to communicate. At the time of the study, Melanie received Physical Therapy, Occupational Therapy, and speech therapy services. Melanie started attending a preschool about five weeks into intervention.

Bart was a 46-year-old black male who resided in the Pacific Northwest with his wife and three children in their home. He held an associate degree and worked full-time outside of the home. Bart reported he had a disability but did not provide his diagnosis. Bart had attended a couple trainings about ABA but had never received one-on-one coaching from a BCBA or RBT. Bart's son Eli was six years old and diagnosed with autism. Eli communicated using an AAC device and sometimes used ASL. On the SCC, Bart reported Eli did not or rarely used single words spontaneously and did not remain actively engaged with toys for 5-10 minutes. At the time of the study, Eli attended speech therapy and a developmental preschool. Eli started ABA services after the last coaching session.

Each caregiver received up to $100.00 in gift cards (see Appendix A for gift card schedule).

Institutional Review Board (IRB)

The study was submitted to the University of Washington for IRB approval. No study activities began until approval was granted. The IRB determined this study qualified as exempt. Participants completed an electronic consent form and survey. The survey included inclusion criteria and demographic questions. All materials were shared with participants via REDCap®.

Inclusion and Exclusion Criteria

Inclusion criteria for the study included: Caregivers were adults, spoke English, and were willing to participate in all aspects of the intervention with their child. For the child to participate, they either qualified for Part C/B services, received speech-language services,

demonstrated characteristics of a diagnosis, developmental delay, or had a diagnosed disability such as autism or down syndrome. If the child was non-vocal verbal, they had a dependable and consistent Augmentative and Alternative Communication system (AAC) device (e.g., Picture Exchange Communication System). It was also required for caregivers to have a reliable internet source, a computer with a camera, and access to Zoom®.

Exclusion criteria included caregivers who were under the age of 17 or did not have a child with a disability or not receiving or qualifying for early intervention supports, and/or the child is one or younger or over the age of 7 were not eligible to participate in the study. Additionally, the child would not qualify if they had a significant, uncorrected sensory impairment, significant challenging behaviors, or received home or clinic-based behavior analytic services.

Table 1

Caregiver-Child Dyads

Caregiver	Elizabeth	Cathy	Bart
Gender	Female	Female	Male
Ethnicity	White	White	Black
Age	33	43	46
Education	High school Diploma	Master's Degree	Associate Degree
Disability	None	None	Yes
Caregivers Child	**Hazel**	**Melanie**	**Eli**
Gender	Female	Female	Male
Ethnicity	White	White	Black
Age	2	2	6
Disability	Global Developmental Delay	Down syndrome	Autism
Modality of communication	Vocalized, "Ya" ASL	Approximations ASL	AAC Device ASL

Settings and Materials

Sessions occurred remotely over Zoom® once a week for approximately one hour. The entire session was recorded on Zoom®. The coaching portion of the session occurred in a quiet location in their home where the participant could listen and talk with the researcher. After coaching, the caregiver moved to a location in their home where they typically played with their child.

The materials required to participate in the study included a lab top, internet, camera, and

a Zoom® account. The researcher provided some additional materials for all the participating dyads. These included a welcome handout, an envelope with a small and large CATNAP SSHORT handout, and two sets of identical interactive toys. Toys were labeled and color-coded for baseline, intervention, or generalization. These toys were not required for each session but were provided for equitable access to the intervention. If the caregiver recommended toys their child would be more interested in playing with, such as pretend play food those toys were incorporated into the session.

1. Baseline/Intervention Toys: Fishing game, squiqz, and spelling letter game
2. Generalization Toys: Play-doh®, painting books, and magnetic tiles

Experimental Design

A non-concurrent multiple probe design across participants was used to examine the effects of caregiver-friendly NDBI strategies using remote coaching. In a non-concurrent multiple probe design, data were not collected simultaneously for participants, since participants were gradually introduced to the researcher (Slocum et al., 2022). Additionally, this design allows for across-tier comparison, can show a potential treatment effect after the same number of sessions in another tier. Furthermore, this design provided an analysis of the relationship between the independent variable, and dependent variable; and treatment effects only after the participant had been exposed to treatment (Ledford & Gast, 2014). Baseline data were gathered for all three caregiver-child dyads. The first caregiver-child dyad had three baseline sessions, the second dyad had five baseline sessions, and the third dyad had six baseline sessions. Although Ledford and Gast recommend a minimum of five baseline sessions, participants were required to meet weekly for 8-weeks and were eager to start intervention; especially since their children were awaiting behavioral services. Therefore, the researcher decided to use a minimum of three

baseline sessions for dyad one to limit the number of baseline sessions for the remaining participants.

Independent Variables

The independent variables included a weekly didactic training and remote coaching of caregiver-friendly NDBI strategies using a two-block approach (see Table 2). This treatment package included three components:

1. **Caregiver-Friendly NDBI strategies**

The caregiver-friendly NDBI strategies coined as CATNAP SSHORT were taught to each caregiver-child dyad. For block one, CATNAP, four strategies were taught, and for block two, SSHORT three strategies were taught. Caregivers were provided with two laminated handouts illustrating the strategies. One handout was intended for the caregiver to place near them during the play session, and the other was intended to be placed in an area of their home they would frequent, such as the refrigerator (see Appendix B). The acronym was created for participants to quickly recall the different NDBI strategies to implement when playing with their child during and outside of play sessions.

Table 2

Description of CATNAP SSHORT

Block 1 CATNAP (Following your child's Lead)	**Block 2 SSHORT** (Asking your child to add a little more)
Copy	**S**ay something back to your child's appropriate request
Actions	**S**et-up opportunity (Model, Time-delay, Choice, Question, Carrier Phrase)
Toys	**H**ear a response
	Once your child responds
Narrate	**R**eward your child with item or praise
Affect	**T**ime to celebrate your child's success and think about the next opportunity
Play	

2. **Weekly remote coaching** reviewing the recording of the caregiver's video from the previous week. Remote coaching occurred over Zoom® once a week, one-on-one with each caregiver-child dyad for about 30 minutes during the 1-hour session. During the coaching portion of the session, participants were shown the video of them playing with their child from the previous week. While watching the video, the researcher would pause the video to point out the caregiver's implementation of the NDBI strategies, which included areas of strength and areas of improvement. The researcher engaged in the recommended coaching practices for supporting family-centered practice (i.e., collaboration, active listening, self-reflection, contextual and nonjudgmental feedback) (Hanft et al., 2004; Inbar- Furst et al., 2020; Rush & Shelden, 2011). Participants often asked clarifying questions or stated what strategy they wanted to work on

during the play session. Another component of coaching included a follow-up email that was sent before the next scheduled coaching session. The email included detailed information on the strengths of the caregiver's implementation of CATNAP SSHORT and what to practice before the next session.

3. **Weekly didactic training** using videos from Project ImPACT that aligned with the corresponding block being taught. After reviewing the recording of the previous week's video, the didactic training was delivered one-on-one with the caregiver-child dyad over Zoom®. The researcher shared their screen and showed videos from Project ImPACT. These video clips illustrated a caregiver or researcher implementing an NDBI strategy with a child. These video clips were representative of the demographics of the caregiver participants and their child. Each strategy had several videos to choose from based on the child's communication ability, for instance preverbal or verbal. Each video clip was 3-5 minutes long and illustrated a caregiver demonstrating an NDBI strategy with their child. The same set of videos were shown for the block the caregiver was learning to implement. Given the communication abilities of the children who participated in this study, all caregiver-child dyads were shown the same videos for block one and block two. While the participant watched the videos, the researcher would reference similar skills the caregiver in the video demonstrated that either the participant had demonstrated or needed extra support implementing during the play session.

Dependent Variables

In this study four different measures assessed caregiver and child behavior to determine the effectiveness of coaching on the CATNAP SSHORT strategies. These included the caregiver's use of the CATNAP SSHORT strategies, the child's FVUs, spontaneous FVUs, and the child's engagement (see Table 3). The primary dependent variable used to make data-based

decisions was the caregiver's behavior, specifically their implementation of block one, and then block two. In addition, pre and post data were collected on parents rating of their child's communicative behavior and on the acceptability and effectiveness of the intervention.

Table 3

Research Questions and Dependent Variables

	Research Questions	
	1) What is the effect of remote caregiver coaching on implementation of caregiver-friendly NDBI strategies for young children with disabilities?	2) What impact does the caregivers' implementation of the CATNAP SSHORT strategies have on child behavior?
Dependent Variables		
Caregiver Behavior	X	
Child FVU		X
Child Spontaneous FVU		X
Child Engagement		X
Midpoint SV	X	
Post SV	X	
URP-IR	X	
SCC		X

Caregiver's Behavior. The primary dependent variable was the caregiver's behavior, specifically their implementation of seven discrete behaviors associated with the CATNAP SSHORT model. Strategies one through four were taught in block one (CATNAP), and strategies five through seven were taught in block two (SSHORT); however, all strategies were measured for every session. A datasheet created for this intervention included the strategies of

the CATNAP SSHORT model, which included operational definitions, examples and non-examples. Data were collected during a 10-min observation/recording period using a 10-sec partial interval system (see Appendix C). The percentage of intervals in which the caregiver implemented the strategies were calculated. The seven behavioral strategies, operational definitions, examples, and non-examples for the CATNAP SSHORT model are specified below.

Behavioral Strategies:

1. Engaging the child in play routines
2. Copying the child's actions
3. Narrating the child's affect
4. Narrating the child's play
5. Responding to the child's request or initiation
6. Setting up an opportunity
7. Providing positive feedback

Operational Definitions

Caregiver Behavior

Engaging the child in play routines was defined as the caregiver and child participating in collaborative play routines with toys, in which the caregiver and child were both active participants. Play routines had consistent steps and might have been repeated several times, though they may vary in complexity based on the child's developmental level. Examples included the child and caregiver taking turns putting coins into a piggy bank until it was full. Together, the child and caregiver stacked blocks on top of each other, until the tower fell, and they both began building again. Together, the child and caregiver built a train track, put trains on the track, loaded blocks onto the train cars, then drove the trains. Non-examples included the

child and caregiver moving quickly from one activity to another throughout the session, without settling on a joint play activity or the child dropping marbles down a marble run while the caregiver fed a baby doll, or the caregiver watched the child play and occasionally narrates what they are doing. Cleaning up toys after a play routine, did not count in this category. Cleaning was defined as any occurrence of the caregiver picking up items alone and putting them away in their original receptacle. For example, placing fish and fishing rods back into the bag while their child was playing with blocks.

Copying the child's action was defined as, the caregiver imitating the child's exact movements, vocalizations, and gestures within 3-seconds of the child's action. This also included imitating the child's facial expressions, vocal tone, and emotions. An example of copying the child's action was the child smiling while placing one block on top of another, and the caregiver smiling back to the child and beginning to stack blocks to make a block tower by placing one block on top of another. Another example of copying the child's action was the child throwing a bean bag into a bucket and then caregiver throwing a block into a bucket. A non-example would be the child placing one block on top of another and the caregiver lining up the blocks.

Narrating the child's affect was defined as, describing, or labeling how the child appears to be feeling while interacting with them or the items they are engaging with in the current moment. An example of narrating the child's affect was if the child was laughing while crashing their block tower, the caregiver then replied, "You are happy" or "You are excited." A non-example would be the child was crying after their tower got knocked over, and the caregiver responded, "It's okay, we can make a new tower."

Narrating the child's play was defined as, describing or labeling what the child was playing with, doing, seeing, or interacting with, in the current moment. The caregiver provided

or added information to the child's play. An example of narrating the child's play was, the child is spinning in circles with their caregiver, and the caregiver states, "Spinning!! We are spinning". A non-example would be the caregiver was spinning with their child, and the caregiver responded, "Let's play blocks." The caregiver narrating their own actions, what they were cleaning up, what they wanted the child to attend to, what they wanted the child to look at, or what the caregiver wanted them to do was not considered narrating.

Responding to the child's request or initiation was defined as, when the child attempted to communicate appropriately, which included vocalizations, eye contact, word approximations, gestures, or joint attention. The caregiver then vocally repeated, clarifies, and/or expanded on the child's communication. An example of saying something back to the child's appropriate request or initiation was the child saying "block," and the caregiver responding with "red block" and hands the child a red block. A non-example was if the child said "block," and the caregiver did not respond vocally to the child or handed them a car.

Setting up an opportunity was defined as the caregiver either setting up a **model**, **time-delay**, **choice**, **question**, or **carrier phrase**. The caregiver was facing the direction of the child, the child was engaged in an activity and then the caregiver delivered the opportunity, and the opportunities were varied throughout the session. A non-example of setting up an opportunity would be the caregiver not setting up an opportunity for more than 10-seconds. A **model** was defined as stating one or two words for the learner to repeat, for example, the child is playing with trains and is building a train track, the caregiver then delivers the model "track" and then the child repeats the word "track" or an approximation such as "tra." A **time-delay** was defined as engaging in a social routine at least twice, and then waiting for the child to respond. An example of a time delay was the child building a tower of blocks, and the caregiver continued to

add a block to their tower two times, before placing the third block on the tower the caregiver waited 5-10 seconds for the child to request "block." A **choice** was defined as the caregiver giving two options for the child to select from. An example of a choice was, "Do you want to build a big tower or a short tower?" and the child replies, "big." Choices needed to be labeled, for instance, "Do you want blue or green?" a non-example of a choice would be "Do you want this or this." A **question** was defined as the caregiver asking a question that warrants either a "yes" or "no" response from the child. An example of the caregiver asking a question was, "Do you want to play blocks?" and the child responded with "Yes." A non-example of a question would be, "What do you want to play with next?" A **carrier phrase** was defined as the caregiver saying a common phrase that warranted a predictable response from the child. An example of a carrier phrase is the child and caregiver were racing cars on a track, and then the caregiver brings their car to the starting line and said to the child, "Ready set…" and waited for the child to respond with "go."

Providing positive feedback was defined as, contingent on a child behavior the caregiver immediately gave the item the child had requested or delivered behavior-specific praise for the child's response to the opportunity. An example of this was the caregiver and the child were playing with trains, and they were building a train track together, the caregiver then delivered the model "track," waited for 5-seconds for the child to respond, and then the child repeated the word "track" the caregiver then immediately handed the track to the child, and the caregiver enthusiastically stated "track, a train track."

Child Behavior

Functional Verbal Units. Functional Verbal Utterances (FVUs) are often used in NDBI research to measure the child's vocal behavior (Coolican et al., 2010; Minjarez et al., 2011;

Vismara et al., 2009, 2018). Researchers have also found a significant correlation between children's FVUs and caregiver fidelity (Vismara et al., 2013). FVUs were collected over a 10-min observation period using 10-sec partial intervals (see Appendix D). A 10-sec partial interval is typically used in the NDBI literature to measure FVUs and spontaneous FVUs (Minjarez et al., 2010); this was scored by collecting the ratio and percentage of intervals in which the child used an FVU and/or spontaneous FVU.

FVUs are verbalizations that included (a) the child's use of at least normal vocal volume, (b) body and facial orientation towards the parent and/or relevant stimulus materials, and (c) the vocalization appeared functional or related to the task. Utterances needed to be meaningful but not necessarily phonetically correct. Functional verbal utterances include requests, refusals, comments, responses, initiations, and questions. This can be in the form of American Sign Language (ASL) and/or Augmentative Alternative Communication (AAC). Immediate or delayed echolalia and any type of stereotypic or repetitive vocalizations were not counted.

Additionally, utterances associated with tantrums, screaming, or whining were not counted unless they contained functional verbal utterances (i.e., met all above criteria for functional). (Minjarez et al., 2011).

Spontaneous FVUs. A 10-second partial interval was also be used to measure spontaneous functional verbal utterances. Spontaneous functional verbal utterances were defined as,

> verbalizations (1) initiated by the child without an adult model; (2) relevant to the interaction (i.e. no out-of-context, stereotypic, or echolalic responses); (3) combined with body and facial orientation toward the adult and/or relevant stimulus materials; and (4) contained a phonetically correct approximation of the word or word combination. (adapted from R.L. Koegel et al., 1988; Symon, 2005, as cited in Vismara

et al., 2009)

Engagement was defined as the child being interested, even enthusiastic in the activity, taking turns, continuing the activity, and remaining in the proximity of the caregiver. The child's engagement was scored during a 10-min observation period, using a 10-sec momentary time sampling.

Additional Measures

Social Communication Checklist (SCC). This checklist was administered to participants before baseline and after the eight coaching sessions. Participants completed this checklist independently outside of the coaching sessions independently. The SCC is a part of the Project ImPACT curriculum and is a 70-item checklist (Ingersoll & Dvortcsak, 2010). Participants indicated if their child used each skill "rarely/not yet" (1), "sometimes, but not with consistently" (2), or "usually, at least 75% of the time" (3). The domains and number of items include social engagement (15), language/communication (38), and imitation/play (17). Each domain was scored, and a total score was calculated.

Social Validity. Social validity assessments were collected during and after the intervention. An electronic survey was emailed to participants using REDCap®. Participants were emailed after their third coaching session and after coaching had ended. Participants were asked to answer six questions about the implementation of the intervention. Three questions assessed their satisfaction with the intervention, and two assessed the likelihood of the participant using the intervention in the future and if they would recommend it to other participants. The last open-ended question asked if the caregiver would like to provide any additional information. Participants responded using a Likert scale, from 1 (not at all satisfied) to 5 (extremely satisfied) or 1 (not at all likely) to 5 (extremely likely). The mean satisfaction of the

intervention was calculated during and after the intervention (Wolf, 1978). If, during the intervention, participants responded to any questions with moderately satisfied and/or provided an additional comment about the intervention not addressing their needs, a follow-up meeting over Zoom® would have been scheduled to make the appropriate modifications; however, no participants reported this in the midpoint social validity questionnaire.

Following the last coaching session, a modified version of the Usage Rating Profile Intervention (Revised) (URP-IR; Chafouleas, 2011) was administered to each participant using REDCap®. NDBI researchers have recommended this process because it creates buy-in for the family and ensures the goals, procedures, and outcomes of the interventions are validated by the family (D'Agostino et al., 2019). The survey assessed six factors, acceptability, understanding, therapist school collaboration, feasibility, system climate, and system support. Participants responded using a Likert scale, from 1 (strongly disagree) to 6 (strongly agree). The mean satisfaction of each factor was calculated for each participant.

Procedures and Data Collection

Pre-Baseline Data Collection. After caregivers consented to participate in the study, they were sent a demographic survey on REDCap®. Caregivers were asked information about themselves and their child. Examples of information requested included their age, gender, race/ethnicity, relation to the child, education, the child's age, gender, and diagnosis. Parents also completed the SCC at this time.

Baseline. During baseline, participants met over Zoom® and were instructed to place the provided toys in a location in their home where they usually played and to orient their computer towards the toys and their child. While participants were setting-up toys and their computer, the "record" function was selected to capture all video footage. When participants stated they were

ready to begin, the researcher delivered the instruction "Whenever you and (child's name) are ready, you can deliver the instruction, "Let's play." During the play session, the researcher turned off their camera and activated the mute function. The play session was recorded for 10-minutes using the record function on Zoom®. No feedback or instructions were provided to the caregiver during the recording. The recording was saved to Zoom® and was reviewed and scored. Data was collected on the caregiver's implementation of the CATNAP SSHORT model, their child's FVUs and spontaneous FVUs and engagement. Data were collected using the CATNAP SSHORT data sheet (see Appendix C), and the FVU, spontaneous FVU, and engagement data sheet (see Appendix D).

Intervention

Remote Coaching. Eight sessions of remote coaching were provided. Sessions occurred once a week, for approximately 1- hour with the coaching portion lasting approximately 30-minutes. Participants were taught CATNAP SSHORT in two blocks. First, participants were taught the strategies from block one (copying their child's actions and toys and narrating their child's affect and play). Once a participant demonstrated strategies from block one for 37% or more of intervals for two consecutive sessions, they advanced to block two.

Every session consisted of the same format with six activities:

1. **Greetings** (0-5 mins)
2. **Coaching: Review Video for Reflection and Discussion** of the caregiver-child interaction from the previous week and provide feedback/coaching and record feedback (20-30 mins)

3. **Didactic Training** on CATNAP SSHORT strategies occurred each session on the current NDBI strategies for the week (Project ImPACT video clips for either block one or block two) (10-15 mins)
4. **Prepare for New Video** for caregiver to set up the environment with toys and move the laptop to the play area (1-5 mins)
5. **Record New Video** delivered the statement, "Whenever you and (child) are ready, you can deliver the instruction, "Let's Play!" (10 mins)
6. **Wrap-up and reminders** for the week, the next meeting day, and time (0-5 mins)

Once the caregiver-child dyad had joined Zoom®, the session was recorded using the "record" function on Zoom®. Participants were **greeted** by name and asked how they were doing and how their week was, etc.; this took approximately 0-5 minutes. Following the greeting, the researcher and caregiver reviewed the caregiver participant's 10-minute video from the previous week. During the review, the child did not need to be present, but, joined if they wanted to. While reviewing the previous week's video together, the researcher recorded the session for the research assistant to collect procedural fidelity. In addition, verbal feedback was provided in the form of positive praise statements and areas for improvement. This feedback was provided in a written email detailing the participant's success and improvement areas (Rogers et al., 2021).

When **coaching** the caregiver, and researcher reviewed their video together and paused it to either affirm their competence, provide information about their interactions and their child's behavior, or make suggestions for the play portion of the session; this took approximately 20-40 minutes. Reviewing the video together allowed participants to ask the researcher questions

regarding the strategies of NDBI and to answer their questions; this is an effective strategy during parent training via telehealth (Ingersoll & Berger, 2015).

The next part of the session was providing **didactic training**. During the training portion, videos from Project ImPACT were shared that corresponded to the block the participant was being taught. Videos from Project ImPACT were often paused and commented on with either strategies the participant had also been demonstrating similarly to the caregiver in the video and/or explaining what strategy of CATNAP SSHORT the caregiver in the video was implementing. After reviewing the videos together, the CATNAP SSHORT handout was shared to remind participants of the strategies to focus on for the play portion of the session.

After the didactic training, participants were instructed to **prepare** for the recording of the 10-minute play video. Participants were reminded to have the toys and CATNAP SSHORT handout in view of the computer. Once all materials were in place, the participant brought their child to the play location of their home. Recordings during intervention were conducted just as they were during the baseline condition. After the 10-minutes had elapsed, the researcher turned on their camera, unmuted themselves, and informed the participant and their child the play session had ended and thanked the participant and their child for playing.

The session ended with **wrap-up** and reminders for the following week, such as the next scheduled meeting time and strategies to continue practicing or strategies the participant had demonstrated well.

Follow-Up Probe.

After the participant had received eight coaching sessions, two follow-up probes were conducted, except for dyad three who had three follow-up probes. Follow-up probes were scheduled at two-week intervals. The follow-up probe was conducted similarly to baseline, with

the addition of the generalization toys; however, if the child requested the teaching toys or other toys in their home, they were also included in the probe. The caregiver-child dyad and researcher met for approximately 15 minutes for the first follow-up probe. Similarly, to baseline, when participants stated they were ready to begin, the researcher delivered the instruction to the caregiver "Whenever you and (child's name) are ready, you can deliver the instruction; "Let's play." No feedback or instructions were provided to the caregiver during the recording.

Data Collection

Measurement. Data collection was completed by two coders and the researcher. The first coder had received her master's degree in special education with an emphasis in ABA, and the second was pursuing the same master's degree. Both coders had completed the human research course by Collaborative Institutional Training Initiative (CITI). Coders were trained by reviewing a mock video of a child and parent playing together, coding videos independently, meeting to discuss agreement and disagreements, and coding three videos independently with at least 80% of agreement before coding videos for the study.

Reliability. Inter-observer agreement (IOA) was collected for at least 30% of data points in each block. The researcher served as the primary data collector, and the two coders collected IOA. Point-by-point agreement data were collected for each caregiver-child dyad, that included the caregiver's implementation of the CATNAP SSHORT model, the child's FVUs, spontaneous FVUs, and engagement. Point-by-point agreement was calculated by adding the total number of agreements for each interval divided by the number of agreements plus the number of disagreements multiplied by 100 (Ledford & Gast, 2014). Reliability data was also collected for Hazel's communication, specifically the number of new words and approximations she demonstrated over the course of the eight coaching sessions and two follow up probes. This data

is reported in a cumulative record.

Procedural Fidelity. Procedural fidelity was collected for 30% of sessions by the research assistants. The research assistant reviewed the recorded videos they had been randomly assigned to and collected procedural fidelity on the coaching session planning sheet (see Appendix E). Procedural fidelity was calculated by dividing the number of steps correctly implemented by the total number of steps.

Caregiver Implementation and Child FVUs and Spontaneous FVUs. The caregiver's implementation of the CATNAP SSHORT model was scored each week following the session. The caregiver's implementation and the child's FVUs and spontaneous FVUs were scored during a 10-minute observation using 10-second partial interval data, and the child's engagement was scored using a 10-second momentary time sample.

Data Analysis

Data on the percentage of the CATNAP SSHORT strategies implemented by dyads were graphed along three tiers. Each dyad's data was graphed separately on two graphs. The first graph depicted four data paths, the total percentage of the implementation of the CATNAP SSHORT strategies, child FVUs, child spontaneous FVUs, and child engagement. The second graph depicted two data paths, the participant's percentage of implementation of block one strategies and percentage of implementation of block two strategies.

Visual analysis occurred throughout the study to determine a steady baseline for each dyad. Baseline data were collected on the participant's implementation of CATNAP SSHORT strategies, the child's FVUs, spontaneous FVUs, and engagement. The primary dependent variable (block one strategies) was analyzed throughout the study to inform data-based decision-making. Once steady state responding has been achieved during baseline for a minimum of three

sessions; the intervention was introduced (see Figure 2). Visual analysis of each tier took place by examining the level, trend, and variability (Kratochwill et al., 2010).

Data were further analyzed by calculating the percentage of non-overlapping data (PND). PND was calculated by dividing the non-overlapping data points by all data points and then multiplying by 100. Because a non-concurrent multiple probe design was utilized, a functional relation was considered by analyzing the change in the implementation of block one strategies across all tiers (Ledford & Gast, 2018). When intervention was introduced for dyad one, and an increase in implementation of block one strategies increased while the remaining dyad's implementation of block one remained steady (no increase in level or trend) during baseline, a functional relation was observed. When block two was introduced for dyad one, and an increase in implementation of block two strategies increased while the remaining dyad's implementation of block one remained steady or increased during intervention, a functional relation was also demonstrated.

Each caregiver participants responses from the midpoint social validity survey, and post-intervention social validity survey were calculated (see Tables 6 and 7). The caregiver participants responses from URP-IR were analyzed using mean satisfaction (see Table 8), as well their responses from the SCC to illustrate pre and post measures of their child's social communication skills (see Table 5).

Chapter 4: Results

Three caregiver child dyads participated in a study examining the effects of remote coaching to increase the use of a treatment package integrating elements of NDBI strategies. The results suggest all three dyads demonstrated behavioral changes after participating in this intervention. Dependent variables included percentage of intervals in which caregiver's

implemented the CATNAP SSHORT strategies their child's percentage of FVUs, spontaneous FVUs, and engagement. Data were reported on the SCC pre and post. Additionally, a midpoint and post-social validity questionnaire, and URP-IR were reported. These data are reported for all three caregiver-child dyads.

Implementation of CATNAP SSHORT

Figures 1 and 2 display the percent of intervals caregivers implemented CATNAP (block one) strategies, SSHORT (block two) strategies, and total implementation of CATNAP SSHORT strategies (block one and block two combined), as well as child behavior. The results for each caregiver-child dyad are displayed across two graphs. The first graph reported the child's engagement, the child's FVUs, spontaneous FVUs, and the caregiver's total implementation of CATNAP SSHORT (see Figure 1).

The second graph reported the caregiver's implementation of CATNAP (block one) strategies and SSHORT (block two) strategies (see Figure 2). Caregiver implementation of CATNAP (block one) strategies was the dependent variable on which intervention decisions were based.

For each of the seven strategies, individual caregiver data were collected and averaged across each condition (see Table 4). All caregiver participants showed an increase in implementation of the CATNAP SSHORT strategies taught during intervention. Additionally, child participants in each caregiver-child dyad also showed increases in engagement and communication (see Figure 1).

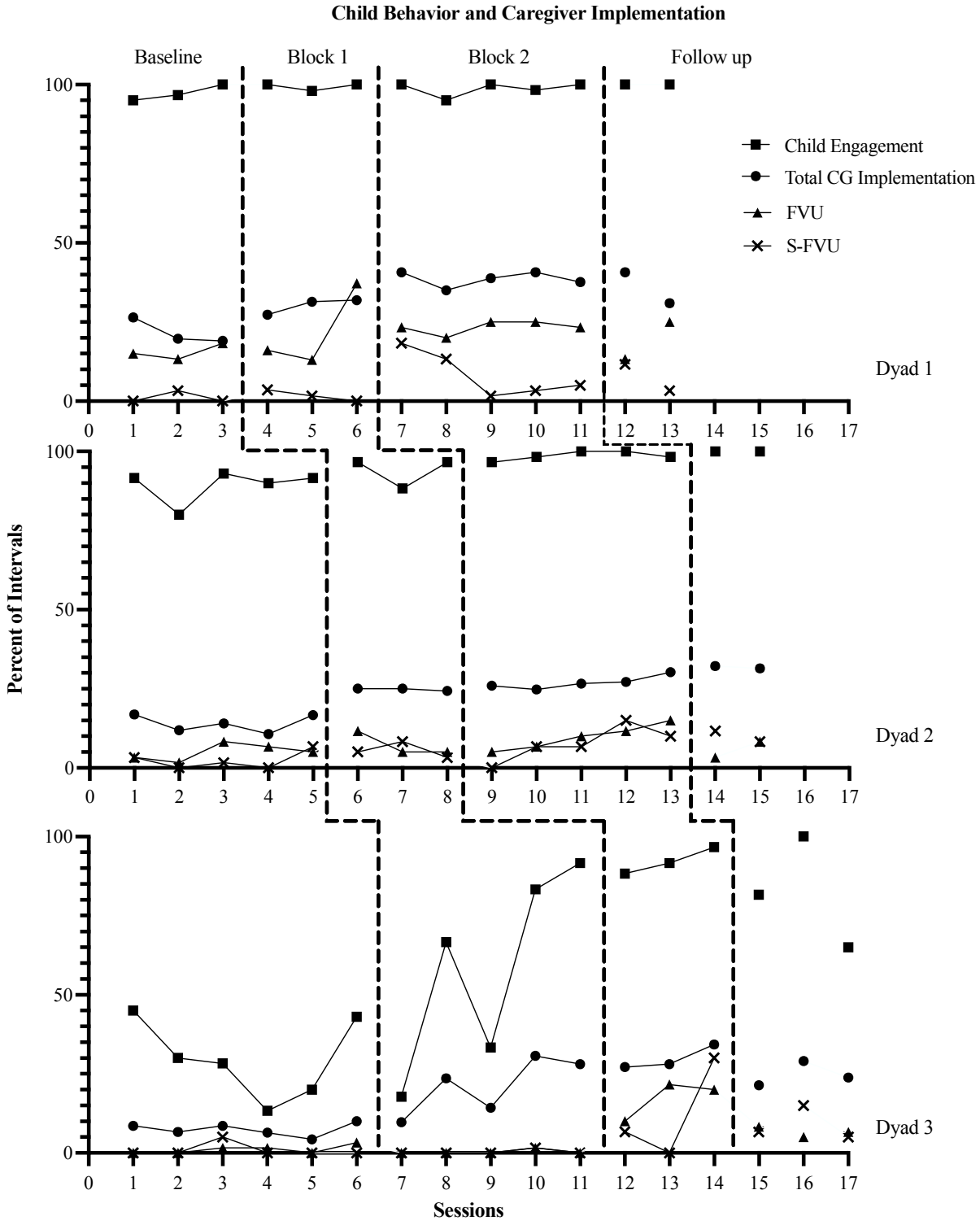

Figure 1. Child Behavior and Caregiver Implementation.

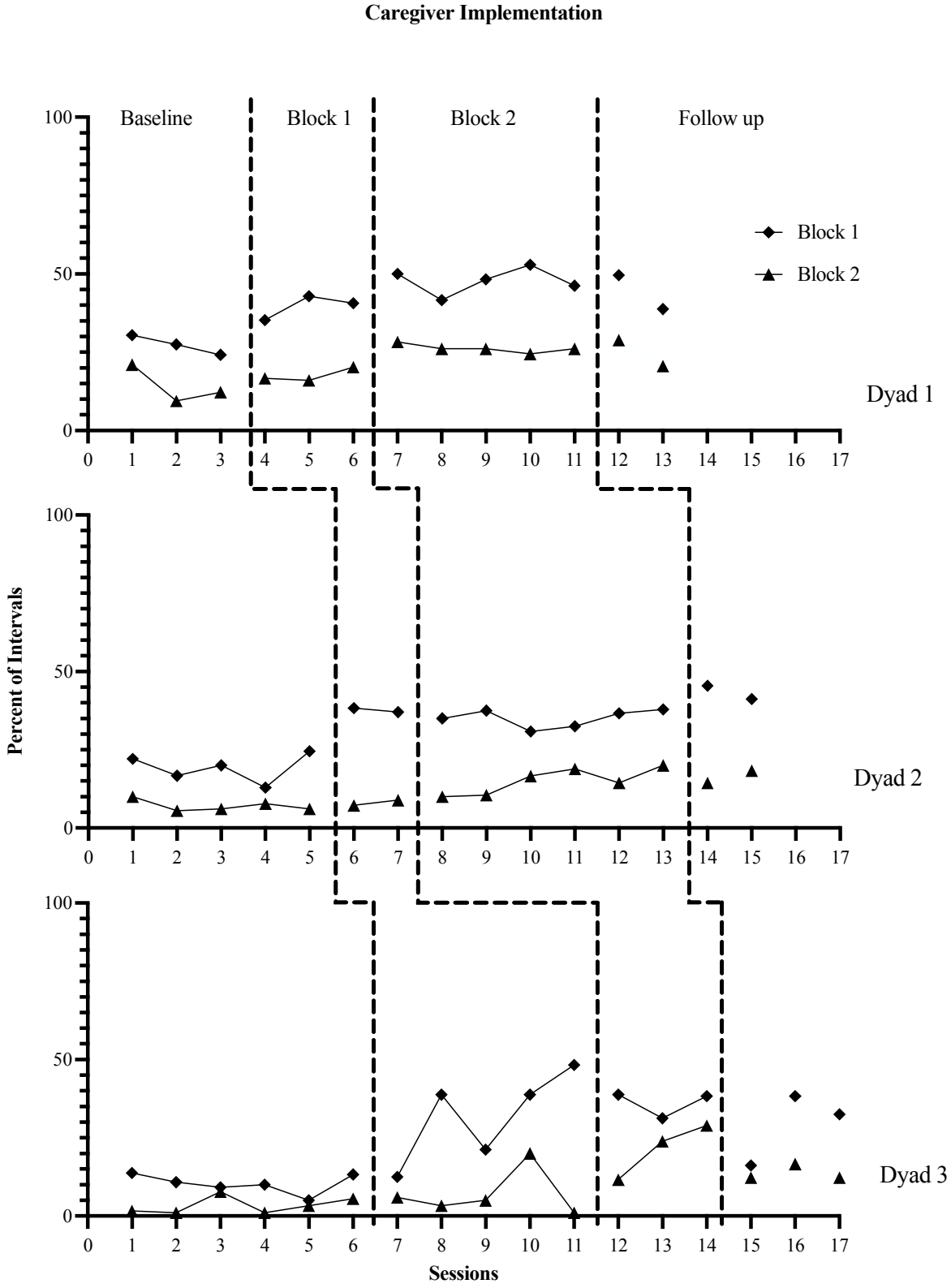

Figure 2. Caregiver Implementation of block one and block two strategies.

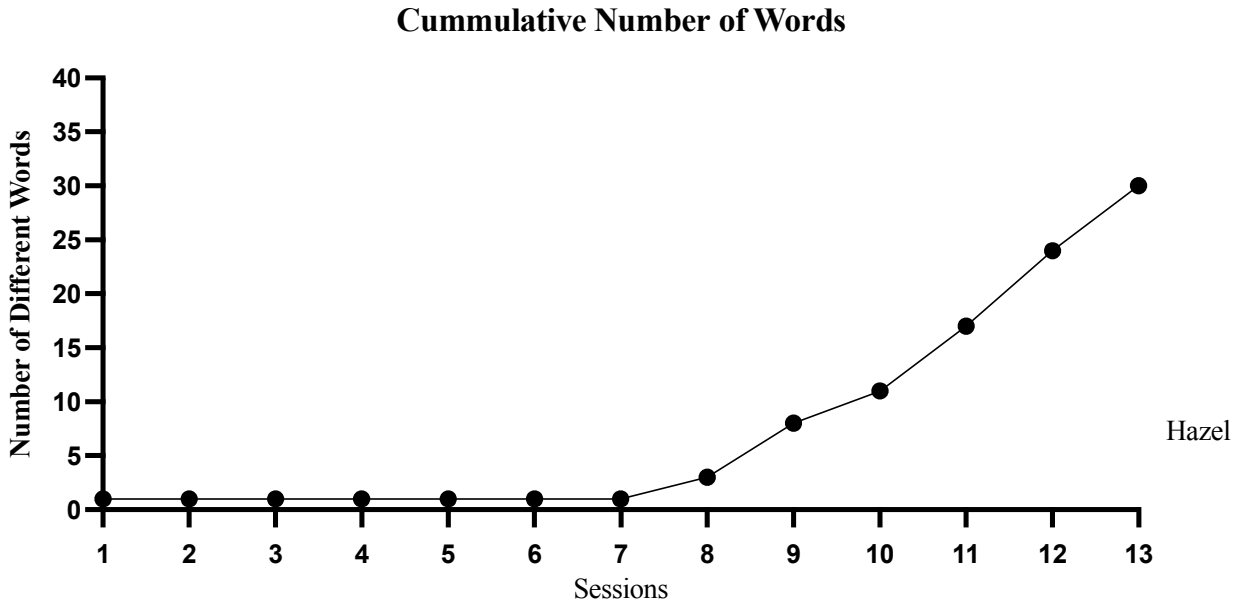

Figure 3. A cumulative record of Hazel's spoken words.

Table 4.

Percent of Implementation of Strategies Averaged Across Phases

Strategy	Caregiver											
	Elizabeth Condition				Cathy Condition				Bart Condition			
	BL	Block 1	Block 2	Follow Up	BL	Block 1	Block 2	Follow up	BL	Block 1	Block 2	Follow up
Engage in Play Routine	93.3%	88.96%	97.98%	99.16%	56.97%	80.83%	91.66%	99.16%	35.27%	69.66%	94.99%	96.10%
Copy Child Action	1.66%	17.66%	24.64%	31.66%	5.52%	26.66%	10.99%	29.99%	0.83%	23.76%	14.99%	18.33%
Narrate Child Affect	0%	0.66%	0.33%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Narrate Child Play	14.4%	35.35%	68.33%	45.83%	14.66%	43.44%	39.44%	44.16%	5.55%	34.22%	34.44%	17.77%
Respond to Child	6.63%	12.25%	27.33%	30.83%	1.33%	4.16%	17.77%	25.83%	3.33%	2.32%	19.44%	13.33%
Setting up opportunity	35.43%	36.04%	37.99%	30.83%	16.99%	16.66%	22.21%	20.83%	6.94%	18.89%	30.55%	22.77%
Providing Feedback	0.53%	4.62%	13.32%	12.50%	2.93%	3.33%	5.27%	2.5%	0%	0%	14.44%	4.99%

Dyad 1 Elizabeth and Hazel

Baseline. During baseline, Elizabeth's total implementation of CATNAP SSHORT strategies ranged from 19.04% to 26.42% of intervals across three sessions (see Figures 1 and 2). Elizabeth implemented strategies included in the CATNAP block one, the primary dependent variable (engaging her child in play routines, copying her child's actions, narrating her child's affect and play) between 24.16% to 30.40% of intervals across three sessions. During baseline, Elizabeth implemented strategies of SSHORT (responding to her child's request, setting up an opportunity, and providing positive feedback) between 9.4% and 21% of intervals across three sessions. Elizabeth's implementation of all seven strategies averaged for baseline is shown in Table 5.

Intervention Block 1. When intervention was implemented, Elizabeth demonstrated an immediate increase in level and trend of behavior. During this condition implementation ranged from 35.26% to 42.90% of intervals across three sessions for the block one strategies on which she was receiving coaching (see Figure 2). No noticeable changes in her use of block two strategies were observed. Elizabeth's implementation of the seven strategies averaged for block one is shown in Table 4.

Intervention Block 2. Block two was introduced during session seven, and Elizabeth demonstrated an increase in block two strategies, ranging from 24.44% to 28.33% of intervals (see Figure 2). Elizabeth's implementation of block one strategies maintained at the level she had demonstrated during block one and ranged from 41.66% to 52.91% of intervals. Elizabeth's total implementation of CATNAP SSHORT for the eight coaching sessions ranged from 27.29% to

40.70% of intervals. Elizabeth's implementation of the seven strategies averaged for block two is shown in Table 4.

Hazel. Hazel's data demonstrated this coaching model was moderately effective for increasing FVUs and ineffective for spontaneous FVUs and engagement. This finding will be addressed in more detail in the discussion (see Figure 1).

FVUs. During baseline, Hazel demonstrated FVUs between 13.3% and 18.3% of intervals across three sessions. These FVUs were either in the form of Hazel responding with "Ya" to questions or signing. During intervention of block one, Hazel's FVUs ranged from 13% to 37.25% of intervals, and during intervention of block two, Hazel's FVUs ranged from 20% to 25% of intervals.

Spontaneous FVUs. During baseline, Hazel demonstrated spontaneous FVUs between 0% and 3.33% of intervals. During intervention of block one, Hazel's spontaneous FVUs ranged from 0% to 3.57% of intervals, and during intervention of block two, Hazel's spontaneous FVUs ranged from 5% to 18.33% of intervals.

Total Number of Different Spoken Words. During baseline, Hazel only spoke one word. During intervention of block one, Hazel's spoken words remained at one. During intervention of block two, Elizabeth began providing more varied prompts for verbal behavior and Hazel's number of spoken words increased from three to 24 (see Figure 3).

Engagement. During baseline, Hazel's engagement ranged from 95% to 100% of intervals. During intervention of block one, Hazel's engagement ranged from 98% to 100% of intervals, and during intervention of block two, Hazel's engagement ranged from 98% to 100% of intervals.

Elizabeth and Hazel Follow-Up. Two, two-week follow-up probes were conducted to determine maintenance of CATNAP SSHORT strategies (block one and block two). Elizabeth implemented strategies from block one between 38.75% and 49.58% of intervals, from block two between 20.55% and 28.88% of intervals, and total implementation between 30.95% and 40.71% of intervals. Hazel's FVUs ranged from 13.33% to 25% of intervals, her spontaneous FVUs ranged from 3.33% to 11.66% of intervals, and her engagement maintained at 100% (see Figures 1 and 2). During follow-up, Hazel's total spoken words increased from 24 to 33 words. Elizabeth's implementation of the seven strategies averaged for follow up is shown in Table 4.

Dyad 2 Cathy and Melanie

Baseline. During baseline, Cathy's total implementation of CATNAP SSHORT ranged from 10.71% to 16.90% of intervals across five sessions. Cathy implemented strategies of CATNAP (engaging her child in play routines, copying her child's actions, narrating her child's affect and play) between 12.90% and 24.58% of intervals across five sessions (see Figures 1 and 2). During baseline, Cathy implemented strategies of SSHORT (responding to her child's request, setting up an opportunity, and providing positive feedback) between 5.55% and 10% of intervals across five sessions. Cathy's implementation of the seven strategies averaged for baseline is shown in Table 4.

Intervention Block 1. For session six, block one of intervention was introduced, and an immediate increase in level and trend was observed in Cathy's behavior. During Block one, Cathy's implementation of strategies ranged from 35% to 38.33% of intervals across three sessions (see Figure 2). Cathy's implementation of the seven strategies averaged for block one is shown in Table 4.

Intervention Block 2. Cathy had met criteria for implementing block one for 37% intervals for two consecutive sessions (see Figure 2). Given the steady state of responding during block one, block two was introduced during session eight. Cathy demonstrated an increase in block two strategies, ranging from 10% to 20% of intervals. Cathy's implementation of block one strategies maintained a range from 30.83% to 37.91% of intervals, while in intervention of block two. Cathy's total implementation of CATNAP SSHORT over the eight coaching sessions ranged from 24.28% to 30.23% of intervals**.** Cathy's implementation of the seven strategies averaged for block two is shown in Table 4.

Melanie. Melanie's data demonstrated this coaching model was moderately ineffective for increasing FVUs, and spontaneous FVUs but moderately effective for increasing engagement (see Figure 1).

FVU. During baseline, Melanie demonstrated FVUs between 1.67% and 8.3% of intervals across five sessions. These FVUs were in ASL. During intervention of block one, Melanie's FVUs ranged from 5% to 11.66% of intervals, and during intervention of block two, Melanie's FVUs ranged from 5% to 15% of intervals.

Spontaneous FVU. During baseline, Melanie demonstrated spontaneous FVUs between 0% and 6.67% of intervals. During intervention of block one, Melanie's spontaneous FVUs ranged from 5% to 8.33% of intervals, and during intervention of block two, Melanie's spontaneous FVUs ranged from 0% to 15% of intervals.

Engagement. During baseline, Melanie's engagement ranged from 80% to 93% of intervals. During intervention of block one, Melanie's engagement ranged from 88.33% to 96.66% of intervals, and during intervention of block two, Melanie's engagement ranged from

96.66% to 100% of intervals.

Cathy and Melanie Follow-up. Two, two-week follow-up probes were conducted to determine maintenance of CATNAP SSHORT strategies (see Figures 1 and 2). Cathy implemented strategies from block one between 41.25% and 45.41% of intervals, from block two between 14.44% and 18.33% of intervals, and total implementation between 31.42% and 32.14% of intervals. Melanie's FVUs ranged from 3.33% to 8.33% of intervals, her spontaneous FVUs ranged from 8.33% to 11.66% of intervals, and her engagement maintained at 100% for both follow-up sessions.

Dyad 3 Bart and Eli

Baseline. During baseline, Bart's total implementation of CATNAP SSHORT ranged from 4.28% to 10% of intervals across six sessions (see Figures 1 and 2). Bart implemented strategies of CATNAP (engaging his child in play routines, copying his child's actions, narrating his child's affect and play) between 5% and 13.75% of intervals across six sessions. During baseline, Bart implemented strategies of SSHORT (responding to his child's request, setting up an opportunity, and providing positive feedback) between 1.11% and 7.77% of intervals across six sessions. Bart's implementation of the seven strategies averaged for baseline is shown in Table 4.

Intervention Block 1. Given this range of block one implementation during baseline, block one of intervention was introduced during session seven, and an increase in level and trend in Bart's behavior was observed, ranging from 12.50% to 48.33% of intervals across five sessions (see Figure 2). Bart's implementation of the seven strategies averaged for block one is shown in Table 4.

Intervention Block 2. Block two was introduced during session twelve; Bart had met criteria for implementing block one for 37% of intervals for two consecutive sessions (see Figure 2). Bart demonstrated an increase in block two strategies, ranging from 11.66% to 28.88% of intervals. It should be noted that Bart's implementation of block one strategies ranged from 31.25% to 38.75% of intervals, while in intervention of block two. Bart's total implementation of CATNAP SSHORT ranged from 9.69% to 34.28% of intervals. Bart's implementation of the seven strategies averaged for block two is shown in Table 4.

Eli. Eli's data demonstrated this coaching model was highly effective for increasing FVUs, ineffective for increasing spontaneous FVUs, and moderately effective for increasing engagement (see Figure 1).

FVU. During baseline, Eli demonstrated FVUs between 0% and 3.33% of intervals across six sessions. These FVUs were in the form of ASL or an AAC device. During intervention of block one, Eli's FVUs ranged from 0% to 1.66% of intervals, and during intervention of block two, Eli's FVUs ranged from 10% to 21.66% of intervals.

Spontaneous FVU. During baseline, Eli demonstrated spontaneous FVUs between 0% and 5% of intervals. During intervention of block one, Eli's spontaneous FVUs ranged from 0% to 1.66% of intervals, and during intervention of block two, Eli's spontaneous FVUs ranged from 0% to 30% of intervals.

Engagement. During baseline, Eli's engagement ranged from 13.33% to 45% of intervals. During intervention of block one, Eli's engagement ranged from 17.85% to 91.66% of intervals, and during intervention of block two, Eli's engagement ranged from 88.33% to 96.66% of intervals.

Bart and Eli Follow up. Three, two-week follow-up probes were conducted to determine maintenance of CATNAP SSHORT strategies. Bart implemented strategies from block one between 16.19% and 38.33% of intervals, from block two between 12.22% and 16.66% of intervals, and total implementation between 21.42% and 29.04% of intervals. Eli's FVUs ranged from 5% to 8.33% of intervals, his spontaneous FVUs ranged from 5% to 15% of intervals, and his engagement ranged from 65% to 100%. Bart's implementation of the seven strategies averaged for follow up is shown in Table 4.

Percentage of Non-Overlapping Data (PND)

PND was calculated for all three dyads using the PND calculator (Tarlow & Penland, 2016). The treatment effect scores were determined using the following ranges to interpret PND scores: 0–50% ineffective, 50–70% questionable, 70–90% effective, and 90% or greater very effective (Scruggs et al., 1987). Based on the PND scores, this intervention was effective for one participant and very effective for two participants in increasing their usage of CATNAP SSHORT strategies.

Elizabeth and Hazel.

PND of Elizabeth's implementation of block one strategies was 100%, and the PND for Elizabeth's implementation of block two strategies was 62.50%. PND for Elizabeth's total implementation of CATNAP SSHORT was 100%. PND of Hazel's FVUs was 75%, spontaneous FVUs was 50%, and her engagement was 0%.

Cathy and Melanie.

PND of Cathy's implementation of block one strategies was 100%, and the PND for Cathy's implementation of block two strategies was 62.50%. PND for Cathy's total

implementation of CATNAP SSHORT was 100%. PND of Melanie's FVUs was 50%, spontaneous FVUs was 37.50%, and her engagement was 87.50%.

Bart and Eli.

PND of Bart's implementation of block one strategies was 87.50%, and the PND for Bart's implementation of block two strategies was 50%. PND for Bart's total implementation of CATNAP SSHORT was 87.50%. PND of Eli's FVUs was 37.50%, spontaneous FVUs was 25%, and engagement was 75%.

Social Communication Checklist

Each caregiver completed the SCC before the beginning of baseline and after the last intervention session (see Table 5). Elizabeth reported Hazel's social engagement had decreased from 95.5% to 91.01%, but her language and communication had increased from 61.76% to 62.60%. Elizabeth also reported Hazel's imitation and play skills had decreased from 64.70% to 58.82%, and Hazel's total score on the SCC decreased from 69.30% to 67.67%. However, this reporting is inconsistent with the data shown in Figure 1. Cathy reported that Melanie's social engagement decreased from 91.10% to 84.40%, and her language and communication decreased from 52.10% to 47.89%. Cathy reported Melanie's imitation and play skills had increased from 66.66% to 70.58%, and Melanie's total score on the SCC decreased from 63.72% to 60.93%. Similarly, to Elizabeth, Cathy's reporting is inconsistent with the data shown in Figure 1. Bart reported on the SCC an increase in all domains for Eli. For the social engagement domain, Bart reported an increase from 55.55% to 73.33%; for Eli's language and communication, Bart reported an increase from 50.42% to 63.44%; for imitation and play, Bart reported an increase from 70.58% to 78.40%, resulting in a total increase from 56.27% to 69.06%. Consequently,

Bart's reporting on the SCC is consistent with the data shown in Figure 1.

Table 5.

Social Communication Checklist Scores

Caregiver/Child	Domains							
	Social Engagement		Language/Communication		Imitation/Play		Total	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Elizabeth/Hazel	95.5%	91.10%	61.76%	62.60%	64.70%	58.82%	69.30%	67.67%
Cathy/Melanie	91.10%	84.40%	52.10%	47.89%	66.66%	70.58%	63.72%	60.93%
Bart/Eli	55.55%	73.33%	50.42%	63.44%	70.58%	78.40%	56.27%	69.06%

Social Validity

All caregivers completed a midpoint and post-intervention social validity questionnaire (see Tables 6 and 7). Elizabeth reported on the midpoint social validity questionnaire that she was "extremely satisfied" (5) with how the intervention was delivered, the goals, and the procedures being taught. Elizabeth also reported she would be "extremely likely" (5) to carry out this intervention after it had ended and would be "extremely likely" (5) to recommend this intervention to other caregivers. The last question on the social validity questionnaire asked if there were any additional information the caregiver would like to share. Elizabeth stated, "We have had the best time getting to know and learn different skills and strategies from the interventionist."

Following intervention, Elizabeth reported on the post-intervention social validity

questionnaire she was “very satisfied” (4) with the way the intervention was being delivered, the goals, and the procedures being taught to her. For the last question on the survey, Elizabeth stated, “This is such a valuable program! So many great videos and the interventionist is just amazing with how she delivers all information, critiques, and praises. She is a joy to have as a mentor.”

Cathy reported on the midpoint social validity questionnaire that she was “very satisfied” (4) with how the intervention was delivered, the goals, and the procedures being taught. Cathy also reported she would be “very likely” (4) to carry out this intervention after it had ended and would be “very likely” (4) to recommend this intervention to other caregivers. Following intervention, Cathy reported the same responses on the post-intervention social validity questionnaire. For the last question on the survey, Cathy stated, “Great ideas to encourage more convo from my child.”

Bart reported on the midpoint social validity questionnaire he was “very satisfied” (4) with the way the intervention was being delivered, the goals, and the procedures being taught to him. Bart also reported he would be “very likely” (4) to carry out this intervention after it had ended and would be “very likely” (4) to recommend this intervention to other caregivers. Following intervention, Bart reported the same responses on the post-intervention social validity questionnaire except for being satisfied with the procedures and recommending the intervention to caregivers, which he reported as “moderately satisfied” and “moderately likely” (3).

Table 6.

Midpoint Social Validity Responses

Item	Elizabeth	Cathy	Bart	Mean
How satisfied are you with the way the intervention is being delivered?	5	4	4	4.33
How satisfied are you with the goals created while you are playing with your child?	5	4	4	4.33
How satisfied are you with the procedures being taught to you?	5	4	4	4.33
How likely are you to use this intervention after it has ended	5	4	4	4.33
How likely are you to recommend this intervention to other caregivers?	5	4	4	4.33
What additional information would you like to share?	"We have had the best time getting to know and learn different skills and strategies from the interventionist."	"Thank you"		

Table 7.

Post-Intervention Social Validity Responses

Item	Elizabeth	Cathy	Bart	Mean
How satisfied are you with the way the intervention is being delivered?	4	4	4	4
How satisfied are you with the goals created while you are playing with your child?	4	4	4	4
How satisfied are you with the procedures being taught to you?	5	4	3	4
How likely are you to use this intervention after it has ended?	4	4	4	4
How likely are you to recommend this intervention to other caregivers?	4	4	3	3.66
What additional information would you like to share?	"This is such a valuable program! So many great videos and the interventionist is just amazing with how she delivers all information, critiques, and praises. She is a joy to have as a mentor."	"Great ideas to encourage more convo from my child."		

URP-IR

Caregivers completed the URP-IR post-intervention (see Table 8). The highest subscale rating was Understanding (88.88%), followed by Feasibility (83.33%), System Climates (81.11%), Acceptability (80.86%), Home/Therapist (53.70%), and System Supports (37.03%). Although caregivers reported low system supports and home/therapist relationship, the midpoint and post-social validity survey responses showed satisfaction with the therapist and the intervention.

Table 8.

Usage Rating Profile Responses

		Caregiver		
Domain	Elizabeth	Cathy	Bart	Mean
Acceptability	81.48%	83.33%	77.77%	80.86%
Understanding	100%	83.33%	83.33%	88.88%
Home/Therapist	1.66%	77.77%	66.66%	53.70%
Feasibility	83.33%	83.33%	83.33%	83.33%
System Climates	80%	83.33%	80%	81.11%
System Supports	1.66%	3.88%	5.55%	37.03%

Interobserver agreement

Interobserver agreement was gathered on the caregiver's implementation of CATNAP SSHORT, the caregiver's child's FVUs, spontaneous FVUs, and engagement. IOA was collected across all phases for at least 33% of sessions. The range of IOA collected for the caregiver's

implementation was 87% to 98%, with an average of 93.64%. The range of IOA collected for the caregiver's child's FVUs, spontaneous FVUs, and engagement was 85% to 99%, with an average of 95.77%.

Procedural Fidelity of Coaching

Procedural fidelity was collected for at least 33% of coaching sessions. Procedural fidelity ranged from 85% to 100%, with an average of 91.81%. It should be noted the steps that were missed in procedural fidelity were either asking the caregiver to check their technology or reminding them at the end of the coaching session to practice a specific skill. Further explanation is provided in the discussion.

Chapter 5: Discussion

In this study, caregivers of children with disabilities participated in a brief remote training and coaching intervention to support the implementation of Naturalistic Developmental Behavioral Intervention (NDBI) strategies. All caregiver participants increased their use of NDBI instructional strategies, and their children demonstrated concomitant behavioral changes in engagement or verbal output.

Previous research has shown NDBIs to be an effective intervention for increasing the quality of caregivers' interactions with their children with autism. These interactions have resulted in improved communicative and social outcomes for their children (e.g., Ingersoll & Wainer, 2013; Ona et al., 2020; Penny & Schwartz, 2019; Vibert et al., 2020). However, these NDBI models or packages tend to be delivered to families who have received an autism diagnosis and whose children are enrolled in autism specific therapeutic services. The current study extends this literature by analyzing a remote treatment package of caregiver-friendly NDBI

strategies delivered for eight, one hour sessions to families whose children are not currently receiving behavior analytic services.

Caregiver Implementation

Remote coaching and didactic training were used to facilitate caregiver implementation of NDBI strategies. The strategies used in this study were called CATTNAP SSHORT, a collection of evidence-based NDBI strategies developed by the author with the intent of being easy for parents to use. The didactic training provided the caregivers with content knowledge, video examples of NDBI strategies, the CATNAP SSHORT handout, and remote coaching. In addition, the coaching portion of the session resulted in time for reflection and practice of the NDBI strategies. As a result, all three caregiver participants increased their implementation of NDBI strategies (see Figures 1 and Figure 2). Although all caregivers increased their use of the NDBI strategies, individual differences were observed in child expressive communication, child engagement, and caregiver satisfaction with training. These issues are discussed below.

Dyad One

During baseline, Elizabeth's average implementation of engaging in play routines was relatively high (93.5%) but demonstrated a low percentage of copying Hazel's actions (1.66%) and narrating Hazel's play (14.4%) and affect (0%) (see Table 1). Elizabeth set up many opportunities during baseline, specifically asking Hazel many yes/no questions. Hazel responded with "Ya" for most questions. Because Elizabeth asked many questions during baseline, this counted towards her implementation of setting up opportunities, which resulted in an increase in her percentage of implementation of block two strategies and total implementation (see Figure 1). However, the data shown in figure 1 is not completely representative of Elizabeth's

improvement of appropriately varying communication opportunities due to the data collection system and coding.

Relatedly, since Elizabeth asked many yes/no questions, this increased Hazel's percentage of FVUs. Although Hazel responded to Elizabeth's questions, the quality of her responses were limited. She responded to all of Elizabeth's questions with the same one syllable response, "Ya". Therefore, once Elizabeth began to vary the type of communication opportunities to Hazel, the quality and diversity of Hazel's FVUs improved. Hazel's number of different spoken words was reported in a cumulative record to illustrate her increase in varying words over time (Figure 3). Once block one was introduced, Elizabeth's percentage of setting up opportunities remained around the same percentage, but her implementation of copying Hazel's actions (17.66%) and narrating her play (35.35%) increased.

When block two was introduced, Elizabeth's average implementation of all NDBI strategies increased, except for narrating Hazel's affect. During the follow-up probes, Elizabeth's average implementation of engaging in a play routine, copying Hazel's actions, and responding to Hazel increased, whereas her narrations, setting up opportunities, and providing feedback slightly decreased. During the last follow up probe, Elizabeth reported Hazel's communication was increasing and acknowledged Hazel's OT was starting to teach her strategies that she already knew how to implement because of the training and coaching she received.

Dyad Two

During baseline, Cathy's average implementation of engaging in play routines was 56.97%, demonstrating a low percentage of the remaining strategies. However, once block one was introduced, Cathy demonstrated an increase in engaging in play routines (80.83%) and

copying Melanie's actions (26.66%), and narrating Melanie's play (43.44%). Of the three dyads, Cathy met criteria for moving to block two with the least number of sessions. Furthermore, given her advancement into block two and the study's design, Cathy received the most coaching of block two sessions, with six total. Throughout the coaching sessions, Cathy reported she was glad she and Melanie could focus on turn-taking since she was working on this skill in her preschool classroom. During the last follow-up probe, Cathy reported Melanie had been communicating more with her friends at preschool.

Dyad Three

Of the dyads, Bart demonstrated the lowest percentage of engaging in play routines (32.57%); relatedly, Bart's son Eli also had the lowest percentage of engagement across baseline sessions (see Figure 1). However, once block one was introduced, Bart demonstrated an immediate increase in copying Eli's actions (23.76%) and narrating Eli's play (34.22%). Of the three caregiver child dyads, Bart demonstrated the largest increase in copying his child's actions and narrating his child's play. Yet, Bart did receive the most coaching of block one sessions, with a total of five.

During baseline Bart reported to the researcher Eli was no longer interested in the toys and requested a new set of toys that aligned more with Eli's interests. After a discussion with the researcher, Bart introduced blocks, cars, a car ramp, pretend play food, and noise tubes for the remaining coaching and follow-up probes. During the last follow-up probe, Bart reported using the CATNAP SSHORT strategies with his other children, specifically "mirroring" his youngest child during play. Bart also reported that his son Eli seemed happier during the play sessions after intervention than he did during baseline.

Child Expressive Communication

A unique aspect of this study is that each child had a different mode of communication, yet all children demonstrated an increase in FVUs and spontaneous FVUs. For example, at the beginning of the study, Hazel primarily used ASL and had a limited vocal-verbal repertoire of one-word "Ya." However, as Elizabeth's prompts for communication became more focused during the intervention, Hazel used more frequent and diverse vocalizations. Hazel's vocal-verbal repertoire increased from three to 32 words and approximations after session eight. During session ten, Elizabeth was surprised to hear Hazel say "purple" for the first time, and because the previous week's video was reviewed, Elizabeth reflected and identified more sounds Hazel spoke (Artman-Meeker et al., 2015; Hanft et al., 2004, Rush & Shelden 2011).

Melanie's modality of communication was primarily ASL, and she had a limited vocal-verbal repertoire that, at times, was inaudible over Zoom ®. However, after the introduction of block two, Melanie's use of ASL and her spontaneous use of ASL increased. For example, before some coaching sessions would begin, Melanie would initiate "play" and "open" before Cathy could even open the box of toys.

Eli's modality of communication was primarily an AAC device using the Proloquo software. Bart referred to Eli's communication device as his "talker." Eli and Bart needed reminders to have his "talker" near them during sessions. But, when block two was introduced, Eli demonstrated an increase in FVUs and spontaneous FVUs and asked Bart, "How are you?" at the beginning of one of the play sessions. Eli also demonstrated his receptive and expressive communication abilities during the play portion of the session. For instance, Bart would ask Eli "Can I have the blue car?" and Eli would hand the blue car to Bart, which illustrated Eli's

receptive knowledge of colors. Eli also demonstrated his expressive communication during play, for instance, Bart would be emptying toys out of the box, such as a bag of green blocks, and Eli labeled the blocks "green." Bart would then respond to Eli by saying, "Yeah, these are green blocks, do you want me to open them?" and Eli would respond with, "Yes."

Although all children demonstrated an increase in communication (see Figure 1), the results of the SCC illustrate a different result. Cathy reported a decrease in Melanie's communication (see Table 2), and Cathy and Elizabeth reported a total decrease in social communication skills. Conversely, Cathy reported in the social validity questionnaire that the intervention provided great ideas to encourage more conversations with Melanie.

Yet, Bart reported an increase in all domains for Eli on the SCC. Therefore, the SCC may not be appropriate for caregivers to report their child's social communication skills pre and post-intervention. A more appropriate questionnaire may have been the Social Communication Questionnaire (SCQ; Rutter et al.,2003). Given the discrepancies between the SCC and the findings shown in figure 1, the need for single-case research design is evident.

Child Engagement

As shown in figure 1, Hazel and Melanie demonstrated high levels of engagement across all sessions. Given their high percentage of engagement, this may have been advantageous to their caregivers copying their actions and narrating their play. Said another way, because their child's engagement was initially high, caregivers had more opportunities to copy and narrate their child than if their child's engagement was low or variable during the session.

Eli's engagement was below 50% during baseline and was variable during the first three sessions of block one coaching. During the training portion of the session, Bart was provided

with explicit instruction and feedback about how to play and engage with Eli. Bart was creative in his play with Eli but needed support finding strategies that aligned with his style of play but focused more on how Eli liked to explore and interact with the toys. Once Bart became more aware of Eli's interests and could identify them during play, Bart was able to quickly copy Eli's actions and narrate his play. Hence, child engagement is essential for the implementation of NDBI strategies. When engagement is not demonstrated, interventions need to be flexible enough to address the child's engagement before adding more complex strategies like expressive communication goals.

Eli demonstrated an increase in engagement during the last two sessions of block one and a continued increase into block two. Therefore, this could be due to the increase in communication opportunities Bart provided and responding to Eli's requests. Bart appreciated the distinction between narrating and asking a question. Bart would often narrate in the form of a question, for instance, "Are you playing with cars?" and after coaching, he modified his narrations to say, "You are playing with cars," and recognized when he asked Eli a yes/no question he should anticipate a response from Eli. For instance, Bart would ask Eli, "Do you want a car?" and Eli would respond with "Yes."

Individualization of the Intervention

This intervention was designed for caregivers waiting for behavior-analytic services. Part of the intervention included the handout with the acronym CATNAP SSHORT. The acronym served as a reminder for caregivers while they played with their children. Because multiple strategies were taught in two blocks, caregivers could select the strategies aligned most with their preferences while playing with their child. In addition, given that the strategies could not be

implemented simultaneously, caregivers could decide in the moment what strategy would be most beneficial to their child. For instance, caregivers were taught to copy child actions and toys and narrate affect and play; although all caregivers increased their rates of copying their children's behavior and narrating their play, none of them demonstrated an increase in narrating their child's affect. Because these children were early communicators, caregivers may have valued basic communication surrounding play as a more important outcome than their child identifying their affect. It could also be caregivers were more interested in their child developing an expressive vocabulary than identifying affect. Furthermore, given these learners were early communicators, it could be that narrating affect is an advanced skill that is more suitable to target with learners who have an established vocal-verbal repertoire. Future researchers should determine the extent to which narrating a child's affect is an essential strategy for early communicators and if caregivers think this strategy is critical for their child's communication.

Another component of this intervention was viewing the Project ImPACT videos. The initial rationale for these videos were to provide participants with examples of what NDBI instructional strategies looked like in practice. However, it may be these videos did more than just show caregivers implementing instructional strategies; they also represented the demographics of the caregiver participants or their child's communication abilities. For instance, two caregivers, Elizabeth and Cathy, were white mothers. Several videos were shown with a white mother implementing these instructional strategies with her son, who had a limited vocal-verbal repertoire. Elizabeth mentioned several times how much she enjoyed watching these videos and benefited from seeing another mom implement the strategies with her son, who had a similar verbal repertoire to her daughter. Unfortunately, no videos of fathers interacting with

their children were shown, but Bart was able to watch videos of Black parents interacting with their children with disabilities during the training. Future practitioners and researchers should consider selecting video models that are culturally representative of the families they are serving.

Social Validity

Three types of social validity were collected, a midpoint social validity questionnaire, a post-intervention social validity questionnaire, and the URP-IR. Elizabeth reported on the midpoint and final social validity instrument, being very or extremely satisfied with how the intervention was delivered. Elizabeth also stated, "We have had the best time getting to know and learn different skills and strategies from the researcher," and "This is such a valuable program! So many great videos and the researcher is just amazing with how she delivers all information, critiques, and praises. She is a joy to have as a mentor." During the last follow-up probe, Elizabeth also stated she would be interested in participating in more research and would be happy to share her videos for future presentations and trainings. Cathy also reported on the post-intervention social validity questionnaire the intervention provided great ideas to encourage more conversations with her child. All three caregiver-child dyads completed all eight coaching sessions, follow-up probes, and surveys.

However, results from the URP-IR are inconsistent with those from the midpoint and final social validity tool created by the researcher. Specifically for the domains home/therapist and system supports reported in the URP-IR. Elizabeth reported the home/therapist domain at 1.66%. Although the responses on the social validity tools support this intervention, the responses on the URP-IR do not. Further addressing the need for a more reliable and sensitive tool for measuring caregiver satisfaction. Future studies should consider a social validity assessment that captures

the satisfaction of each component of the training package—for instance, using a Likert scale to address the satisfaction of the CATNAP SSHORT handout, Project ImPACT videos, coaching sessions, and feedback emails. Doing so will provide researchers with insight into what components of the training package caregivers were most satisfied with during and after the intervention.

Gaps Addressed in the Literature

This intervention resulted in an increase in child communication for all child participants and caregiver implementation. This study also extends the NDBI literature in several ways. First, it addressed the needs of caregivers wanting to increase their child's engagement and communication living in rural areas. None of the participants were currently receiving behavioral services for their children due to waiting list issues and provider shortages. Two caregiver participants resided in rural areas where services are limited. By delivering the intervention remotely, caregivers and the researcher did not need to travel, reducing the time and cost for both parties. Sessions were also short in duration and were completed in eight weeks. However, there were instances in which caregivers needed to cancel sessions due to sickness or scheduling conflicts, yet all caregiver participants were responsive and proactive in rescheduling sessions, illustrating their commitment and satisfaction with the intervention. Since this intervention was delivered remotely, make-up sessions were more feasible to reschedule. For example, because the researcher did not travel to the caregiver's home and the caregiver did not have to travel to a clinic, caregivers could meet when their other children were home or when their other children were attending school. This flexibility may lead to increased attendance and overall acceptability of the intervention. Utilizing remote intervention is also eco-friendly and has the potential to

decrease the carbon footprint due to reduced transportation for consumers. Furthermore, this model is cost-effective for providers because they can serve more families without the need to travel from one client to another.

Second, caregivers were taught instructional strategies not tied to a specific NDBI model. By not adhering to a specific NDBI model this further eliminated the need for caregivers to adhere to a particular treatment package. Caregivers were taught instructional strategies in two blocks, to facilitate gradual learning as well as not overwhelm caregivers with demonstrating multiple, complex strategies at a time.

Third, this intervention met the needs of children of various ages, disabilities, communication modalities, and levels of support needs. All child participants communicated using different modalities, vocal-verbal, ASL, and AAC. Therefore, this intervention could be easily adapted to meet the needs of children and families with where they are in their support journey.

Fourth, because this intervention was delivered over Zoom®, it may have controlled for the position of authority, or said another way, “evened the playing field” for participants. By joining over Zoom®, caregivers were already in a familiar place (their home) and were in a comfortable space to learn, practice and generalize their skills (Schreibman et al., 2015). In addition, caregivers may have also felt comfortable playing with their child because the researcher was not physically present in their home. When caregivers were instructed to play with their child, the researcher turned off their camera. Since the researcher’s camera was turned off during the play portion of the coaching session, caregivers could not see the researcher or easily ask questions or feel “observed” while playing with their child; this was evident especially when the ten minutes

had elapsed, and caregivers were still playing with their child and forgot they were joining over Zoom®.

Implications for Practice

Although much data demonstrates the effectiveness of NDBIs, BCBAs, and other behavioral interventionists have been slow to pick up these models as part of their ongoing service provision (Hampton & Sandbank, 2021). As a result, these practices are not commonly utilized, let alone included in caregiver education. Practitioners should disseminate common NDBI instructional strategies to caregivers of children with disabilities, focusing on caregiver preference for NDBI strategies when doing so. In addition to identifying a preference for instructional strategies, materials utilized in the intervention should be culturally responsive and representative of the families' receiving services. Specifically, practitioners should consider each client's race, ethnicity, and level of support needs.

In a time where ABA has received criticisms of intervention, NDBIs may be a way to build a bridge, providing intervention in a more fluid, naturalistic, and culturally responsive manner (Schuck et al., 2021; Wang et al., 2022). Interim surveys with caregivers indicated participants found these strategies acceptable. Yet, caregivers struggled to implement one strategy specifically- narrating their child's affect. Moving forward, practitioners should evaluate the extent to which this strategy aligns with caregiver preferences and is essential in increasing child communication or engagement. Because sessions were recorded, caregivers could reflect and review sessions from the previous week and baseline sessions. So, during the last follow-up probe, caregivers were shown one of their videos from baseline. However, an interesting finding that was not reported was the overall happiness of the child and the caregiver. Therefore,

practitioners should consider recording their sessions and measuring caregiver and child happiness (Dunlap & Koegel, 1980) or a validated measurement tool such as the parental sense of competence (Gibaud-Wallston & Wandersman, 1978).

Practitioners should also consider the importance of collaboration with other service providers. For this study, caregivers were not required to share their child's information from their current service providers, including diagnostic reports, assessments, and any current services or intervention plans and programming. However, Bart reported during session 11 he would appreciate the researcher contacting Eli's SLP. As a result, the researcher met with the SLP over Zoom® for approximately 1-hour. This meeting occurred after session 12 and before session 13. During this meeting, the SLP shared Eli's current target goals, his areas of success, and described their parent coaching sessions. The SLP also mentioned how satisfied Bart was with the coaching of CATNAP SSHORT strategies and asked for more information about the layout of the coaching sessions. After learning about the layout, the SLP said she would try similar strategies and liked the idea of turning off her camera during their sessions over Zoom® as she felt this might help Bart engage more with Eli during their sessions.

Implications for Future Research

Similarly to practitioners, researchers should also consider if narrating child affect is an essential strategy for increasing child communication and engagement. Thus, a component analysis could provide researchers with the next steps of identifying critical components of NDBI, how NDBIs work, why NDBIs are effective, or what components of NDBIs could be removed or deemphasized (D'Agostino et al., 2023).

Researchers should also collaborate with the autistic community to improve social and

ecological validity practices (Schuck et al., 2021). One of the strengths of NDBIs is the focus on learner's interests and level of motivation, aligning with the goals and beliefs of much of the neurodiversity movement (Schuck et al.,2021). When NDBIs are implemented correctly, activities and skills selected are based only on the individual's interests and strengths, resulting in child-centered services unique to each child and family.

For much of the NDBI literature, FVUs have been used to measure child communication. However, as shown in this study, it was not representative of child behavior due to the stringent data collection system and strict operational definitions. Therefore, researchers should consider a more sensitive measure demonstrating a child's culmination of new words or approximations over time to identify more effective data collection measurement tools.

Lastly, researchers should consider continued evaluation of the baseline levels of child engagement and caregiver implementation to determine which strategy or block of CATNAP SSHORT could be intervened upon first. In other words, the child's percentage of engagement across baseline sessions could be the variable that determines what block should be introduced to the caregiver. For example, if the child's engagement across baseline sessions is between 90% and 100%, the caregiver might need less coaching and training on copying their child's actions. Furthermore, suppose the caregiver's implementation of copying their child's actions and narrating their child's play is high during baseline. In this case, the caregiver might benefit from learning strategies from block two during all coaching sessions. Essentially, coaching sessions could be individualized based on the child and caregiver's implementation and demonstration of skills.

Limitations

Although this intervention increased caregiver implementation of NDBI strategies and their child's communication, some limitations should be addressed. First, this intervention included several components, including the CATNAP SSHORT handout, Project ImPACT videos, and coaching. As a result, certain intervention components may have been more effective than others and led to an increase in caregiver implementation of NDBI strategies.

Additionally, this intervention was delivered by the researcher, who also served as the primary data coder for all sessions; consequently, this may have resulted in biased data collection. Relatedly, procedural fidelity for this intervention ranged from 85% to 100%, with an average of 91%. The components missed during the intervention were asking the caregiver if their technology was working or forgetting to verbally remind the caregiver at the end of the session to practice a specific NDBI strategy. Even though these components were sometimes overlooked, all sessions were recorded without technical difficulties (i.e., no loss of internet, or lap top battery dying). Relatedly, if a verbal reminder was not provided after the session to the caregiver, caregivers still received a detailed email describing the strategies they implemented correctly and strategies they could improve upon for future sessions.

Another limitation of this study is the materials provided for intervention and follow-up, specifically the sets of identical toys. Initially, the identical toys provided to each family were intended to provide strong methodological rigor. However, if caregivers recommended other toys for the play session, they were welcomed to include them if they had identical sets. Of the caregiver dyads, Bart introduced new toys during session ten. During the first follow-up session, Bart introduced the provided follow-up toys, but Eli attempted to consume Playdoh. Therefore, an additional follow-up probe was included with the toys recommended by Bart. During Cathy

and Melanie's follow-up probes, Melanie requested toys from the coaching sessions. Therefore, Cathy immediately provided access to the toys as this was an instructional strategy of CATNAP SSHORT. This variation of materials used during this intervention may have played a role in intervention results.

Finally, caregivers who participated in this study had to meet the identified inclusion criteria previously outlined. Children in child and caregiver dyads could not be currently receiving behavior analytic services. However, there were no criteria for a child participant who could potentially receive services during the intervention. Consequently, during session 12, Bart reported Eli had started behavior analytic services, but Bart did not attend the caregiver coaching sessions.

Conclusion

In conclusion, the results of this study suggest remote coaching of caregiver-friendly NDBI strategies was effective for increasing caregiver implementation of CATNAP SSHORT strategies, as well as their child's communication. This study was effective for a variety of learners with different disabilities and communication modalities, highlighting the versatility of this intervention for a wide range of children with varying levels of support needs. The results of this study also suggest remote coaching is an effective approach for training and coaching caregivers who do not have access to services residing in rural areas, as well as barriers related to transportation and childcare or who are awaiting services. Caregivers used the strategies of CATNAP SSHORT that aligned most with their learning style and their preferences for teaching their child to communicate. At the core of all NDBI models is following the child's motivation- but for practitioners and researchers to see a meaningful and socially valid change for the

families they serve, they too should follow this same practice by following the caregiver's motivation and preference of NDBI strategies.

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Appendix A

Gift Card Schedule

Study Component	Gift Card Amount
Complete consent form, demographic, social communication checklist	$20.00
Attend three sessions and complete midpoint social validity survey	$20.00
Attend six sessions	$20.00
Attend eight sessions and complete social communication checklist, social validity survey, and Usage Rating Profile	$20.00
Attend two follow up sessions	$20.00
	Total: $100.00

Appendix B

CATNAP SSHORT Handout

Appendix C

Data Sheet for CATNAP SSHORT

Block 1*: Caregiver Behavior-Following Child's Lead*

1. Engaging the child in play routines - the caregiver and child participate in collaborative play routines with toys, in which the caregiver and child are both active participants. Play routines have consistent steps and may be repeated several times, though they may vary in complexity based on the child's developmental level.

- **Examples** include the child and caregiver takes turns putting coins into a piggy bank until it is full. Together, the child and caregiver stack blocks on top of each other, until the tower falls, and they both begin building again. Together, the child and caregiver build a train track, put trains on the track, load blocks onto the trains cars, then drive the trains.

- **Non-examples** include the child and caregiver move quickly from one activity to another throughout the session, without settling on a joint play activity. The child drops marbles down a marble run while the caregiver feeds a baby doll. The caregiver watches the child play and occasionally narrates what she is doing. Cleaning up toys after the play routine, does not count towards engagement.

  Cleaning is defined as *any occurrence of picking up items and putting them away in their original receptacle. For example, placing fish, and fishing rods back into the backpack they came in.*

2. Copying the child's action - is defined as, the caregiver imitating the child's exact movements, and gestures within 3-seconds of the child's action. This can also include imitating the child's facial expressions, vocal tone, and emotions.

- An **example** of copying the child's action is the child is smiling while placing one block on top of another, and the caregiver smiles back to the child and begins stacking blocks to make a block tower by placing one block on top of another.

- An **example** of copying the child's action is the child throws a bean bag into a bucket and then caregiver throws a block into a bucket.

- A **non-example** would be the child is placing one block on top of another and the caregiver lines up blocks. Cleaning up toys after the play routine, does not count towards copying the child's actions.

3. Narrating the child's affect is defined as, describing, or labeling how the child is feeling while interacting with them or the items they are engaging with, in the current moment.

- An **example** of narrating the child's affect is the child is laughing while crashing their block tower, the caregiver then replies, "You are happy" or "You are excited".

- A **non-example** would be the child is crying when their tower gets knocked over and the caregiver responds, "It's okay, we can make a new tower".

4. Narrating the child's play is defined as, describing or labeling what the child is playing with doing, seeing, or interacting with, in the current moment. The caregiver is providing or adding information to the child's play.

- An **example** of narrating the child's play is, the child is spinning in circles with their caregiver, and the caregiver states, "Spinning!! We are spinning".

- A **non-example** would be the caregiver is spinning with their child and the caregiver responds, "Let's play blocks". The caregiver narrating their own actions, what they want the child to attend to, what they want the child to look at, or what the caregiver wants them to do is not considered narrating. Cleaning up toys and labeling them while placing them in the receptacle after the play routine, does not count towards narrating the child's play.

Block 2: *Adding a Little Bit More Child's Behavior*

5.Responding to the child's request or initiation **-** is defined as, when the child attempts to communicate appropriately including vocalizations, eye contact, word approximations, gestures, or joint attention. The caregiver then vocally repeats, clarifies and/or expands on the child's communication.

- An **example** of saying something back to the child's appropriate request or initiation is the child says "block", and the caregiver responds with "red block" and hands the child a red block.
- A **non-example** is the child says "block", and the caregiver does not respond vocally to the child or hands them a car.

6.Setting up an opportunity is defined as, the caregiver either setting up a **model**, **time-delay**, **choice**, **question**, or **carrier phrase**. The caregiver is facing the direction of the child, the child is engaged in an activity and then the caregiver delivers the opportunity, the opportunities are varied throughout the session.

1. A **model** is defined as stating one or two words for the learner to repeat, for example, the child is playing with trains and is building a train track, the caregiver then delivers the model "track" and then the child repeats the word "track".
2. A **time-delay** is defined as engaging in a social routine at least twice, and then waiting for the child to respond. An example of a time delay is the child is building a tower of blocks and the caregiver continues to add a block to their tower two times, before placing the third block on the tower the caregiver waits 5-10 seconds for the child to request "block".
3. A **choice** is defined as the caregiver giving two options for the child to select from. An example of a choice is, "Do you want to build a big tower or a short tower?" and the child replies "big". Choices need to be labeled for instance, "Do you want blue or green?" a non-example of a choice would be "Do you want this or this".
4. A **question** is defined as the caregiver asking a question that warrants either a "yes" or "no" response from the child. An example of the caregiver asking a question is, "Do you want to play blocks?" and the child responds "Yes". To be coded as a question it is only for responses with a yes/no not open-ended questions. A non-example of a question would be "What do you want to play with next?"
5. A **carrier phrase** is defined as the caregiver saying a common phrase that warrants a predictable response from the child. An example of a carrier phrase is the child and caregiver are racing cars on a track and then the caregiver brings their car to the starting line and says to the child "Ready set…" and waits for the child to respond with "go". A non-example of setting up an opportunity would be the caregiver not setting up an opportunity for more than 10-secs.

7. Providing positive feedback is defined as, the caregiver waiting 5-10 secs for the child to respond to the opportunity provided. The response from the child can either be a vocal or functional response. Once the child responds, the caregiver immediately gives the item the child has requested or delivers behavior-specific praise for the child's response to the opportunity

- An **example** of this is the caregiver and the child are playing with trains and they are building a train track together, the caregiver then delivers the model "track", waits for 5-secs for the child to respond, and then the child repeats the word "track" the caregiver then immediately hands the track to the child and enthusiastically states "track, a train track".

Caregiver_____ Date_____

Session _____ Rater_____

Opportunity Legend
M= Model
TD= Time Delay
C= Choice
Q= Question
CP= Carrier Phrase

CATNAP SSHORT Data Sheet

Using a Partial Interval Data Collection
Circle + if the caregiver did demonstrate the behavior at any point during the 10-second interval
Circle - if the caregiver did not demonstrate the behavior at any point during the 10-second interval

Interval	Start and End Time			Block 1 (CATNAP) Strategies				Block 2 (SSHORT) Strategies		
				1. Engage in Play Routine	2. Copy Child Action	3.Narrate Child Affect	4.Narrate Child Play	5.Respond to Child	6.Set-Up Opportunity	7.Providing Feedback
1.	0:00:00	-	0:00:10	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
2.	0:00:10	-	0:00:20	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
3.	0:00:20	-	0:00:30	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
4.	0:00:30	-	0:00:40	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
5.	0:00:40	-	0:00:50	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
6.	0:00:50	-	0:01:00	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
7.	0:01:00	-	0:01:10	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
8.	0:01:10	-	0:01:20	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
9.	0:01:20	-	0:01:30	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
10.	0:01:30	-	0:01:40	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
11.	0:01:40	-	0:01:50	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
12.	0:01:50	-	0:02:00	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
13.	0:02:00	-	0:02:10	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
14.	0:02:10	-	0:02:20	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
15.	0:02:20	-	0:02:30	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
16.	0:02:30	-	0:02:40	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
17.	0:02:40	-	0:02:50	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
18.	0:02:50	-	0:03:00	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
19.	0:03:00	-	0:03:10	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
20.	0:03:10	-	0:03:20	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
21.	0:03:20	-	0:03:30	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
22.	0:03:30	-	0:03:40	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
23.	0:03:40	-	0:03:50	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
24.	0:03:50	-	0:04:00	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
25.	0:04:00	-	0:04:10	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
26.	0:04:10	-	0:04:20	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
27.	0:04:20	-	0:04:30	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
28.	0:04:30		0:04:40	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
29.	0:04:40	-	0:04:50	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
30.	0:04:50	-	0:05:00	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -
31.	0:05:00	-	0:05:10	+ -	+ -	+ -	+ -	+ -	- M TD C Q CP	+ -

32.	0:05:10	-	0:05:20	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
33.	0:05:20	-	0:05:30	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
34.	0:05:30	-	0:05:40	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
35.	0:05:40	-	0:05:50	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
36.	0:05:50	-	0:06:00	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
37.	0:06:00	-	0:06:10	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
38.	0:06:10	-	0:06:20	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
39.	0:06:20	-	0:06:30	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
40.	0:06:30	-	0:06:40	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
41.	0:06:40	-	0:06:50	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
42.	0:06:50	-	0:07:00	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
43.	0:07:00	-	0:07:10	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
44.	0:07:10	-	0:07:20	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
45.	0:07:20	-	0:07:30	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
46.	0:07:30	-	0:07:40	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
47.	0:07:40	-	0:07:50	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
48.	0:07:50	-	0:08:00	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
49.	0:08:00	-	0:08:10	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
50.	0:08:10	-	0:08:20	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
51.	0:08:20	-	0:08:30	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
52.	0:08:30	-	0:08:40	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
53.	0:08:40	-	0:08:50	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
54.	0:08:50	-	0:09:00	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
55.	0:09:00	-	0:09:10	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
56.	0:09:10	-	0:09:20	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
57.	0:09:20	-	0:09:30	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
58.	0:09:30	-	0:09:40	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
59.	0:09:40	-	0:09:50	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-
60.	0:09:50	-	0:10:00	+	-	+	-	+	-	+	-	+	-	-	M	TD	C	Q	CP	+	-

Collect the Percentage of Intervals in which the behaviors were demonstrated:

Block 1

1. Engaging in play routine _____%
2. Copy Action _____%
3. Narrate Child Affect_____%
4. Narrate Child Play _____%

Total for Block 1 _____%

Block 2

5.Respond to Child _____%
6. Set-Up Opportunity _____%
7. Providing Feedback_____%

Total for Block 2 _____%

Total (Block 1 & Block 2) _____%

Appendix D

FVU and Engagement Data Sheet

OPERATIONAL DEFINITIONS

Functional Verbal Utterances

Functional Verbal Utterances are operationally defined as verbalizations that include

a) the child's use of at least normal vocal volume,
b) body and facial orientation towards the parent and/or relevant stimulus materials, **and**
c) the vocalization appeared functional or related to the task. Utterances needed to be meaningful but not necessarily phonetically correct.

- **Examples:** Functional verbal utterances include requests, refusals, comments, responses, initiations, and questions. This can be in the form of American Sign Language (ASL) and/or Augmentative Alternative Communication (AAC).
- **Nonexamples.** Immediate or delayed echolalia and any type of stereotypic or repetitive vocalizations would not be counted.
- **Additional Nonexample**: Additionally, utterances associated with tantrums, screaming, or whining would not be counted unless they contained functional verbal utterances (i.e., met all above criteria for functional). (Minjarez et al., 2011)

Spontaneous Functional Verbal Units

Spontaneous Functional Verbal Units verbalizations

1) initiated by the child without an adult model;
2) relevant to the interaction (i.e. no out-of-context, stereotypic, or echolalic responses);
3) combined with body and facial orientation toward the adult and/or relevant stimulus materials; **and**
4) containing a phonetically correct approximation of the word or word combination.

(adapted from R.L. Koegel, O'Dell and Dunlop, 1988; Symon, 2005, as cited in Vismara et al., 2009)

Engagement

Child engagement is defined as the child is interested, even enthusiastic in the activity, taking turns, continuing the activity, and remaining in the proximity of the caregiver.

Caregiver_____ Date_____

Session _____ Rater_____

Functional Verbal Utterances Scoring

Partial Interval Scoring				*Momentary Time Data*	
+	If during the 10-sec interval the child use an FVU score the interval +	(S)	If during the 10-sec interval the child uses a spontaneous FVU score the interval as S (circle S)	E	If the child is engaged at the end of 10-sec interval circle E
-	If during the 10-sec interval the child does not use an FVU score the interval as a minus	S	If during the 10-sec interval the child does not use a spontaneous FVU do not score the interval as S (do not circle S)	NE	If the child is not engaged for at the end of the 10-sec interval circle NE

Interval	Start and End Time			FVU		SVU	Engage	
1.	0:00:00	-	0:00:10	+	-	S	E	NE
2.	0:00:10	-	0:00:20	+	-	S	E	NE
3.	0:00:20	-	0:00:30	+	-	S	E	NE
4.	0:00:30	-	0:00:40	+	-	S	E	NE
5.	0:00:40	-	0:00:50	+	-	S	E	NE
6.	0:00:50	-	0:01:00	+	-	S	E	NE
7.	0:01:00	-	0:01:10	+	-	S	E	NE
8.	0:01:10	-	0:01:20	+	-	S	E	NE
9.	0:01:20	-	0:01:30	+	-	S	E	NE
10.	0:01:30	-	0:01:40	+	-	S	E	NE
11.	0:01:40	-	0:01:50	+	-	S	E	NE
12.	0:01:50	-	0:02:00	+	-	S	E	NE
13.	0:02:00	-	0:02:10	+	-	S	E	NE
14.	0:02:10	-	0:02:20	+	-	S	E	NE
15.	0:02:20	-	0:02:30	+	-	S	E	NE
16.	0:02:30	-	0:02:40	+	-	S	E	NE
17.	0:02:40	-	0:02:50	+	-	S	E	NE
18.	0:02:50	-	0:03:00	+	-	S	E	NE
19.	0:03:00	-	0:03:10	+	-	S	E	NE
20.	0:03:10	-	0:03:20	+	-	S	E	NE
21.	0:03:20	-	0:03:30	+	-	S	E	NE
22.	0:03:30	-	0:03:40	+	-	S	E	NE
23.	0:03:40	-	0:03:50	+	-	S	E	NE
24.	0:03:50	-	0:04:00	+	-	S	E	NE
25.	0:04:00	-	0:04:10	+	-	S	E	NE
26.	0:04:10	-	0:04:20	+	-	S	E	NE
27.	0:04:20	-	0:04:30	+	-	S	E	NE
28.	0:04:30		0:04:40	+	-	S	E	NE
29.	0:04:40	-	0:04:50	+	-	S	E	NE
30.	0:04:50	-	0:05:00	+	-	S	E	NE

Interval	Start and End Time			FVU		SVU	Engage	
31.	0:05:00	-	0:05:10	+	-	S	E	NE
32.	0:05:10	-	0:05:20	+	-	S	E	NE
33.	0:05:20	-	0:05:30	+	-	S	E	NE
34.	0:05:30	-	0:05:40	+	-	S	E	NE
35.	0:05:40	-	0:05:50	+	-	S	E	NE
36.	0:05:50	-	0:06:00	+	-	S	E	NE
37.	0:06:00	-	0:06:10	+	-	S	E	NE
38.	0:06:10	-	0:06:20	+	-	S	E	NE
39.	0:06:20	-	0:06:30	+	-	S	E	NE
40.	0:06:30	-	0:06:40	+	-	S	E	NE
41.	0:06:40	-	0:06:50	+	-	S	E	NE
42.	0:06:50	-	0:07:00	+	-	S	E	NE
43.	0:07:00	-	0:07:10	+	-	S	E	NE
44.	0:07:10	-	0:07:20	+	-	S	E	NE
45.	0:07:20	-	0:07:30	+	-	S	E	NE
46.	0:07:30	-	0:07:40	+	-	S	E	NE
47.	0:07:40	-	0:07:50	+	-	S	E	NE
48.	0:07:50	-	0:08:00	+	-	S	E	NE
49.	0:08:00	-	0:08:10	+	-	S	E	NE
50.	0:08:10	-	0:08:20	+	-	S	E	NE
51.	0:08:20	-	0:08:30	+	-	S	E	NE
52	0:08:30	-	0:08:40	+	-	S	E	NE
53	0:08:40	-	0:08:50	+	-	S	E	NE
54.	0:08:50	-	0:09:00	+	-	S	E	NE
55.	0:09:00	-	0:09:10	+	-	S	E	NE
56.	0:09:10	-	0:09:20	+	-	S	E	NE
57.	0:09:20	-	0:09:30	+	-	S	E	NE
58.	0:09:30	-	0:09:40	+	-	S	E	NE
59.	0:09:40	-	0:09:50	+	-	S	E	NE
60.	0:09:50	-	0:10:00	+	-	S	E	NE

Percentage of Intervals		
Functional Verbal Utterances using 10-sec partial interval	/	%
Spontaneous Functional Verbal Utterances using 10- sec partial interval	/	%
Engagement using 10-sec momentary time sampling	/	%

Appendix E

Coaching Planning Sheet

Time	Activity	Notes For Researcher	Yes/No
0-5 mins	1. Greetings	○ Thank you for coming ○ Layout of session for today ○ Technology check: ○ Internet connection ○ Camera-ready ○ Volume/audio working ○ Laptop charged	Yes/ No
20-30 mins	2. Review video with Reflection and Discussion	○ Begin recording coaching video ○ Share screen with the caregiver's video from the previous week ○ Areas of strength ○ Areas for improvement ○ Pause the video for: ○ Comments ○ Questions ○ Concerns ○ Feedback	Yes/ No
10-15 mins	3. Didactic Training **Block One: CATNAP** 1. ***C****opy your child's:* 2. ***A****ctions* 3. ***T****oys* 4. ***N****arrate:* 5. ***A****ffect* 6. ***P****lay* **OR**	○ Share screen with CATNAP visual ○ Share screen with corresponding videos for block one: ○ 1) Show video 3 or 4 ○ 2) Show video 5 or 6 ○ 3) Show video 7 or 8 ○ 4) Show video 9 or11	Yes/ No

	Block Two: SSHORT *1. **S**ay something back to your child's appropriate request or initiation* *2. **S**et-up opportunity (Model, Time-delay, Choice, Question, Carrier Phrase)* *3. **H**ear a response, **O**nce your child responds* *4. **R**eward your child with item or praise* *5. **T**ime to celebrate your child's success and think about the next opportunity*	o Share screen with CATNAP visual o Share screen with corresponding videos for block two: o 1)Show video 13 o 2)Show video 29, 21 or 22, 23 or 24, 25 or 26, 27 or 28 o 3)Show video 53 o 4) No video to show	
0-3 mins	4. Prepare for new video	-Have caregiver go set up the environment with toys -Move the laptop to the designated area -Have caregiver bring child to designated area o Caregiver position laptop in view of the child	Yes/ No

10-12 mins	5. Record new video	**- Researcher delivers the statement,** **"Whenever you and (child) are ready you can deliver the instruction, "Let's Play!"**	Yes/ No
0-5 mins	6.Wrap-up and Reminders	-Thank you for coming -Next meeting: Day/Time -Remember to keep practicing X	Yes/ No
	*Reminder to Upload video to one-drive		

PROCEDURAL INTEGRITY OPERATIONAL DEFINITIONS

1. Greetings: is defined as, the researcher thanking the caregiver and child for coming to the session, addressing both the caregiver and the child by their first name, and asking how their day is going. Next, the lead researcher will provide a layout for the entire session, such as what activity will be occurring next and how much time is allocated for each activity. Finally, a technology check will be done by checking both the researcher and caregivers: internet connection and phone number available in case of a disconnection, checking the camera is ready, the volume/audio is loud enough, and laptops are fully charged or plugged in.

2. Review Video with Reflection and Discussion: is defined as, the researcher sharing their screen over zoom and playing the video from the previous week that was recorded during the session. Throughout reviewing the video, the researcher will include areas of strength and areas for improvement
    A. *Affirm caregiver competence: Developmentally supportive interactions are warmly recognized and expanded upon, as are characteristics of child competence*
        a) "He really likes to play with you like that."
        b) "It's so much fun to watch her play."
        c) "When you pushed on it, she imitated you."
        d) "That was a great idea to put it closer to her."
        e) "She really likes how you make those for her...here are some other cookie cutters to try if you like."
        f) You get a lot of pleasure from watching him cruise around, don't you?"
        g) "He's really good at putting the blocks in the hole."
    B. *Focus Attention: Aspects of the interaction are commented upon, expanded, or questioned in order to draw the parent's attention to particular competencies or actions in self or child*
        a) "It's really interesting to watch how she uses all of her familiar actions to explore a new toy."
        b) "I covered Ernie, and Sarah found him!"
        c) "How do you do this at home?"
        d) "How does he let you know that he's interested in a new toy?" "He's really practicing his new walking abilities."
    C. *Provide Developmental Information: information about the child's development agenda is given by verbally labeling or interpreting the child's emotional, cognitive, language, and motor abilities within the context of play and interaction*
        a) The researcher explains to caregiver how to use a material to encourage tracking and reaching.
        b) "He really likes to pretend."
        c) "Look how well she was able to use her fingers to pick up that tiny toy!"
        d) "He's really learning how to bring his hands together to get things!"

e) "Did you see how he was able to remember where it was when you hid it for him?"
f) "He's enjoying exploring containers today, isn't he?"

D. Suggest: *Researcher provides the caregiver with a specific suggestion for something to try with the child*
   a) "I wonder what would happen if you put your hand over it?"
   b) "Watch what he does when I hold him at the hips."
   c) "Let's see what would happen if you moved over here a little so that he has to move to get closer to you."

3. Didactic Training: is defined as the researcher sharing their screen with the CATNAP visual and then reviewing each of the videos in their entirety. During the video the researcher will label the CATNAP strategy being demonstrated. For example, " You will notice in this video the caregiver is labeling the action of the child by stating "You are coloring your paper so nicely."
4. Prepare for new video: is defined as the researcher reminding the caregiver to set-up the environment with the toys the child is interested in, as well as moving the charged or plugged-in laptop to the designated play area. Once the caregiver has placed the toys and laptop in the area, the researcher will then ask the caregiver to bring the child to the play area. When the child and caregiver are in the designated play area the caregiver will position the laptop in view of the caregiver and child.
5. Record new video: is defined as the researcher stating the following, "When you are ready to start playing with your child, please deliver the statement to your child, "Let's Play!" Once you have said "Let's Play" I will turn off my video camera and begin recording over zoom. During this time, only interact with your child. Please only refer me if you need help. Once the 10-minutes have passed, I will turn on my video to signal the play session is over. Once the play session is complete, I will end our session with wrap-up and reminders for the following week."
6. Wrap-up and reminders: is defined as thanking the caregiver and child for attending the session, stating the next meeting day and time, and reminding the caregiver they are doing a great job practicing CATNAP.
7. Researcher uploads video: is defined as uploading the recording to the one drive within 1-hour after the session has been completed.

Coding:

Yes: All components of the step are completed

No: Some, or none of the step is not completed