EFFECTS OF PARENT-MEDIATED REFERENT-BASED INSTRUCTION: A VERBAL BEHAVIOR TRAINING PACKAGE FOR YOUNG CHILDREN WITH AUTISM

by

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ABSTRACT

JANET SANCHEZ ENRIQUEZ. Effects of Parent-Mediated Referent-Based Instruction (PM-RBI): A Verbal Behavior Training Package for Young Children with Autism Spectrum Disorder. (Under the direction of Dr. ROBERT PENNINGTON)

Autism Spectrum Disorders (ASD) are characterized by pervasive impairments, inhibiting social interaction and learning opportunities, often with ensuing behavior challenges (American Psychiatric Association, 2000). Studies estimate that 25-30% of children with ASD do not develop flexible and consistent language (Hinzen et al., 2020; Schaeffer et al., 2023; Tager-Flusberg, 2016;). Communication skills are essential to supporting individuals with ASD to communicate their needs, navigate their chosen environments independently, and establish relationships (Kim et al., 2014). Over the last two decades, advocacy and research organizations in the field of ASD have emphasized the identification and implementation of evidence-based practices and programs. Fortunately, over the past four decades, researchers have identified several practices to address social communication challenges (Chakrabarti, 2017). Naturalistic teaching (NT) and parent-mediated intervention (PMI) are two practices derived from applied behavior analysis that are evidence-based and highly effective language acquisition methods. Extensive research has confirmed the success of these interventions in improving communication, social interaction, and overall developmental outcomes in children with ASD. Caregiver-implemented interventions, often facilitated via coaching, provide families with supportive practice to increase their children's language within natural contexts (Tomeny et al., 2019). By equipping parents with tools, strategies, and support, these interventions leverage the strength of the family unit to facilitate language-rich learning opportunities and connections Binnendyk & Lucyshyn, 2009; Brookman- Frazee, 2004; Dunlap et al., 2006; Kashinath et al., 2006; Lucyshyn et al., 2007; Moes & Frea, 2002). Despite these empirically-supported

communication models for ASD and solid evidence supporting NT and PMI, insufficient access to high-quality interventions remains a barrier for families. Barriers such as inequalities in access to services, challenges in customizing training, schedule constraints, and family pressures remain significant concerns for caregivers. In addition, existing programs may be inaccessible to rural populations, inadequately tailored to the cultural and linguistic needs of families, or not economically feasible for those with limited resources (Fleming et al., 2011; Ingersoll et al., 2020).

The purpose of this study was to examine the effects of a naturalistic caregiver coaching package on the accuracy of parents' implementation of Referent-Based Instruction (RBI), evaluate their children's verbal behavior repertoires subsequent to intervention, and explore caregivers' experiences in participating in RBI. Results suggest that caregivers improved their fidelity and implementation of RBI procedures following the introduction of the coaching package. Child participants' communicative repertoires increased after caregivers participated in the intervention, and they reported their experiences in this training as highly positive. This study makes several contributions to the parent training and coaching literature, first by showing that a combination of short parent training, virtual coaching interventions, and customized caregiver resources can improve RBI implementation and support communication development for young children with ASD. Second, this study illustrated RBI's extended utility by involving caregivers in everyday routines and activities within their natural environments. These findings recommend that service providers, practitioners, and researchers consider naturalistic teaching models, such as Parent-Mediated RBI, for training and intervention. Lastly, reflecting upon the fact that participants in this study were Mexican citizens where ASD support services are scarce, the

outcomes of this study provide potential options for underserved communities, contributing to the development, expansion, and evaluation of virtual service delivery options.

DEDICATION

The greatest gift my parents ever gave me was my brother.

Fitz, you have profoundly and uniquely influenced my life, impacting who I am, what I do, and what I plan to do; my life compass. Your light shines bright, reminding me daily of a sincere heart's profound impact on those around us. Thank you for teaching me, through your own authenticity, the value of staying true to oneself.

This is dedicated to you. Love you forever.

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CHAPTER 1: INTRODUCTION

Statement of the Problem

The view and diagnostic criteria of autism have changed dramatically over the past 75 years since it was first documented (Sharma et al., 2018). "Autism" originates from the Greek word "autos," which means "self." Swiss Psychiatrist Paul Eugen Bleuler introduced it in 1908 to describe schizophrenic patients. In 1943, Austrian-American psychiatrist Leo Kanner redefined the definition to refer to a condition in which children showed language difficulties and social isolation independent of schizophrenia. Kanner observed children who had challenges conversing and relating, engaged in repetitive behavior, and were indifferent to socially mediated experiences (1943). Later, Hans Asperger identified children with social isolation who exhibited none of the language differences typical of autistic children (1944). Through this process, the diagnosis of Asperger's Syndrome, a type of autism, was established (Hippler& Klicpera, 2003).

Today, the heterogeneity of autism spectrum disorder (ASD) is universally accepted and recognized as a complex neurodevelopmental disorder characterized by persistent differences in social communication and interaction and restricted repetitive behavior patterns. As its name suggests, ASD represents a continuum of characteristics and degrees of severity with features and ability profiles spanning a wide range (Wing, 1988). ASD prevalence has dramatically increased in the past 30 to 40 years, with an estimated 2.2% of American adults diagnosed (Lyall et al., 2017). The Centers for Disease Control and Prevention (CDC) report that the number of American children with autism increased from 1 in 150 in 2000 to 1 in 54 in 2016 and now stands at 1 in 36 (CDC, 2023; Nevison et al., 2018). Despite not being clearly explained, this increase is likely a result of several influences, notably the expansion of criteria for diagnosing, increasing healthcare providers' identification in younger age groups, greater parental

understanding, and a growing number of risk factors, such as birth to older parents. (Pham et al., 2022).

Even with the increasing incidence and knowledge of the neurobiology of ASD, the diagnosis of the disorder relies heavily on behaviorally defined characteristics. Core characteristics of ASD impact communication and interaction, and restricted, repetitive behaviors may impede or limit everyday experiences for some individuals (DSM-5; American Psychiatric Association, 2013). Behavioral characteristics include differences in social and communication skills and challenges in responding to reciprocal social behavior, including gestures, eye contact, initiation, or joint attention (Dawson et al., 1998). Recent reports reveal that approximately 60% of individuals with ASD exhibit cognitive delays, and nearly 30%-50% do not develop functional speech (Fombonne, 2005). Significant behavioral deficits and excesses exist in comparison to the general population. Examples of behavioral excesses include self-stimulatory and repetitive behavior such as rocking, hand flapping, object twirling, and repetitive vocalizations. Behavioral deficits include inattention to nonverbal social signals such as pointing, showing, and giving, and later difficulty attending to social requests and interactions (American Psychiatric Association, 2013; Koegel & Koegel, 1995; DSM-5; Osterling et al., 2010). In summary, individuals diagnosed with ASD present a diverse range of challenges in social interaction, communication, and behavior. For many families, receiving a diagnosis of ASD for their child is accompanied with a range of emotions from grief to frustration. At the time of diagnosis, it is typically difficult to predict the prognosis and trajectory of development for a young child with ASD. Despite this, it is essential to note that most children diagnosed with ASD under three years of age retain the diagnosis (Hyman et al., 2020). These cardinal features of ASD have substantial implications for effective programs and the provision of services. These

challenges require family, educational, and community stakeholders to support individuals with ASD through carefully designed programs that consider caregiver needs and preferences. Doing so can contribute to improved quality of life and increased levels of community accessibility, inclusivity, and support for families.

Autism Spectrum Disorder Characteristics & Social Communication

Communication and social exchange play an integral role in everyday life. They are at the heart of human interaction and development - a fundamental human right to uphold for all individuals (McLeod, 2019). Social communication and interaction abilities include an array of verbal and nonverbal behaviors used in reciprocal social exchanges. Among functional communicative proficiency, preverbal skills, including imitation and gestures, contribute to the ability to relate to others and support successful social communication (Stone & Yoder, 2001). Social communication and interaction involve providing attention to social information received, interpreting what is happening in these situations, problem-solving circumstances, and responding accordingly. For most children, these interconnected abilities appear early in life and form the basis of social communication. Individuals with ASD present with a range of challenges in developing social communication repertoires. For example, spoken language development is highly variable in children with ASD. It is common for some children to show no delay in speech onset, while others exhibit delays but develop average or above-average language skills. According to current estimates, 25-30% of children with ASD do not develop flexible and consistent speech patterns (Hinzen et al., 2020; Schaeffer et al., 2023; Tager-Flusberg, 2016;). Some studies suggest that children with ASD use communication for more restricted purposes when they develop vocal verbal behavior than children without ASD (Burton et al., 2020; Ziatas et al., 2003).

These pervasive social impairments are commonly considered to be the core deficits associated with ASD, consequently limiting, and impacting social interactions, learning opportunities, behavior regulation, and post-secondary outcomes for many individuals (American Psychiatric Association, 2005). Providing individuals with ASD effective communication support is crucial to facilitating (a) communication of their essential needs and wants, (b) living and moving within their preferred environments independently, and (c) establishing and maintaining social relationships with others (Kim et al., 2014).

Fortunately, data suggest that these barriers are amenable to high-quality programming. Focused intervention practices and comprehensive programs consisting of targeted methods have been developed to support a wide range of objectives and positively influence autism-related deficits. (Odom et al. 2010). Extant research (Hume et al., 2021; Koegel et al., 2014; Steinbrenner et al., 2020) detailing 28 evidenced-based practices for ASD treatment (e.g., Pivotal Response Training, Behavioral Intervention, Video Modeling, Social Skills Packages) provide caregivers and practitioners the path forward to positively impact language and communication outcomes for individuals with ASD (Odom et al., 2010).

Evidence-Based Practice Standards

Supporting individuals with ASD requires individualized and effective intervention programs. Educators, practitioners, and caregivers must have knowledge of scientific-based approaches in order to appropriately address the needs of individuals with ASD and minimize gaps between research and practice. Despite the extensive and readily accessible resources for determining best practices in ASD in recent years, many still face challenges in accurately identifying these research-based practices and applying them into natural contexts (Wilkinson, 2016). Further, stakeholders may have difficulty staying abreast of new practices within a rapidly

expanding body of scientific literature on the topic. Thus, practitioners, educators, and caregivers require a reliable source for identifying practices that have been demonstrated to be effective through scientific research (Artman-Meeker et al., 2015).

Research in the area of evidence-based practice provided a starting point for determining what interventions are most likely to be effective in achieving the desired outcomes for an individual with ASD. Evidence-based practice is generally characterized by the following: (a) established scientific evidence, (b) experience and expertise of practitioners or clinicians, and (c) respect for clients' values (Slocum et al., 2014).

Implementing a three-part selection technique guides practitioners in choosing interventions that develop learners' and caregivers' skills. It is important to note that besides the broad definition of evidence-based practice, researchers and organizations also developed guidelines defining *interventions* as evidence-based by drawing on studies conducted using single-subject and group research methods in autism services delivery (Smith et al., 2007).

Researchers and advocacy organizations in the field of ASD have increased their emphasis on recommended programming and evidence-based practices over the last two decades. In 2001, the National Research Council (NRC, 2001) provided a comprehensive description of early childhood interventions yielding positive outcomes for the youngest children with ASD. In the United States, the National Research Council (NRC) is a part of the National Academy of Sciences. Congress has entrusted this private, nonprofit society of distinguished scholars engaged in scientific research with the responsibility of advising the U.S. government on scientific matters. For several years, the National Research Council brought together leading researchers in education, psychology, psychiatry, neurology, speech-language pathology, and assistive technologies to study this topic. This committee reviewed scholarly literature relevant

to theory, research, and practices to construct a method for evaluating the credible empirical evidence concerning the effectiveness of educational approaches for children with ASD, ages 8 and under. What resulted was a published report on early intervention programs and their effects on children with autism spectrum disorders. The report was based on scientific evidence and provided specific suggestions regarding early intervention, diagnoses, classification, inclusion, assistive technology, and advocacy. While several NRC guidelines drew on successful practices in early childhood settings, many of these principles apply to school-aged children.

This report guided Iovannone and colleagues (2003) to describe methods deemed effective for supporting children with ASD using the NRC guidelines for preschool programs. The practices outlined include the following: (a) Individualized services and supports based on the student's individualized education program (IEP); (b) systematic instructional procedures and outcome measures designed to meet predetermined objectives; (c) curricular content that focuses on recreation, leisure, and social engagement skills; (d) the use of functional analysis in evaluating challenging behavior; and (e) involving families in their children's educational success. Incorporating these practices has clear and direct ramifications for intervention change agents. Accordingly, the NRC 2001 advised that state and federal agencies execute a plan to enhance individuals' preparedness for working with persons with ASD. These efforts involve careful coordination and collaboration among key stakeholders. As the final component, Iovannone et al. emphasize enhancing family participation for effective educational practices. Parents are a crucial partner in the development of successful intervention and instruction. Under this approach, families are vital collaborators in determining the most effective programs and services for individuals with ASD.

Since those early recommendations, researchers have evaluated numerous practices to be deemed as evidence-based (e.g., antecedent based interventions, functional communication training, reinforcement). Further, they have established clearinghouses to disseminate evidence-based practice. For example, the National Standards Project sought to (a) provide a summary of the strengths of existing evidence for academic and behavior interventions for individuals with ASD, (b) identify those for whom these measures have been successful, (c) highlight the limitations of autism intervention research, and (d) offer evidence-based practice recommendations for practitioners. Phase 1 of the National Standards Project began in 2005, and the report was published in 2009 (National Autism Center, 2009), followed by Phase 2 in 2011, resulting in the report's publication in 2015 (National Autism Center, 2015). Most recently in 2015, 28 practices were found to be effective for individuals with ASD.

Similarly, the *National Clearinghouse on Autism Evidence and Practice (NCAEP)* develops criteria and generates reports on evidence-based practices for individuals with autism (Steinbrenner et al., 2020). They discuss practices and interventions with clear supporting evidence and proven benefits for children with ASD (Odom et al., 2010; Wong et al., 2013, 2015). NCAEP defines evidence-based practices as those supported by (a) one or more group design studies conducted by at least two researchers or groups of researchers; (b) at least five high-quality single-case studies by a minimum of three researchers; at least 20 participants in each study; (c) A minimum of one high-quality group design study and three high-quality single-case design studies conducted by at least two different researchers. By assessing the quality of individual articles, NCAEP designates practices as either evidence-based or with some evidence. Furthermore, it identifies the ages for which these practices are most impactful.

Notwithstanding differences in methodology, definitions, and guidelines for identifying evidence-based practices for individuals with ASD, decades of research have shown that intensive behavioral interventions can lead to short- and long-term positive outcomes for families and individuals with autism. Nearly two-thirds of the established treatments stem from the behavioral literature, e.g., applied behavior analysis (ABA). Behavioral literature dominates the remaining one-third of established treatment studies.

Baer, Wolf, and Risley (1968) defined ABA as "the process of applying sometimes tentative principles of behavior to the improvement of specific behaviors, and simultaneously evaluating whether or not any changes noted are indeed attributed to the process of application" (p. 91). Essentially, ABA consists of a combination of practical, customizable techniques and interventions that practitioners and caregivers can readily employ to teach new skills and improve targeted behaviors. The application of ABA promotes thoughtful integration of family systems supported by scientific evidence while providing quantifiable progress. Furthermore, ABA affords individualized, systematic, and generalizable interventions that currently have the strongest empirical support (Matson et al., 2010).

Naturalistic Teaching Interventions for Language

One practice built upon the principles of ABA and identified as an evidence-based language acquisition or communication strategy is naturalistic teaching (NT) (Wong et al., 2015). NT requires interventions to take place within the child's natural environment, using materials and activities selected by the child, focuses on general behaviors (as opposed to specific behaviors), and emphasizes the broad application of applied prompting methods, reinforcement contingencies, and natural reinforcement (Cowan & Allen, 2007; Ingersoll, 2010b). The use of these methods is effective in assisting children, adolescents, and adults with

autism to improve their communication, play skills, and social skills. (Biel et al., 2020; Goldstein, 2002; Matson et al., 1996; Schreibman & Anderson, 2001). Researchers have established the efficacy of several NT procedures including modeling, mand-model, time delay, and incidental teaching (Hancock & Kaiser, 1996). Further, they have incorporated these procedures into several naturalistic behavioral packages. Some notable examples of these packages comprise Incidental Teaching (IT; Hart & Risley 1968, 1975; McGeee et al., 1999; McGee & Daly, 2007), Pivotal Response Training (PRT; Koegel et al., 1999; Koegel et al., 1989; Schreibman & Koegel, 2005), the Early Start Denver Model (ESDM; Dawson et al., 2010; Fuller et al., 2020; Rogers et al. 2012), Enhanced Milieu Teaching (EMT; Dunn Davision & Kaiser, 2021; Hancock & Kaiser, 2002; Kaiser & Hester 1994), Reciprocal Imitation Training (RIT; Ingersoll, 2010; Ingersoll & Lalonde, 2010; Ingersoll & Schreibman 2006; Penney & Schwartz, 2019), and Project ImPACT (Ingersoll & Wainer2013a,b; Stadnick et al., 2015). Naturalistic teaching offers several advantages. In naturalistic teaching, a learning outcome in one domain (identifying colors when sorting) can be applied to multiple areas (e.g., using color names to describe desired objects). Thus, instructional time becomes particularly valuable and contributes to the child's independence. In addition, NT has been found to be naturally reinforcing to learners. Caregivers can benefit from practicing these methods with their children, as its tenets are best offered in a setting that is comfortable and engaging for all. NT draws on naturally occurring activities, capturing their reinforcing properties, and using these elements to increase engagement and produce correct and desired responses. This pragmatic approach increases the likelihood of generalization of treatment gains, increasing motivation, and successful outcomes. Finally, NT provides opportunities for caregivers, peers, and other family members to become active partners during instructional activities and treatment. These

naturalistic methods have been shown to benefit and target not just language skills and communication but also the growth of social behavior. Using NT methods facilitates learners with ASD to engage and learn more readily by incorporating trials into their everyday routines and activities. The child's initiative drives NT, and its flexibility encourages participation in the learning process. The naturalistic approach also works when distractions are present, preparing children for the real world. Furthermore, among its many advantages is its family-friendly nature, allowing parents, grandparents, and siblings to participate and employ these practices anywhere (Ingersoll & Schreibman, 2006).

Parent-Mediated Language Interventions

Researchers have shown that parents can be trained to effectively implement NT interventions for their children with ASD (Beaudoin et al., 2014; Brookman-Frazee et al., 2006; Kaminski et al., 2008; Lang et al., 2009; Meadan et al., 2009; Oono et al., 2013; Patterson et al., 2012; Schultz et al., 2011). In fact, parent-mediated interventions have garnered sufficient evidence to be deemed an evidence-based practice for children with ASD as young as 2 and as old as 9 years of age (NCAEP, 2020). Parents may be uniquely suited as indigenous change agents to deliver effective and responsive interventions for their children. As primary caregivers, they are catalysts for sustained behavior change and may provide invaluable, thoughtfully designed, and appropriate cultural adaptations to programs in the home (Conners & Capell, 2020).

Educating and preparing parents to become "co-interventionists" has significant benefits including increased consistency in programming across parents and providers, selecting contextually appropriate practices to facilitate natural social relationships in the home and community, and increased teaching opportunities throughout the day. Parent training may also

decrease parents' reliance on outside agencies for support and may decrease costs in terms of time and resources, enabling the family to provide treatment themselves rather than relying on outside agencies for assistance, saving time and resources for all involved. Further, parent training can assist families in managing their children's challenging behaviors, resulting in reduced parent frustration. Finally, parent-mediated interventions can more efficiently facilitate the retention and generalization of skills acquired during the intervention (Kaiser et al., 2001; Koegel et al. 1996; National Research Council 2001; Pacia et al., 2021; Symon 2005).

The effectiveness of parent-implemented communication interventions is supported by a large body of literature. Recent years have produced five reviews examining the efficacy of parent-mediated interventions in communication (DeVeney et al., 2017; Lang et al., 2009; Meadan et al., 2009; Rakap & Rakap 2014; Roberts & Kaiser 2011). In a recent systematic literature review, DeVeney and colleagues (2017) compared interventions implemented by parents versus those directed by clinicians. Even though both types of interventions were effective, those that parents implemented produced better results in increasing language skills and generalization effects. Similarly, Roberts and Kaiser (2011) completed a meta-analysis of parent-implemented language interventions for children 18 to 60 months of age. The authors systematically reviewed 18 studies that examined 10 different approaches to parent-mediated programs. Results of the meta-analysis indicate a positive impact of parent-implemented interventions on child communication. Interestingly, Kaiser and Roberts reported that comparatively few interventions were carried out in households (i.e., natural environments) suggesting this to be a next logical step. Overall, the available research literature indicates that PMI are an effective approach to improving family and learner outcomes; when implemented in

natural settings, they are a cost-effective, ecologically valid solution in response to the growing demand for autism services for families (Green et al., 2022; World Health Organization, 2016).

Training Parents to Implement Language Interventions: Caregiver Coaching

While research suggests that caregiver-implemented approaches benefit children with ASD, professionals use them infrequently (Hume et al., 2005; Thomas et al., 2007). One study of caregivers of 195 children with ASD revealed that less than 25% had access to parent-implemented interventions (Hume et al., 2005), and another found that less than 20% had received home-based support services (Thomas et al., 2007). Researchers report that caregivers of children with ASD report unmet needs for parent training across the U.S. (Pickard & Ingersoll, 2016). Several factors may contribute to ineffective parent training in community settings, including time constraints and financial limitations, low family participation, and insufficient access to services and support (Stahmer, 2005).

To perform intervention procedures effectively, caregivers require the guidance or coaching of professionals who are proficient in the process. Caregiver coaching is a method of training that is currently emerging within the field of early intervention research. In general, caregiver coaching investigation has concentrated on naturalistic developmental behavioral methods that incorporate caregiver-child interactions as the core of the intervention framework (e.g., Shire et al., 2021; Stahmer & Pellecchia; 2015; Sone et al., 2021). Additionally, caregiver coaching focuses on increasing caregiver responsiveness to children's interactional cues. Various methods can be employed to deliver caregiver coaching, including face-to-face delivery, the use of web-based platforms, or mobile applications (Ellison et al., 2021; Sutherland et al., 2018). As part of most coaching models, the caregiver receives instruction on various intervention

strategies, is provided with multiple opportunities for practicing these strategies, and receives feedback on how well the strategies are being implemented (Rush & Sheldon, 2011).

To bridge the gap between research and practice, professionals need explicit knowledge methods to promote parent-mediated interventions. Tailoring services to meet the diverse needs of families may be particularly challenging due to time limitations, financial means, insurance coverage, and family stressors. Additionally, arranging and coordinating travel may also restrict the access to services for some families, especially those in rural communities. Given these challenges, it is imperative caregivers be able to avail themselves of comprehensive services afforded through autism professionals' critical knowledge of parent training and caregiver coaching models.

Research Purpose

Despite recent developments in evidence-based treatment of ASD, inequalities in service access, lack of customized training, schedule challenges, and stress remain significant barriers for caregivers. Many families report unmet parent training needs across the nation (Pickard & Ingersoll, 2016). Available treatment models are often inaccessible, not personalized, or impractical for families with limited resources or enduring hardship. In this study, I will examine the effects of a naturalistic verbal behavior training package (written instructions, role-play, 5-minute video models, and real-time performance feedback) specifically based on a functional analysis of the learner's language (i.e., Parent-Mediated Referent-Based Instruction (PM-RBI; Mason & Andrews, 2014; 2020) as well as parents' competence in implementing these procedures with fidelity within identified family routines.

Research Questions

1. What are the effects of a naturalistic caregiver training package on the accuracy of a

parent's implementation of Parent-Mediated Referent-Based Instruction (PM-RBI)?

2. Following intervention, do children's verbal behavior repertoires increase, i.e., functional proportionality of requesting, labeling, echoing, replying as indicated by post Stimulus Control Ratio Equation (SCoRE)?
3. What were parents' experiences of learning and participating in the RBI training package? (Seidman's three-part interview process)

Significance of Study

This study contributes to the extant literature on caregiver training in several ways. First, I will expand the application of naturalistic teaching to parents, as they are vital partners, having intimate knowledge of their children and the environment to create successful instruction and achieve positive intervention outcomes (Beaudoin et al., 2014). Young children spend most of their waking hours with their families. These interactions offer critical learning experiences promoting language learning opportunities. This study will facilitate caregivers to be primary interventionists in implementing RBI with their children. Second, I will provide caregiver coaching to families during preferred family routines and activities. Despite strong support for effective evidence-based communication interventions for young children with ASD, family-centered approaches are necessary to foster participation in naturally occurring everyday routines with parents to maximize learning (Roberts & Kaiser, 2011). Throughout this study, I will provide caregiver instruction and support for children's language acquisition by assisting caregivers to identify preferred routines aligned with family goals and priorities using specially designed materials and resources supporting family-focused practices. Third, this study will add to the literature on caregiver coaching practices for families of young learners with ASD by embedding critical capacity-building elements within intervention sessions. Available research

indicates that parent-mediated interventions are often underutilized, and practitioners spend limited time actively coaching caregivers during their treatment sessions (Hume et al., 2005; Sawyer & Campbell, 2017). This study will use a naturalistic caregiver verbal behavior training package with coaching components of (a) joint planning, (b) observations, (c) practice, (d) reflection, and (e) feedback to increase caregiver competence in their application and engagement of RBI. Finally, I will examine social validity of the naturalistic verbal behavior training package, i.e., Parent-Mediated Referent-Based Instruction (PM-RBI), at the conclusion of the study using an adapted version of Irving Seidman's Three-Part Interview Series (2013). The interview offers an "in-depth interview technique," eliciting detailed and authentic accounts of parents' experiences in the intervention program.

Delimitations

The following delimitations should be considered when interpreting the results as well as contributions of this study. First, due to the small number of participants, the generalizability of these findings may be limited. Additionally, using the Stimulus Control Ratio Equation (SCoRE) metric as a direct measure of caregivers' effectiveness in implementing Referent-Based Instruction requires some discretion. These findings cannot be said to be solely attributable to PM-RBI. Future research warrants this investigation. Furthermore, the use of a single-case design, and external validity was also difficult to establish. Moreover, the design of this study poses a significant limitation since it is difficult to make causal conclusions about its impact. Further studies would benefit from examining a broader range of settings, change agents, and targets. Future initiatives will be crucial for exploring the impact of web-based caregiver-mediated language interventions on fidelity of implementation and outcomes of children with ASD.

Definition of Terms

The following list of terms are important to understand within the context of this study:

Applied Behavior Analysis: “the science in which tactics derived from the principles of behavior are applied to improve socially significant behavior and experimentation is used to identify the variables responsible for the improvement in behavior” (Cooper et al., 2020, p. 19)

Autism Spectrum Disorder: “a developmental disability that often causes deficits in social and communication skills, and often causes individuals to have restricted or repetitive behaviors or interests” (Centers for Disease Control and Prevention, 2020)

Echoic: “Repeating what another person says. Either immediate or delayed.” (Barbera & Rasmussen, 2007)

Ecological validity: "The capacity of research findings to be applied in real-world situations. Research on interventions with high ecological validity are as realistic as possible” (Bruinsma et al., 2020)

Errorless Teaching: “A method for reducing or preventing errors. Prompts are given immediately after directions are given or questions are asked, and they fade out over time” (Barbera & Rasmussen, 2007)

Intraverbal: A verbal response to a verbal stimulus with another verbal response. It may include replies, answering questions, or fill-in-the-blank frames. (Barbera & Rasmussen, 2007)

Joint Attention: “The ability to coordinate attention among objects and people” (Bruinsma et al., 2020)

Mand: a request or demand to obtain a specific item, action, or consequence (Barbera & Rasmussen, 2007)

Operant: "Operant behavior reflects the effects of environmental contingencies, meaning its actions are determined by the consequences that follow." (Barbera & Rasmussen, 2007)

Parent-Mediated Referent-Based Intervention: when practitioners teach a learner's caregiver(s) how to implement a verbal behavior intervention program that combines both natural language teaching (NLT) and frequency building to strengthen their child's verbal behavior throughout their daily routines and activities.

Referent-Based Instruction: a verbal behavior intervention program that combines both natural language teaching (NLT) and frequency building to strengthen verbal behavior.

Shaping: "reinforcing successive approximations to the target response" (Bruinsma et al., 2020)

Tact: "verbal behavior of naming, labeling, or describing something present in an environment verbally." (Barbera & Rasmussen, 2007)

Treatment Fidelity: "sometimes called fidelity of implementation or treatment adherence: the degree of accuracy which a procedure or a set of strategies is implemented or used" (Bruinsma et al., 2020)

Verbal Behavior: Using Skinner's (1957) definition, verbal behavior can be characterized as **"**behavior shaped and maintained by mediated consequences" (p. 2).

Verbal Operant Experimental Analysis: "a functional analysis of verbal behavior that is formalized for statistical analysis to identify what controls a speaker's responding and determines to the extent to which the speaker's repertoire is balanced." (Mason & Andrews, 2021).

CHAPTER 2: REVIEW OF LITERATURE

This chapter includes a review of literature relevant to communication interventions and autism spectrum disorder (ASD). Figure 1 depicts the logic model, which serves as a foundation for this study. The following literature review comprises three sections. The first section includes an overview of communication interventions for ASD, including evidence-based naturalistic teaching procedures and packages. The second section includes an overview of Parent Mediated Interventions (PMI) and family-focused practices incorporated in notable programs. The final section presents the historical implications, benefits and emergence of caregiver-coaching in early childhood and its efficacy within PMI.

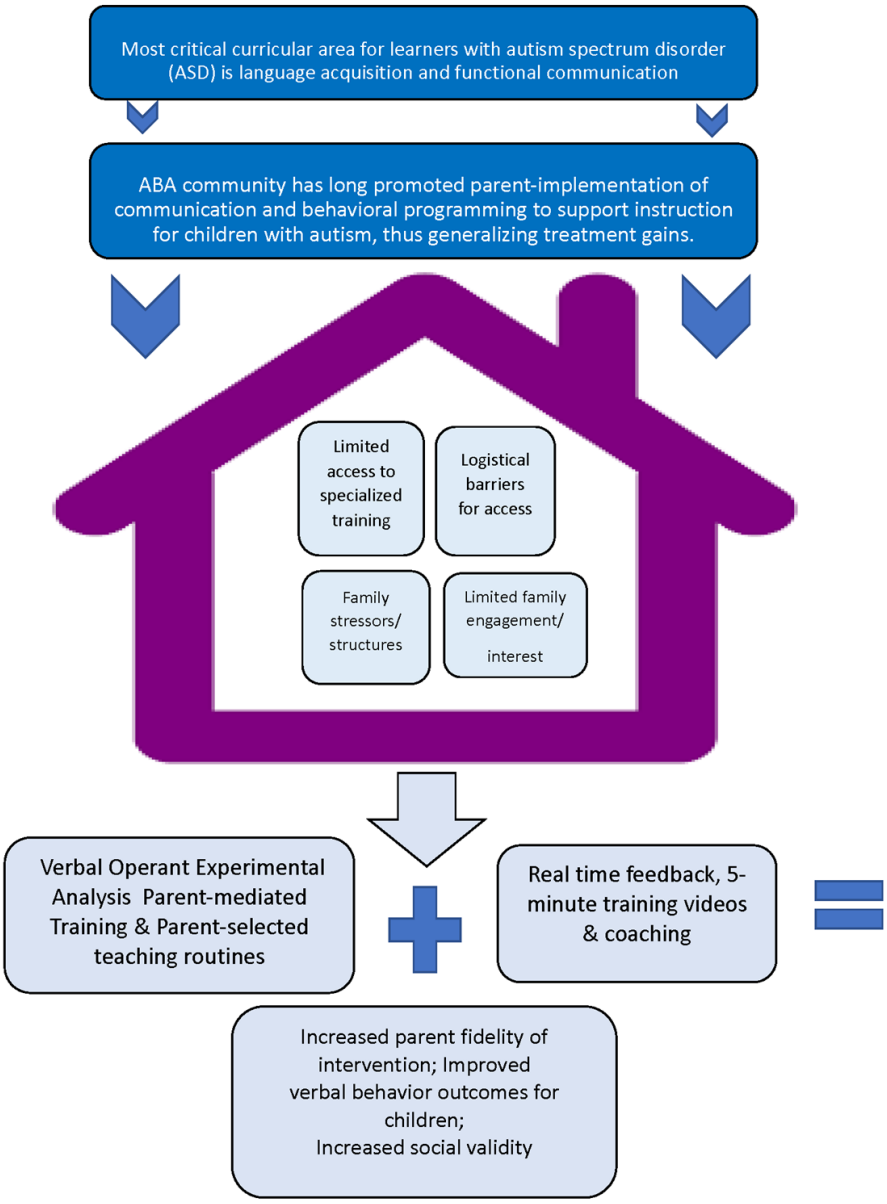


Figure 1

Logic Model

Communication Interventions and Autism Spectrum Disorder

Communication is one of the most critical repertoires children develop during their early years. Most children, rapidly and with seemingly little effort, develop essential communication skills through observing and interacting with those in their surroundings. Researchers have established developmental milestones for use in identifying children that may need additional intervention and support (Landa, 2007). These milestones have been commonly used to identify the need for evaluation and services for children with ASD. These children often present with differences in social communication development (American Psychology Association 2013; Cohen et al., 1987), including increased challenges in social and emotional reciprocity, difficulty with nonverbal communication, an impacted ability to respond to social stimuli, imitate behavior, and recognize mental states in themselves and others (Clark et al., 2008; Zwaigenbaum et al., 2005). These differences vary greatly across children with ASD. For example, some children present with no delay in speech while approximately 25-30% of children with ASD do not develop flexible and functional speech repertoires. (Bottema-Beutel, 2020; Hinzen et al., 2020). Due to these differences, children with ASD are at risk for academic failure, behavioral challenges, and social difficulties (Bauminger and Kasari, 2000; Bradhshaw et al., 2017; Charman & Stone, 2006; Koegel et al., 1992; Mundy et al.,1986; Sandbank et al., 2020).

Fortunately, these social communication challenges are amenable to intervention, and a broad range of focused practices and comprehensive program models have been identified over the past four decades (Chakrabarti, 2017). In 2001, As jointly administered by the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine, the National Research Council (NRC) was established to coordinate and bring together the scientific and technological communities. At the behest of the Office of Special Education Programs of the

U.S. Department of Education, the NRC formed the Committee on Educational Interventions for Children with Autism with the objective of integrating scientific, theoretical, and policy literature creating a framework for evaluating the effectiveness of educational interventions for young children with ASD. This project primarily examined educational programs for children with ASD between birth and eight years of age. The committee conducted comprehensive assessments of these interventions, publishing a report of the research base. Although carried out in the United States, their results provide valuable insight into early intervention programs that may be helpful to professionals worldwide when designing, selecting, and evaluating these approaches.

A strong consensus exists among researchers regarding what a program for young children with ASD should entail. The committee identified goals, prioritized intervention areas, and developed basic recommendations to provide educators with a framework for developing educational programs for children with ASD. The NRC recommended that the goal of education for children with ASD should be the same as those for typically developing children: personal independence and social responsibility. In order to achieve personal independence and social responsibility, they emphasized the importance of facilitating learner progress in social, cognitive, verbal, nonverbal, and adaptive abilities; behavioral regulation; and the ability to generalize skills across diverse environments. Moreover, according to the NRC, interventions should be aimed at six specific priority areas of need for students with ASD, including functional spontaneous communication, social skills, play skills, cognitive development, proactive approaches to behavior problems, and academic skills.

Since the NRC report, researchers, in response to the rising prevalence of ASD, have focused on establishing evidence-based practice in the field of ASD. Numerous professions have

emphasized the value and support for evidence-based practice (EBP), such as the American Psychological Association in 2005, the American Speech-Language and Hearing Association and the Institute of Medicine in 2001, and the National Association of Social Workers in 2003. An evidence-based approach is essential to treatment success and leads to optimal results(Hume et al., 2021; Kryszak & Mulick, 2022; Leaf et al., 2022).

Recently, researchers have identified several evidence-based practices for improving outcomes for children with ASD. For example, Wong and colleagues (2015) conducted a systematic review of ASD intervention literature between 1990 and 2011 to identify EBPs. As an EBP, an intervention must be supported by at least two high-quality experiments or quasi-experiments with a group design, a minimum of five high-quality studies conducted on a single subject, or by combining at least one high-quality experimental or quasi-experimental group design study with three high-quality single-subject design studies. It was determined that 28 strategies had sufficient evidence to qualify as evidence-based practices, and 24 of the 28 intervention strategies were found to enhance social communication outcomes for children with ASD.

Recently in 2020, the National Clearinghouse on Autism Evidence and Practice (NCAEP) conducted extensive literature reviews to identify focused intervention strategies addressing specific skills or objectives for individuals with ASD. They identified 28 evidence-based strategies for ASD, e.g., pivotal response training, behavioral interventions, video modeling, and social skills packages that provide caregivers and practitioners the means to improve communication outcomes (Hume et al., 2021; Koegel et al., 2014; Steinbrenner et al., 2020).

Among EBPs demonstrated to improve communication skills in all age groups are antecedent-based interventions, reinforcement, visual supports, prompting, modeling, and video modeling. A number of these practices are proven effective for toddlers (0–2 years old), preschoolers (3–5 years old), elementary school students (6–11 years old), middle school students (12–14 years old), and high school students (15–18 years old). Notably, fewer social communication programs for toddlers generate substantial evidence comparable to EBPs for school-age learners. These results are as expected, given that the average age of diagnosis for ASD is four years of age, although it is possible to make a reliable, valid, and stable diagnosis as early as two years of age (Brian et al., 2019). Nevertheless, preschoolers have twenty EPBs for improving their social communication skills, e.g., play and joint attention skills and social-emotional reciprocity.

These behavior-analytic EBPs are characterized by systematic procedures teaching socially significant skills that improve self-care, communication, academics, behavior, and leisure skills (Allen & Wallace, 2012; Wolf, 1978). EBPs used routinely and systematically include reinforcement, extinction and prompting, assessment techniques informing intervention (e.g., functional behavior assessment, preference assessments), as well as combinations of behavioral practices, (i.e., functional communication, pivotal response training). Despite their effectiveness, some practices have failed to generate responses that generalize to natural environments, resulting in (a) challenging behavior, (b) lack of spontaneity, and (c) prompt dependence (Schreibman et al., 2015). Considering these limitations, advances in learning theory and developmental science have extended early intervention methodologies for learners with ASD resulting in comprehensive programming that includes both developmental and ABA principles. As a result, Naturalistic Language Teaching (NLT) emerged, incorporating behavioral

principles and adhering to guidelines for implementing interventions (Matson et al., 1996; Mundy & Crowson, 1997).

Language Interventions: Past to Present

Early research demonstrated that reinforcement and punishment were effective interventions for children with ASD, with little or no functional speech. Researchers applied these procedures to eliminate non-functional speech and encourage functional verbal behavior. Verbal behavior could be operantly conditioned, i.e., strengthened through exposure to carefully planned contingencies of reinforcement. Assuming that children learn to speak by listening to and repeating the speech of others, these methods relied upon verbal imitation, shaping verbal responses by reinforcing closer and closer approximations to the speech modeled by adults (Fay & Schuler, 1980). This approach, discrete trial training (DTT), establishes conditions allowing maximum stimulus control, eliminating distractions from the environment. DTT presents a discriminating stimulus, such as a question or a directive, e.g., "What is it?" "Say "car," or "Touch your mouth. When the learner responds correctly, he or she is immediately provided with tangible or generalized reinforcers. Incorrect responses were punished by loud "no's," withdrawal of attention, or other unpleasant stimuli (Lovaas, 1987).

These early attempts to teach language were generally conducted in isolated clinical settings and related social behaviors were taught separately. Additionally, learners' attempts to communicate through nonvocal and disruptive means were punished before language instruction began. This method led to substantial progress for many students; however, due to its highly controlled delivery, many students' verbal behavior was subject to very restricted environmental control, resulting in a lack of spontaneity (Lovaas, 1977).

Subsequently, researchers emphasized teaching communicative skills outside highly controlled settings. Procedures designed for implementation in natural settings include incidental teaching (Hart & Risley, 1975), mand-modeling (Warren, et al., 1984), naturalistic time delay (Collins, 2021), milieu teaching (Hart & Rogers-Warren, 1978), and pivotal response training (Koegel et al., 2006). These early NLT approaches are distinguished for being child-led, using materials and activities that the child selects, targeting general behavior rather than specific behavior, and employing loosely applied prompts and natural reinforcement contingencies (Cowan & Allen, 2007; Ingersoll, 2010b).

The use of NLT approaches has increasingly been regarded as the treatment of choice for learners with ASD (Noonan & McCormick, 1993). The National Research Council (2001), National Autism Center (2009), and National Professional Development Center on Autism Spectrum Disorders (2011) have assigned these approaches an "established" level of evidence for efficacy. Substantive evidence supports using these procedures to teach children, adolescents, and adults with ASD language, play, leisure, and social skills (Lindgren & Doobay, 2011; Matson et al., 1996; Steinbrenner et al., 2020). Researchers have investigated successful ABA-derived NLT practices in the home, school, and community (e.g., games, meals) (Gevarter et al., 2022; Dubin & Lieberman-Betz, 2020). Over the years, significant research has concluded that NLT facilitates improvements across domains, including communication (Brian, et al., 2017; Dawson et al., 2010; Lawton & Kasari, 2012; Shire et al., 2017), language (Dawson et al., 2010), adaptive behavior (Dawson et al., 2010; Estes et al., 2015; Ingersoll et al., 2017; Wetherby & Woods, 2006), and play skills (Chang et al., 2016; Shire et al., 2017) for children with ASD.

Research in the area of NLT has expanded greatly over the last several decades. For example, Snyder and colleagues (2015) conducted a systematic and identified 43 studies of NLT

for young learners with developmental disabilities addressing a wide range of child skills within the pre-academic, motor, communicative, cognitive, social, and adaptive behavior domains, finding that 207 of the 211 participants achieved positive outcomes. Moreover, research on the effectiveness of NLT interventions indicates that child communication skills can improve within six to thirty weeks. The results regarding generalization and maintenance of child behaviors were encouraging. An estimated 92% of the children participating in these interventions demonstrated some degree of generalization; 94% demonstrated maintenance. Fewer than 50% of these published studies reported generalization and maintenance measures. Therefore, caution should be taken when interpreting these results (Snyder et al., 2015).

Tiede and Walton (2019) similarly conducted a meta-analysis of over 27 studies examining the effects of NLT methods and the extent to which they vary by intervention features and study quality. Findings indicated positive and significant improvements in language, cognition, play, and social communication resulting in mitigated autism characteristics. Developing communicative and interactional skills, as well as cognitive abilities, is contingent upon initially establishing a reciprocal connection (Schreibman et al., 2015). In most of the NLT interventions reviewed, engagement, joint attention, and play were specified as proximal intervention objectives. Other positive outcomes are predicated upon establishing shared attention within the NLT model. Tiede and Walton (2019) reported that social engagement with a known social partner is likely the most specifically directed and immediate treatment result, especially in parent- and educator-training studies. It is not then unexpected that social engagement measures produced the most significant and consistent impact. This review primarily consisted of studies that included community-based features, such as stakeholder-mediated models operating in homes and schools, providing greater feasibility and opportunities

for developing home and professional partnerships and increasing opportunities for generalization.

In a most recent systematic review, Dubin and Lieberman-Betz (2020) identified 11 single-case designs and 14 group-design evaluations of NLT interventions targeting social and pre-linguistic communication repertoires in young learners with ASD. This research indicated that caregivers, school-based personnel, and university students could conduct NLT interventions within their respective settings. Researchers identified seven features that were shared across the majority of studies reviewed: (a) following the child's lead, (b) prompting, (c) natural consequences, such as providing a child with the desired object immediately upon request, (d) instruction integrated within routines, (e) environmental arrangement, (f) time delay, and (g) linguistic mapping. These findings further establish a standard set of core NLT features targeting the early development of communicative behaviors, suggesting that NLT interventions can be used to teach joint referencing and related pre-linguistic social communication skills to young learners with ASD. Additional parallels across programs with favorable results were related to the frequency and duration of interventions, with most studies concluding the more and longer, the better. Significantly, in more than half of the eight group design studies, pre-linguistic communication skills were found to generalize and maintain; three SCD studies established functional relations.

Naturalistic Teaching (NT) Procedures and Packages

Incidental Teaching. One of the earliest forms of NT practices is incidental teaching (IT), introduced in 1960 to enhance the communication abilities of disadvantaged preschoolers (Hart & Risley, 1968). Hart and Risley (1968) defined IT as designing the learner's surroundings in such a way as to make toys and activities accessible, with adult guidance and support. Once

these teaching stimuli are in place, learners' interest in these items will signal the start of teaching trials. In this approach, a teacher or caregiver uses naturally occurring teaching situations to provide the child with language-learning opportunities; following the learner's lead when selecting an activity, thus enhancing the reinforcing value of the teaching situation (Hart & Risley, 1975). IT strategies are designed to maximize reinforcement and facilitate generalization. Implementing incidental teaching involves the following steps: (a) waiting for the child to request assistance, permission, and attention, (b) immediately responding to the child's request, (c) signaling a lack of understanding of what the child wants, (d) encouraging elaboration, (e) prompting and modeling the elaborated response, and (f) confirming the request while granting access to the chosen item.

Hart and Risley (1968) conducted one of the earliest studies of the efficacy of IT. They first taught several young children to emit adjective-noun combinations (e.g., red truck) in a structured group setting. Despite the acquisition of the targets, the children did not generalize their new skills to free-play settings. To promote the spontaneous use of adjective-noun combinations in free-play settings, classroom materials such as paints were made conditional upon the appropriate use of these combinations in natural settings. This study demonstrated that formal language teaching in a structured setting has little impact on learners' spontaneous language, whereas teaching in natural contexts using the natural opportunities offered by the preschool environment produces significant and enduring vocabulary changes. In a subsequent study, Hart and Risley (1974) used IT to increase children's use of complex phrases during unstructured play, gradually requiring them to make increasingly sophisticated responses. Learners were first expected to merely name objects, then to add a descriptive phrase, and finally to name the object and describe its use. Participants improved noun usage, adjective-noun

pairings, and complex phrases. Similarly, Hart and Risley (1975) examined the effect of IT on preschoolers' generalized use of compound sentences directed toward teachers and peers. Results indicated increased use of complex phrases in the classroom. Across all three studies, Hart and Risley reported marked improvement in preschool participants' speech (Hart & Risley, 1968, 1974, 1975).

Similarly, McGee and colleagues (1999) examined the effectiveness of IT methods within the *Walden Toddler Program*. The program served 28 toddlers with ASD and provided 4-hour therapy sessions five days per week, as their caregivers received home-based support services from therapists. Among the participants, 38% were from marginalized communities, 31% qualified for economic need-based scholarships. Within a traditional daycare curriculum, the program was designed to facilitate adults' ability to expand learners' requests for items, activities, and inquiry. Through the use of engaging toys and learning opportunities for toddlers, the program demonstrated the most impressive language gains using naturalistic environments, speech-shaping procedures, and incidental instruction. Upon completion of the program, 82% of children were verbal (mean age = 3 years six months), and 71% showed increased tolerance of peer proximity. However, despite the promising results, the absence of a control group prevents differentiating treatment effects from maturation and other confounding variables or determining whether this sample of children with ASD is representative of the general population.

Rittenhouse and Cho (2019) used a multiple baseline design across participants to evaluate the effects of a training package on implementing IT procedures by four teachers, targeting the initiation of interactions of six students with ASD. Procedures consisted of (a) setting up the classroom environment with preferred items, (b) waiting for the student to initiate a request, (c) blocking or denying access to the requested items, (d) delivering a suitable prompt

for the elaboration of a request, (e) re-prompting when necessary, (f) confirming the request for the item, (g) and honoring the request (Hart & Risley, 1982). The training aimed to improve teaching effectiveness in academic, self-help, and social-related skills, maximizing student outcomes. As with previous studies (Casey & McWilliam, 2008; Fetherston & Sturmey, 2014; Ryan et al., 2008), Rittenhouse and Cho found that instructors, when offered the opportunity to receive feedback in natural environments, acquired specific teaching protocols quickly and effectively. The training package resulted in increased implementation fidelity and student initiations, and generalized results. Moreover, prior research demonstrated the benefits of IT for learners of various ages and mixed settings (e.g., Charlop-Christy & Carpenter, 2000; Kroeger & Nelson, 2006; McGee et al., 1999).

Modified Incidental Teaching (MITS). However, one potential drawback of IT is that since a training episode involves a single trial presentation, it may be insufficient for some learners to acquire targeted skills (Charlop-Christy & Carpenter, 2000). Because of this drawback, Charlop-Christy and Carpenter (2000) created Modified Incidental Teaching Sessions (MITS). In MITS, aspects of IT and DTT are merged, and basic DTT procedures are used to teach specific skills within the context of naturally occurring and motivating conditions. Researchers optimized the effectiveness of the conventional IT procedures during MITS. Specifically, the frequency of training trials increased from once to twice per day. Additionally, two practice trials were included for these two trial trials. This increased the total number of trials per day to six.

Charlop-Christy and Carpenter (2000) compared the effects of MITS, DTT, and the conventional IT procedures implemented by caregivers in their homes with three culturally diverse learners with ASD. Changes in participants' verbal responses were evaluated using

combined alternative treatments and a multiple baseline across participants' design. Findings indicated that caregivers were successful in their implementation of strategies and made relatively few errors. Also, MITS resulted in superior acquisition and generalization compared to DTT and IT methods. Researchers noted that the more robust acquisition of MITS might be because this strategy was designed to integrate critical aspects of IT and DTT to facilitate language gains. Furthermore, MITS combined numerous elements to facilitate generalization; caregivers trained loosely and provided multiple exemplars. Findings from this study provide evidence supporting the continued use of IT and its variations to maximize its effectiveness.

Mand-Model. Another successful method is the mand-model approach (e.g., Warren et al., 1984) which involves the instructor modeling *manding o*r requesting a learner's response. This approach has been described in detail by a number of authors (Akemoglu et al., 2021; Halle, 1982; Halle, et al., 1984). Mand-modeling incorporates a question, choice, or request (mand) prior to the teacher modeling a response. Teachers implement mand-modeling through establishing shared attention, presenting a verbal direction such as a request (mand) or question, expanding the response, and providing the requested item when the learner responds appropriately. For example, the teacher and learner may implement mand-modeling during afternoon snack time when a variety of food items are available. The teacher asks the learner "What would you like to eat? Or provides a choice, "Do you want oranges or cookies?" When the learner provides the target response (e.g., "cookies"), the teacher provides the snack and expands the request "I want cookies, please!" If the learner does not respond and simply points, the teacher prompts, "Say, want cookies." When the learner repeats "Want cookies," the teacher provides the cookies and expands, "I want cookies, please". The environment is arranged in such

a way as to promote communication based on the child's wants and needs (Charlop-Christy, et al.,1999).

In a seminal study examining the effects of the mand-model approach on learners' verbal behavior during free play, Rogers-Warren and Warren (1980) used a multiple-baseline design across three preschoolers with moderate to severe language delays. During free play, classroom teachers provided learners with a choice of items (e.g., manipulatives, blocks, and dolls). As the child approached the materials, the teacher requested that the child mand for the item. If the child responded appropriately, the teacher delivered praise. If the child did not respond or provided a one-word utterance, the teacher would elaborate and model the response for imitation. Teachers arranged the environment to create multiple mand opportunities. First, by approaching the learner, next by delivering a mand (i.e., asking a question), and finally by presenting a model to evoke the desired response. All three participants produced generalized responses across a variety of contexts and significant increases in total vocalizations as well as untrained words and phrases. Furthermore, learners maintained these gains post-follow-up data at seven months.

Mobayed and colleagues (2000) used a multiple-probe design to evaluate the effectiveness of parent-implemented mand-model procedures. The researchers taught four mothers to conduct mand-model procedures in their home with their toddlers during naturally occurring routines, increasing expressive language skills. Following training, researchers provided parents with performance feedback as they worked with their children. As a result of the intervention, children were able to produce targeted verbal responses across a variety of contexts, demonstrating that the mand-model procedure yielded progressively elaborated responses in learners as young as 2 years old.

Naturalistic Time Delay. Naturalistic time delay is an adult-initiated procedure using select situations when the learner requires assistance, then postponing that assistance for 5 to 15 s while maintaining eye contact with the learner. This procedure is used when learners demonstrate a behavior but may not do so with fluency or require practice in producing responses in generalized contexts. Typically, the teacher blocks the child's access to a preferred object or activity and waits a predetermined response interval for the child to respond. If the child responds correctly within the interval, the teacher delivers praise. If the child does not respond or emits an error, the teacher delivers a prompt. For example, a teacher and learner are playing with a wind-up toy car; then the teacher pulls the toy car back and pauses. Waiting 3-5 seconds for the learner to respond, the teacher holds the toy car back, giving an expectant look to the learner. If the learner says, "Let go!" the teacher can say, "Let it go really fast!" as he lets go of the wind-up car. If the learner does not respond, the teacher can provide a mand, "e.g., What do I do?" or give a model, "Say, Let go!" If the learner replies, "Let go!" the teacher will expand the response and release the wind-up car. If the learner still does not provide the target response or imitate the model provided, the teacher will repeat the target response, "Let go!" and release the wind-up car (Collins, 2021).

Liber and colleagues (2008) employed a multiple-baseline across-subjects design to evaluate the effectiveness of a naturalistic time delay procedure to teach learners with ASD to ask a peer to play and engage in multiple play sequences. Instructional methods from Wall and Gask (1997) were replicated during the intervention. The researchers began every session by cueing a request to start the play sequence. Next, they used a graduated 2-second time delay throughout instruction and generalization sessions. According to the results of this study, a graduated naturalistic time delay procedure was an effective method for all three boys with ASD

to request peer assistance during a social play activity. Following the implementation of the naturalistic time delay procedure and fading, all three participants independently initiated the steps of the play sequence. Additionally, two participants applied the skills taught in different settings and with larger groups of peers during generalization probes.

Naturalistic time delay can be used effectively with learners and youth with ASD and intellectual and developmental disabilities (IDD), regardless of their level of expression and cognitive abilities. Johnson and Parker (2013) employed an alternating treatments design to compare the effects of different wait times while teaching three young learners with IDD to communicate more effectively and complete various tasks, i.e., pointing to the correct picture (for instance, "find mommy"), selecting music, and writing on an iPad. In one condition, prompting occurred between 0 and 1 s after the request was made. During another condition, the adult waited between 5 and 15 seconds before prompting. There was a two-fold increase in response rates during intervention phases compared to baseline sessions for all three participants. Study results indicate that learners experiencing communication challenges benefited from systematically providing wait time procedures, increasing opportunities for learning and social interactions, and improving language acquisition.

Milieu Teaching. Incidental teaching, the mand-model procedure, and naturalistic time-delay procedures have been integrated with other strategies for the development of comprehensive stepwise training packages facilitating learners' language in natural environments (Alpert & Kaiser, 1992; Hart & Rogers-Warren, 1978). Hart and Rogers-Warren termed this method "milieu teaching." The word *milieu*, is French for environment or setting, emphasizing instruction relevant to the natural environment. Kaiser (1993) defines milieu teaching (MT) as "a naturalistic, conversation-based teaching procedure in which the child's interest in the

environment is used as a basis for eliciting elaborated child communicative responses" (p. 77). Recently, Walker and colleagues (2019) conducted a systematic review of language interventions in early childhood and educational settings, identifying milieu teaching as an effective treatment method for young learners with and without disabilities, laying the groundwork for many intervention practices.

Enhanced Milieu Teaching. (EMT). Over the last two decades, MT has evolved to include environmental arrangement and responsive interaction elements. This extended package is called enhanced milieu teaching (EMT; Kaiser, 2003). EMT was proposed by Hemmeter and Kaiser (1994) as a more comprehensive method for language interventions. Like other naturalistic teaching packages, EMT uses the learners' interests and initiations throughout daily social interactions to model and promote language and communication. EMT takes place in the natural environment, leveraging six essential strategies (a) environmental arrangement, (b) responsiveness, (c) modeling target language, (d) eliciting communication, (e) increasing communication, and (f) encouraging communication (Kaiser & Hampton, 2016).

As a component of EMT, *environmental arrangement* increases learners' engagement within the physical environment. This provides teachers with increased opportunities to communicate frequently with the learner, encourage learners' communicative responses, model appropriate communication methods, and respond to learners' verbal and nonverbal communication requests as they occur. Teachers carefully choose items and materials particularly interesting to the learner, increasing communication opportunities. Teachers are instructed to arrange materials so as to evoke communication and encourage active participation. For instance, teachers may use toys with multiple parts, such as Legos or Mr./Ms. Potato Head, to promote requesting these items. Teachers can provide turn-taking opportunities when they and

the learner have these items. For example, when both have Potato Head toys, they may take turns assembling: "He wants the red hat", or "She wants the pink lips."

Responsive interactions are the second critical element introduced in EMT, which involves responding to learners' communication and facilitating turn-taking to build a conversation. The teacher responds to learners' every gesture, vocalization, and speech. When learners fail to respond during play, the teacher *mirrors* play actions and *maps* language. For example, if the learner is rocking a doll, the teacher will *mirror* by rocking a doll and *maps* language saying, "We put baby to sleep." In this way, mirroring allows the adult to participate in the activity alongside the learner. At the same time, mapping describes the activity to the learner and provides an opportunity for reciprocal conversation. Many children with ASD and those from at-risk and low-resource households can improve early language development when taught through these methods (Kaiser & Hampton, 2016; Kaiser & Roberts, 2013). EMT has effectively strengthened spontaneous language in learners with ASD, even those with limited vocal verbal behavior (Hampton et al., 2021; Kasari et al., 2014; Quinn et al., 2021).

Hancock and Kaiser (2002) used a modified single-subject study design to investigate the effects of EMT on preschool children's social communication skills when delivered by 24 trained interventionists in university-based clinical sessions. Four children with ASD between 2.5-5 years of age and their mothers participated in the study. Researchers assessed (a) trainer's use of the intervention strategies, (b) children's social communication during observations, (c) developmental measures of child language, and (d) parent satisfaction with the intervention program. During the intervention, parents brought their children to the clinic twice-weekly for interventionists to play with their children. Once each month, for a six-month follow-up period, for sessions identical to the baseline sessions, parents returned to assess the child's maintenance

of social communication skills. Probes to evaluate the generalization effects of the children's language gains were videotaped. These sessions were conducted in the families' living room, children's rooms, or a room of the parents' choosing, using preferred toys and materials. All children displayed positive increases in specific language skill use at the end of the 24 intervention sessions, and gains were maintained through the six-month follow-up observations. Generalization to the home setting was observed for three of the four children; however, the most significant changes noted immediately after the intervention as compared to the 6-month follow-up. These findings offer further support for the effectiveness of NLT interventions based on the EMT model.

Similarly, Webb and Robbins (2012) used a multiple-baseline design across participants to examine the effects of a training package on teacher-delivered naturalistic interventions to increase the expressive communication of three preschool-aged boys with ASD in an inclusive preschool program. During this study, seven early childhood teachers obtained training and support applying EMT strategies. The training package consisted of three components: an intervention strategy manual, ongoing meetings with the researchers, and performance feedback. The baseline phase consisted of observing typical teacher-student interactions within the daily routine of the school day without the benefit of specific instructions. The researchers scheduled meetings with the teachers to discuss the intervention in dyads or triads. The purpose of these meetings was to ensure implementation fidelity; an agenda in the form of a checklist included discussions of specific child-led strategies and their applications during typically occurring school activities. Discussions included structuring the environment to meet student interests and strategies to follow their lead during snack time. Due to the training, all teachers increased their use of these strategies, and all student participants demonstrated increased expressive language.

This study revealed the relationship between child-directed strategies and responsive interactions, emphasizing the significance of adult-mediated, communication-rich teaching environments.

Pivotal Response Treatment. Pivotal Response Treatment (PRT) is a successful and comprehensive naturalistic intervention approach based on ABA. PRT differs from other NLT approaches in its focus on pivotal behaviors, which once taught generates new behavior (Koegel et al., 2006). PRT addresses issues related to motivation, responsivity to multiple cues, self-management, and social initiations. Specific components include providing multiple clear cues, allowing learners to make choices, facilitating turn-taking, integrating maintenance tasks with acquisition tasks, and reinforcing learners' verbal responses (Koegel, Koegel, & McNerney, 2001). Studies support the effectiveness of PRT in teaching social skills, including joint attention (Whalen & Schreibman, 2003), dramatic play (Thorp et al., 1995), peer interactions (Boudreau et al., 2021; Odom, 2019) and academic skills (Koegel et al., 2010). In addition, PRT has been shown to improve a range of outcomes for learners with ASD, including speech imitation (Laski, et al., 1988; Rezaei et al., 2018), labeling (Suhrheinrich et al., 2007), asking questions (Bozkus-Genc & Yucesoy-Ozkan, 2021; Verschuu et al., 2017), spontaneous speech (Forbes et al., 2020; Laski et al., 1988), and conversational communication (Laski et al., 1988; McCollow et al., 2019).

As the primary intervention agents in school environments, classroom teachers are responsible for addressing the individualized needs of learners with ASD. Consequently, it is crucial to evaluate the efficacy of teacher-mediated interventions. Stahmer et al. (2016) used a multiple baseline design across training groups to evaluate 20 teachers trained in Classroom Pivotal Response Teaching (CPRT). Researchers conducted brief training sessions and follow-up

meetings. During baseline, researchers recorded videos of teachers implementing PRT during selected classroom activities twice a week. Soon after baseline was established, the researchers implemented group and individualized coaching sessions and adapted materials for implementation. The group and individual coaching sessions were scheduled to accommodate teachers. During 30-45 min visits, the research team observed activities, coded for fidelity, modeled strategies, and provided feedback as to what teachers did well, offering suggestions for improvement, and answering their questions. A final classroom observation was conducted two months after the last session. Learner active engagement averaged 37% at baseline, 50% across all treatment sessions, and 54% during the last two sessions. Overall, results indicated that CPRT was moderately to highly effective for increasing active student engagement and reducing disruptive behavior for learners with ASD.

PRT efficacy has been extensively examined by researchers in systematic reviews and meta-analyses. For example, Bozkus-Genc and Yucesoy-Ozkan (2013) evaluated 34 single-case studies conducted across multiple environments including clinics, homes, school and community settings over 25 years to evaluate PRT effectiveness and identify potential moderators of treatment. They found that at least 70% of studies were rated as fairly effective across dependent variables, regardless of the method used to estimate effect size. Although noting positive results, they also reported several methodological limitations involving a lack of treatment integrity, maintenance and generalization. Moreover, social validity data was only provided for 25% of studies. Despite such limitations, PRT has been found to increase learners' language repertoires and peer interactions.

In a more recent meta-analysis of PRT, Ona and colleagues (2019) examined social interaction, language acquisition, and restrictive, repetitive behavior (RRB) outcomes of 7 RCT

studies published before 2017. They synthesized study results related to expressive language outcomes and found that PRT had statistically significant advantages over the control condition, though not necessarily for adaptive communication. PRT showed statistically significant advantages over control for RRB and social interaction. A total of five RCTs were included in this review, all of which demonstrated statistical significance. While these findings are mixed, researchers noted that they do not necessarily imply that PRT is ineffective, but rather suggest that more high-quality studies are required.

Referent-Based Instruction

Although intensive communication and behavioral programs have been proven effective in developing and supporting language repertoires in children with ASD, some learners' inability to converse fluently could be due to stimulus overselectivity (Brown & Bebko, 2012; Mason & Andrews, 2014; Reed et al., 2013); their verbal behavior has been adequately conditioned under some, but not all, relevant properties of the environment.

Verbal behavior is behavior mediated by another person's behavior, or interactions with others. Based on BF Skinner's seminal work *Verbal Behavior* (1957), his analysis focuses on the function of language rather than the form. An operant is behavior that *operates* on the environment to produce a change or a consequence. Within a functional analysis of language, the response "truck" may function as a label (tact), a request (mand), an intraverbal, or repeating what has been said by another individual (echoic). The word truck can be taught as a mand, tact, intraverbal and echoic so the learner may successfully use the word for a full range of purposes (Skinner, 1957).

Skinner (1957) classified language according to stimulus control. Mason and Andrews (2014; 2020) propose a behavior-analytic approach to developing a learner's functional language

through the conditioning of converging and individual independent verbal operant responses. This model generates functional verbal repertoires using items and/or activities the learner engages with, i.e., the *referent*, thus capturing the motivation to produce the four elementary verbal operants: mand, tacts, echoics and intraverbals. In this way, Referent-based Instruction (RBI) is proposed as a model for teaching all four verbal operants over specific targets.

To illustrate the effectiveness of RBI, pre and post-measures of verbal behavior were examined in 13 children with ASD (Mason & Andrews, 2014). Children received RBI at a university-based center for 13 weeks, three days each week for 90 minutes a day, in which toys and activities were provided. Graduate students provided instruction in a 2:1 technician-to-student ratio, emphasizing strengthening the four primary verbal operants. The Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP; Sundberg, 2008) was used as a pre- and post-measure of each learner's verbal behavior. Each learner's pre-test scores were determined through direct assessment. The post-test scores were collected both from student records and from direct assessments. These early results suggest that RBI contributes to balanced verbal repertoires.

In a subsequent study, Mason and Andrews (2020) further confirmed and extended the efficacy of RBI with 49 learners; however, the results of a pre-/-post verbal operant experimental (VOX) were used to demonstrate improved language. A study comparing the criterion-based VB-MAPP to an experimental evaluation of verbal behavior determined the utility of the experimental analysis, particularly in assessing the interdependency of the verbal operants (Mason et al., 2018). A total of 49 learners with ASD and related language disorders between the ages of 2 years and 6 years participated in the RBI intervention over 13 weeks, four days a week, for 90-min each day. Instruction was similarly provided by graduate students in a 2:1 technician-

to-student ratio and concentrated on strengthening the primary verbal operants within learner led activities. After 13 weeks of RBI intervention, all four verbal operants increased, as did the verbal repertoire proportionality for participants.

Summary

Learners with ASD present with difficulties in forming effective communication repertoires. It is estimated that up to 30% of children with ASD lack flexible and consistent speech patterns (Schwartz et al., 2020). Pervasive social impairments are core features of ASD, restricting social interactions, learning opportunities, behavior management, and post-secondary outcomes (American Psychiatric Association, 2000). Effective communication is vital for supporting individuals with ASD to (a) communicate their needs, (b) live and move freely in their chosen environments, and (c) create and sustain social connections (Kim et al., 2014).

Fortunately, applications of focused behavior analytic interventions and comprehensive programs have been developed to meet the diverse learning targets and unique needs of learners with ASD (Wong et al., 2014). Although effective, some of these practices' highly controlled methods have failed to generalize in natural environments. In reaction, researchers initiated naturalistic language teaching (NLT) methods and training packages, which positively impact learners' language trajectories within naturally occurring contexts. These NLT methods integrate learning into everyday activities, emphasizing spontaneity rather than traditional models of repeated responses to adult-led prompts, and are centered on learners' motivations, and focused on maximizing generalization. Unfortunately, these advancements have not been available to all. A concerning gap has been identified between research and actual practice, as many individuals encounter obstacles that prevent them from receiving high-quality, evidence-based programming (Johnson & Hastings, 2002; McIntyre & Barton, 2010). Current treatment models are limited by

financial constraints and extensive time commitments that many may find difficult to fulfill and impractical to implement. Moreover, the geographical distribution of well-trained, research-based service providers is also highly disparate (Antezana et al., 2017; Stahmer et al., 2005). Aiming to address disparities in access to services, researchers are now concentrating their efforts on broad dissemination and implementation methods, likely the most critical of which is training parents and caregivers to implement these strategies.

Parent-Mediated Intervention (PMI)

ABA and early intensive, comprehensive interventions have unequivocally become a standard of care for individuals with ASD (Smith et al., 2000). An often recommended element of comprehensive intervention programming is parent training to implement practices in natural settings. (National Autism Center, 2015). Parent-mediated intervention (PMI) has long been considered essential to the long-term effectiveness of programming for children with ASD (Lovaas et al., 1978). Consequently, families of children with ASD have been trained to implement a range of interventions to increase language repertoires (Ackley et al., 2019), decrease challenging behavior (Steed et al., 2020), and improve their parent-child relationship (Factor et al., 2019). Considerable research supports early intensive intervention as best practice and recognizes parents as the child's most effective interventionist (Tomeney et al., 2020).

The benefits to PMI are significant, among which is promoting caregivers' agency in developing their children's skill repertoires (e.g., shared enjoyment, language; Kasari et al., 2014; Vismara et al., 2009) and addressing challenging behavior (Bearss et al., 2015; Kaat & Lecavalier, 2013). Further, since PMI are often implemented in natural settings, they are more likely to produce generalized and maintained responding (Koegel et al., 1982). In addition, the relative cost- and resource-efficiency of PMIs contribute to their feasibility and sustainability

(Trembath et al., 2019). Finally, PMIs have been shown to reduce parent's stress levels (Lichtle et al., 2020). Parents who participate in training programs recount feelings of optimism towards positively affecting their child's development, contributing to their continued commitment to their participation (Estes et al., 2019). Increasingly in recent years, parent-mediated intervention researchers have focused on addressing core features of ASD, including prosocial behavior, language, socialization, and imitation skills (Ingersoll & Gergans, 2007; Koegel et al., 2022; Rogers & Dawson., 2020).

Over the last several decades, researchers have demonstrated the effectiveness of PMI in improving social communication outcomes for children with ASD (Akamoglu & Meadan, 2018; Brown & Woods, 2016; DeVeney et al. 2017; Kashinath et al., 2006; Roberts & Kaiser, 2012). In a study examining parent education programs, Schultz and colleagues (2011) concluded most PMIs emphasize behavioral or communication interventions, and in almost half of the 30 studies reviewed, communication was the main target of intervention. Mothers were the primary caregivers implementing these procedures, with only 23% of studies including fathers. Most studies used an individual training approach, i.e., 13% used a combined group and individual training approach. Schultz et al. found that caregivers' intervention skills improved by 87% and targeted child skills, i.e., spontaneous speech, appropriate behavior, play behavior, and social skills, increased by 83%. In addition, 13% of studies reported an associated decrease in parent stress, and 13% reported a decrease in children's challenging behavior. Whether the parent program was one-on-one or a combination of group and individual sessions, parents reported positive outcomes. For the most part, positive effects were noted regardless of frequency or duration of program implementation.

In a related study, Oono and colleagues (2013) identified 17 studies focused on PMI for young children with ASD from six countries, including the USA, UK, Australia, Canada, Thailand, and China. Their review included 17 RCTs comparing interventions delivered by parents to no treatment, local programming, or alternative child-centered interventions, such as, daycare facilities or other parent-delivered intervention. Among the interventions considered were those targeting parents' awareness, and responsiveness when communicating with their children to develop their communicative repertoires. The content of the parents' training and the length of their contact with training professionals varied. Through their participation in PMI, parent-child interactions improved, as did child outcomes such as language, and the severity of ASD characteristics decreased. While further high-quality RCTs are warranted, these findings underscore the need for parent-mediated programs, which among their advantages include mitigation of caregiver stress.

Akamoglu and Meadan (2018) identified and described a variety of NLT methods employed in research studies, outlined the characteristics of study participants, and compiled and summarized the outcomes of PMI studies. They reviewed 21 PMI NLT studies of interventions for learners with various disabilities and ages between the years 2000 and 2016. The studies reviewed focused on teaching caregivers to use responsive interaction, modeling, and environmental arrangement within naturally occurring family routines. While some studies involved time delay and mand-model procedures, these methods were least frequently used. All studies produced positive results for both children and parents, demonstrating the efficacy of PMI in improving children's communication and language skills.

The potential significance of combining these NLT practices into packages facilitating children's language acquisition and communication skills seem apparent. Several comprehensive,

stepwise parent-training packages have been manualized incorporating the aforementioned procedures, which facilitate learners' language in natural environments. Such packages include, but are not limited to, the Early Start Denver Model (ESDM;Dawson et al., 2012; Fuller et al., 2020), Project ImPACT (Improving Parents as Communication Teachers (Barber et al., 2020; Ingersoll and Wainer 2013a, b), and Joint Attention Symbolic Play Engagement and Regulation (JASPER; Kaale et al., 2014; Shire et al., 2021).

Project ImPACT (Improving Parents as Communication Teachers) is a parent-led intervention for young learners with ASD and related communication delays. The program is based on developmental and behavioral research and provides an approach to improving social communication skills for children up to age six. Project ImPACT practitioners use systematic instruction to increase caregivers' responsiveness to their child's behavior, teaching parents to use prompting and reinforcement procedures to increase their children's communication, imitation, and play skills within daily routines and activities.

Using a multiple baseline design across eight participating dyads, Ingersoll and Wainer (2013a) evaluated Project ImPACT techniques by examining observed free play during weekly parent training sessions recorded in 10-min videos. All caregivers improved their use of the techniques across the five areas (e.g., building rapport, evaluating information, modeling, giving feedback, and fostering independence) and met treatment fidelity after six weeks. Results revealed that both parents and children improved performance from baseline to treatment and follow-up. A significant positive correlation also was found between parent treatment fidelity and spontaneous child language, indicating that if the parent improved using the techniques, spontaneous child language improved correspondingly.

Using a more rigorous method, Stadnick and colleagues (2015) evaluated the outcomes of 30 dyads in community settings between intervention and control groups. Parents were taught how to apply NLT strategies to improve their children's language and social abilities. Throughout 12 weeks, individuals received individual treatment in a one-hour format. The intervention group demonstrated superior gains in communication upon implementing Project ImPACT compared to the control group. Furthermore, as was the case in the first study, there was a positive relationship between parent treatment fidelity and improvement in child communication.

While extensive research has demonstrated promising long and short-term outcomes of PMI programs, many intervention models fail to transition to everyday settings, and their results are inconsistent. (Smith et al., 2007). For example, Nevill and colleagues (2018) demonstrated that although extant literature suggests numerous benefits to parent-mediated programs, inconsistent evidence supports positive childhood outcomes, likely impacted by discrepancies across the quality of studies and frequency and duration of parent training interventions. Despite the importance of these practices and their long-standing evidence base, they are rarely implemented effectively in community settings (Nahmias, 2019). While this concern has broad generalizability, the ubiquitous nature of ASD, the wide variety of intervention approaches, and the complexity of the service system require special attention. Examining the context in which these interventions are implemented for families, particularly how they fit into that context, may facilitate their widespread adoption, benefiting more children and caregivers (Stahmer et al., 2019). Given these challenges, caregivers must reliably gain access to and participate in full-spectrum services and acquire the necessary understanding that parent education provides. PMI

models with empirical support integrate family-focused practices, centering on collaboration with caregivers to support communication and socialization for learners with ASD.

Family-Focused Practices

Researchers have suggested that PMI's can be enhanced when implemented as a part of family-focused practice. Family-focused practices are designed to be considerate of the family context. They are implemented in natural household settings and woven into daily family routines (Estes, 2019). Family-focused practices encompass the development of close collaboration between service providers and caregivers in decision-making. Caregivers are identified as vital experts in supporting their children, acknowledging the intimate familiarity with their children's unique differences and strengths during collaborative consultation.

Lucyshyn and colleagues (2007) used a family focused approach in supporting caregivers to implement behavior strategies for their 5-year-old daughter. Prior to intervention, the researchers collaborated with caregivers to identify four family routines within home and community environments. The routines represented activities that were valued by the family but were unsuccessful or did not occur as a result of the learner's target behaviors and included (a) dinner as a family; (b) getting ready for bed and picking up toys; (c) dining out with family, and (d) accompanying her mother to the grocery store. Subsequently, they used a multiple baseline design to evaluate the effects of the caregiver's implementation of a function-based intervention. Training and support included coaching, parent self-monitoring, and researchers adapting behavior support strategies to family routines. The customized intervention plan successfully decreased child participant target behaviors to near-zero levels within four family-centered routines, resulting in 100% participation in family routines. Additionally, researchers observed reduced family separation, an improvement in family life, and a reduction in challenging

behavior. The study offers creative planning tools and a model for creating behavioral family interventions that are feasible, acceptable, and effective for families within the daily occurrences of their lives.

Similarly, Dunlap et al. (2006) trained parents to implement functional communication training (FCT) during parent-identified activities to address challenging behavior for two toddlers. They evaluated the effectiveness of the PMI using a multiple baseline design across three home routines. The researchers collaborated with the parents to identify the target challenging behavior and typical routines during which to intervene. Subsequently, they conducted a functional assessment and trained parents to implement FCT in their home. Following the introduction of FCT, both children learned to use the targeted utterances consistently, which resulted in decreases in challenging behavior. Further, parents maintained their use of FCT procedures following the termination of coaching. Parents reported feeling satisfied with the consultation delivered and information-gathering strategies used; they found the program to be family-focused and responsive to their schedules which are vital components of effective parent-mediated training programs.

In a related study, Moes and Frea (2002) used a multiple baseline design to evaluate the effects of contextualizing an FCT program on caregiver needs identified through parent interviews. Three families with toddlers exhibiting challenging behavior facilitated functional communication during home and community-based activities. In collaboration with families, researchers selected specific moments and conditions during the day in which target behaviors were likely to be observed. An initial functional analysis of each toddler's contextually inappropriate behavior helped researchers determine that behavior was mediated by access to preferred items or activities. During the treatment phase, researchers taught caregivers specific

procedures to provide their children with functionally equivalent means to access preferred items or activities. Results indicated that toddlers' challenging behaviors decreased, and functional communication increased upon introducing FCT to fit the families' particular needs. Researchers concluded that family routines and circumstances are critical for assessment and intervention planning; during post-surveys, families reported finding FCT as highly valuable.

Researchers have established that parents can learn empirical practices and implement them with fidelity, facilitating the generalization of these techniques to novel situations, everyday routines, and activities (Meadan et al., 2010). For example, Kashinath and colleagues (2006) maximized the use of learning opportunities within home-based routines to create an accommodating and responsive parent-mediated program. Researchers used a multiple baseline across behaviors design to evaluate the effects of a training package on parents' use of teaching communication strategies to their children with ASD. Five parents and six children (ages 3 to 5) participated in the study. Researchers trained parents to implement two teaching strategies during the first session using written directions, video examples, modeling, and rehearsal. Following the parents' implementation of strategies into their daily target routines, researchers met with them to consider a novel routine to generalize the use of the strategies. Across sessions, researchers collected data on the frequency of parents' use of strategies and children's target communication outcomes. Data indicated proficient use by all five parents and generalization across each parent selected routine. All children in the study also met communication targets.

Brookman- Frazee (2004) also examined the impact of collaborative partnerships delivering family-focused practices and used a reversal design to compare the effects of incorporating parent empowerment principles into Pivotal Response Training (PRT), a language milieu intervention, with a clinician-driven (CD) PRT model with three children with ASD and

their caregivers. Within a CD condition, the clinician initiated all procedures, including target behaviors, intervention activities, and strategies for implementation. During a parent-empowerment condition, the researcher worked to directly involve and educate parents in the treatment of their children by eliciting caregiver input and providing choices on opportunities for language development and intervention strategies. During this phase, parents were allowed to participate in all steps of treatment and assessment, including identifying targeted challenging behaviors and establishing language training opportunities. Results indicated decreased stress levels for caregivers and increased confidence when the intervention was delivered using the family-focused, parent empowerment model. This model showed a positive influence on child effects, responsiveness, and engagement, thus indicating that the use of the family-focused model increased the effectiveness of caregivers as interventionists. Moreover, the findings provide preliminary empirical evidence for a partnership between professionals and parents, demonstrating a framework for PMI.

Effective intervention models involve assessing caregiver choices, preferences, and individual family and child routines and activities. Family-focused PMI provides opportunities to support families through an integrated system of appreciation of family tenets and priorities in delivering services and individualized support. How providers design and deliver programs can impede or improve child and caregiver outcomes. The essence of family-focused PMI is acknowledging the family as the central unit of intervention and working cooperatively to identify parent-preferred activities that are engaging, meaningful, and motivating for all.

During the last 30 years, advances in research practices have provided various methods and indicators for better identification and intervention for young learners with ASD. The literature shows that receiving an early diagnosis and treatment improves families' and children's

outcomes(Factor et al., 2019). Although there is extant research demonstrating the efficacy of parent-mediated programs, evidence of the effectiveness of programs supporting early learners with ASD has only recently materialized. These programs are most often situated in more naturalistic environments and target social contexts like play-based routines using items and materials identified as motivating by the learner. Often referred to as Naturalistic Developmental Behavioral Interventions (NDBI), these manualized programs provide opportunities for caregivers and children to share control within everyday experiences to target instruction on developmentally appropriate repertoires.

Naturalistic Developmental Behavioral Intervention (NDBI) Packages

Early Start Denver Model (ESDM). One of the most notable manualized NDBI programs with empirical support is the Early Start Denver Model (ESDM). The ESDM is explicitly designed for toddlers and preschool-aged children with ASD. The manualized program provides caregivers with pre-determined skills to be taught and the required procedures for instruction which supports fidelity to implementation (Vismara et al., 2013). Caregivers are encouraged to create prosocial relationships with their children through implementing play therapy across various settings. Lessons may occur in various settings; using play-based therapy; caregivers are encouraged to create and facilitate relational skills with their children (Rogers & Dawson, 2020; Vismara et al., 2013).

Recently, the global pandemic demanded that many children and their families receive critical services and support remotely. In a noteworthy investigation that demonstrated both feasibility and adaptability in service delivery, Vismara and colleagues (2013) used a multiple baseline design across eight children with ASD and their parents to assess the efficacy of using a two-way live video-conferencing platform and a self-guided website for parent training on the

Early Start Denver Model (ESDM). Participants completed an online 12-week intervention program emphasizing the use of natural reinforcers, encouraging turn-taking, and incorporating child-selected activities that result in following the child's lead. Caregiver sessions facilitated affective sharing and relationship-building between learners and caregivers. These activities embedded strategies such as responsive interaction providing many options for language and play opportunities, and supporting transitions. Caregiver sessions concluded with opportunities to share and discuss family experiences and learning goals with others. The families' mean fidelity rating at baseline was 2.93, while the mean fidelity rating after the intervention was 3.68. At follow-up, all but one family had mean fidelity ratings of 4.15. The results indicate that caregivers successfully implemented the EDSM procedures, and families reported high satisfaction rates, supporting the effectiveness and acceptability of family-focused interventions.

Parent-Child Interaction Therapy. Like the ESDM, Parent-Child Interaction Therapy (PCIT) is another type of Naturalistic Developmental Behavioral Intervention (NDBI) that similarly affords caregivers and families opportunities to be active participants during treatment through completing training in therapeutic methods, participating in continuing collaboration with practitioners, and receiving frequent feedback during sessions. PCIT has a solid base in behavior analysis and has shown to be a successful practice for preschoolers with a range of behavior-related challenges, specifically defiance and noncompliance (Graziano et al. 2015). Research has additionally demonstrated its considerable promise as an effective intervention program for children with ASD as it addresses many behaviors often reported to be challenging for families, such as tantrums, defiance, and inflexibility (Allen et al., 2023).

For example, Graziano and colleagues (2015) conducted a pilot study assessing an intensive, abbreviated version of PCIT with children exhibiting challenging behavior.

Researchers combined directive and nondirective approaches to family therapy and trained caregivers to respond to behaviors exhibited by their children. Eleven children and their families participated in the study, which included two phases of Child-Directed Interaction (CDI) and Parent-Directed Interaction (PDI). Throughout the first phase (CDI), parents were instructed to use PCIT PRIDE skills which consisted of leading during play, delivering praise, reflecting on child comments, and imitating play behaviors. Caregivers learned to apply these techniques to children's appropriate play and ignore undesirable behavior, including negative statements, questions, commands, or criticism. Researchers modeled how to demonstrate these skills and encouraged families to refrain from using negative language, including giving their children commands or asking too many questions. Throughout the second phase (PDI), caregivers were instructed to establish limits and follow through with directives, reducing noncompliance and learning to use effective commands consistently. Families participated in ten 90-min sessions with researchers in which the first five sessions were exclusively for instruction, and the remainder were for practicing the performance of skills with their children. Overall results were positive and demonstrated an increase in improving parents' positive parenting skills and revealing the feasibility and acceptability of a shortened and more intensive form of PCIT, recording a 100% attendance rate by families and 0% attrition of participants. A significant increase in caregiver implementation of prosocial skills was noted, along with a significant decrease in negative feedback and parental stress.

Research Unit on Behavioral Interventions- Parent Training (RUBI-PT). The Research Unit on Behavioral Interventions- Parent Training (RUBI-PT) is a parent-mediated, manualized intervention program that uses the principles of ABA to prevent and respond more effectively to challenging behavior in learners with ASD aged 3-14. The manual is designed for

practitioners to use with families and supports their application of techniques in home and community settings (Bearss et al., 2018). The program is comprised of eleven core sessions, seven supplemental sessions, and home visits that provide a comprehensive overview of behavioral principles, reinforcement, functional communication training, and compliance. Availability and implementation of empirically supported PMI interventions are often hindered by a lack of qualified specialists, particularly in rural and underserved areas (World Health Organization, 2007). Bearss et al. (2018) assessed the feasibility of the RUBI-PT program, when delivered to caregivers in rural communities. Researchers administered the manualized program to 13 families and their children ages 3-8 over a 16-week period. The program targeted common behavioral challenges, including tantrums, aggression, and noncompliance in children with ASD, and comprised 11 core sessions, two additional sessions, and three extra booster sessions conducted by phone. Family-focused sessions with caregivers consisted of therapist scripts, activity sheets matched to family routines, parent handouts with tips for implementation, and accompanying fidelity checklists. A short video vignette accompanied each core session to help families understand the concepts. Between sessions, caregivers were given homework assignments focused on applying techniques to self-selected target behaviors at home. Home visit forms and telephone booster sessions allowed caregivers to share progress and ensured that learned skills were maintained between sessions. Various methods were used to collect reliable feasibility measures, such as parent-reported and independent therapist ratings conducted at baseline, week 8, week 16, and 24 weeks. Results indicated that therapist fidelity to the manual was 98% and that caregiver adherence, engagement, understanding of the material presented, and meeting session objectives was 95%. Generally, data indicated the program was acceptable to caregivers, as evidenced by parental adherence to procedures and the completion of sessions,

homework, and satisfaction surveys. The outcome data of parent-reported measures was 92% across the 24 weeks, demonstrating substantial support for the program's feasibility as an empirically-based PMI.

Reciprocal Imitation Training (RIT). Reciprocal imitation training (RIT) is another NDBI program that uses principles of ABA to teach generalized, spontaneous imitation to young children with ASD (Schreibman et al., 2015; Ingersoll, 2010; Ingersoll & Lalonde, 2010; Ingersoll & Schreibman, 2006). RIT is only one of seven early intervention packages cited with "strong" support for its effectiveness for children with or at risk for ASD (Ingersoll, 2010; Ingersoll & Gergans, 2007). The program requires caregivers to imitate learners in extended turn-taking sequences to teach spontaneous imitation repertoires during play. RIT can be used in various play-based environments, including outdoors, in daycares, at home, and in routine family interactions. Since RIT focuses on critical skills that emerge early in development and do not demand language, families may use it with early learners to facilitate imitation skills and social engagement.

Ingersoll and Schreibman (2006) used a multiple-baseline across five young learners with ASD to evaluate RIT for teaching object imitation. Researchers targeted multiple actions concurrently according to the context of the children's play. Various actions were modeled across toys using modeling, prompting, and reinforcement strategies to prevent associating a specific action with a particular toy. All learners demonstrated an increased ability to imitate objects in treatment settings, during structured imitation assessments, and under structured observations conducted with researchers and guardians. The gains were sustained by four out of five participants after treatment, and carried over to novel games, new therapists, and new

environments. Moreover, changes in imitation were associated with improvements in other social-related skills, notably language, play, and joint attention.

Extending RIT delivery to a virtual format, Wainer and Ingersoll (2015) used a multiple-baseline design across five parent-child dyads to study the efficacy of parent-mediated RIT via telehealth. The team investigated the effectiveness of the online program, which incorporated video-conferencing coaching sessions to provide support and training to parents. Following a self-paced, web-based tutorial and receiving coaching via video conference, the researchers evaluated parents' use of RIT methods after completing a baseline assessment. After participating in the self-guided digital tutorial, all parents improved their understanding of RIT procedures. In addition, nearly a third of the families increased their model, prompt, and delivery of reinforcement abilities through video conferencing. The children's imitation skills improved at the program's start, but they exhibited substantial gains after parents participated in video-conferencing coaching sessions. Caregivers responded positively to the program and format of delivery, citing RIT as highly acceptable, functional, and practical, and found the online platform shared as highly accessible.

PMI and Social Validity

Numerous systematic reviews have examined PMI's efficacy (Beaudoin et al., 2014; Brookman-Frazee et al., 2006; Lang et al., 2009; Meadan et al., 2009; Oono et al., 2013; Patterson et al., 2012; Schultz et al., 2011). However, a significant factor influencing PMI is their social validity (Rivard et al., 2017). Social validity is defined as the appropriateness and acceptability of interventions as both a process and outcome measure (Wolf, 1978). Critical components considered are (a) the significance of goals, (b) the social appropriateness of procedures used, and (c) the social importance of the effects or changes produced.

There have been several reviews of the literature on social validity assessments within the field of special education (Barton et al., 2018). Ledford and colleagues (2016) reviewed 54 single-case research articles that included 109 studies. Among the 109 studies, 44% reported social validity data. The social validity measures reported focused primarily on the acceptability of intervention procedures, not the feasibility or acceptability of program objectives. In a subsequent study, Snodgrass et al. (2018) reported similar findings on social validity assessments in single-case research. Researchers examined six top-ranked special education journals from 2005 to 2016. Out of 429 single-case research articles, 27% (115 out of 429) reported any social validity assessment of the program, while 6.5% reported on all aspects of social validity (i.e., goals, procedures, and outcomes). Various factors may influence caregivers' abilities to perceive intervention components as socially valid or acceptable compared to professionals (Feldman et al., 2002; Moes & Frea, 2002; Sloman et al., 2010). For this reason, applied researchers must identify and examine interventions that offer social validity in typical settings with typical implementers such as caregivers (Baer et al., 1968; Horner et al., 2005; Schwartz & Baer, 1991; Wolf, 1978).

Effective intervention programs integrate the best available research evidence and caregivers' beliefs and values (Buysse & Wesley, 2006). Social validity assessment involves obtaining feedback from consumers of intervention programs, i.e., caregivers, to guide program planning and evaluation (Schwartz & Baer, 1991). Wolf's (1978) work on social validity formed the conceptual foundation for social validity assessment, which has been most widely applied by researchers when conducting research. In single-case research, social validity data are not related to the primary dependent variable (Schwartz & Baer, 1991). Instead, they can provide insight into an intervention's value to stakeholders. The assessment of social validity can be

accomplished using a variety of different methods and methodologies. Information such as this can be obtained through qualitative methods, such as open-ended, in-depth interviews with participants (Leko, 2014). Qualitative methods, such as an "in-depth interview process" (Seidman, 2006), provide a rich account of caregivers' experiences and perspectives. Open-ended questions offer opportunities to share intimate details and experiences that Likert scales and questionnaires may not capture. Additionally, the results can facilitate community acceptance of a program (Baer et al. 1987). Furthermore, results can potentially improve future replications and applications of interventions (Finn & Sladeczek, 2001).

Despite advances in empirically-based models for ASD and increased evidence to support NLT and PMI, there is underutilization of parent training and examination into their social validity (Leaf et al., 2022). For example, in a recent review, Lee and colleagues (2022) examined current practices for conducting social validity assessments and reporting their outcomes within parent-mediated language interventions for young learners with ASD. While positive outcomes for parent-implemented interventions were reported, information about social validity assessments of these programs was limited in quantity and quality. Among the eleven included studies, nine assessed social validity at the end of their investigation, and two did not discuss social validity. In most cases, researchers reported the results of the social validity assessment in quantitative form. Caregiver acceptability, feasibility, and satisfaction were assessed mainly using Likert-type questionnaires. Lee et al recommended various data sources and methods should be used to evaluate the social validity of interventions, and findings should be reported in relation to other types of data.

Summary

NDBIs for caregivers of children with ASD are available and extensively evaluated via the application of single case and group studies and have been shown to have the potential to facilitate successful and meaningful family-centered programs. These parent-mediated approaches share an integrated cognitive and behavioral framework and solid empirical support. Various research studies indicate that these practices are effective in both clinical and home settings, and that they are likely to result in favorable results, addressing fundamental features of ASD, namely cognitive and communication impairments (Brian et al., 2022; Frost et al., 2021; Ingersoll & Wainer, 2013; Rogers et al., 2012). Despite the increasing literature base supporting PMI models for this age group, research indicates that practitioners rarely employ these models consistently in the community (Hume et al., 2005; Thomas et al., 2007). Professionals need a clear understanding of how to effectively facilitate these practices in partnership with families during everyday routines and activities. PMI models require an understanding of adult learning principles as well as communication and collaboration with families (Wainer et al., 2018). Among the most valuable methods professionals can use to assist caregivers in fostering their children's learning within family-oriented PMIs is coaching (Rush & Shelden, 2011).

Caregiver Coaching

Coaching is a collaborative, helping relationship where a coach and client, i.e., the mentee, engage in a systematic process of setting objectives and developing solutions to facilitate goal attainment, development of self-directed skills, and personal growth (Grant, 2013). The National Association for the Education of Young Children (NAEYC) describes coaching as:

> a relationship-based process led by an expert with specialization and adult learning knowledge and skills designed to build capacity for specific professional

> dispositions, skills, and behaviors and is focused on goal setting and achievement for an individual or group. (p.11)

Coaching provides a structured method for accomplishing a parent-professional partnership focusing on sharing skills, knowledge, and experiences to develop competence and confidence in key stakeholders, i.e., caregivers that influence children's daily routines. Coaching provides an interactive foundation for establishing and nurturing family and practitioner relationships that shifts the focus from expert-driven to learner-focused service delivery (Dunst et al., 2000). A coach's role consists of establishing clear expectations, clarifying responsibilities, co-creating supportive working relationships, and encouraging creative thinking by listening attentively and asking curious questions (Losch et al., 2016). A coach provides individual support through recognizing the particular needs and strengths of menteess. By encouraging menteess to think critically, coaches challenge their assumptions and offer new perspectives (Losch et al., 2016). Coaches, according to Rush and Sheldon (2011), incorporate several vital elements into their practice: (a) observation, (b) joint planning, (c) action steps, and (d) reflection and feedback. Thus, caregiver coaching is an integral part of PMI incorporating critical materials, stimulating practice opportunities, and feedback delivery (Dusnt, 2000).

Historical Implications

In the early 1980s, coaching became an accepted practice in developing and supervising education. Since then, coaching has been applied successfully in early childhood, elementary, middle, and high school education. Preservice preparation programs for general educators and special educators use coaching extensively. Coaching is a relationship-based process that strengthens existing skills, develops new skills, builds competence, and builds confidence so that the mentee can achieve targeted outcomes (Rush & Sheldon, 2011).

Extant research supports the successful use of coaching by general education teachers, administrators (Kurz et al., 2017; Huguet et al., 2014) and special education teachers (Barton et al., 2013; Scheeler et al., 2012). Coaching has also proven to be an effective method of supporting the learning of parents of children in early childhood programs and with disabilities (Camden & Silva, 2021; Friedman & Woods, 2015; Ward et al., 2020). Over 30 years of research substantiating the effectiveness of coaching, initially establishing coaching as a professional development practice for educators.

Ackland (1991) reviewed 29 peer and expert coaching studies conducted between 1982 and 1989. Ackland found three characteristics shared in all effective coaching programs reviewed. He noted that coaching was non-evaluative, i.e., coaching was not intended to evaluate the mentee's performance, but rather, to create a safe learning environment. Another identified feature of coaching was that observations were followed by feedback. Feedback was provided in one of three ways, (a) the coach gathering information to share with the mentee; (b) the coach and the mentee analyzing performance data together; or (c) the coach sharing specific ideas related to performance improvement with the mentee. The third characteristic Ackland referenced was that coaching was directed toward improving instructional techniques. The principal focus of much of coaching research to date has been on helping educators learn and apply new methods for promoting student learning.

Joyce and Showers (1980) were among the first to explore peer coaching as a professional development method in education. They analyzed over 200 studies that investigated various kinds of training methods. A series of studies, beginning in 1980, were conducted to test their hypotheses concerning weekly coaching, which enabled teachers to better practice and apply what they were learning. As part of these coaching sessions, students' responses were

analyzed, along with classroom implementation and analysis of teaching. Instructional coaches were recruited to work on-site with teachers, encouraging their efforts through collaborative partnerships, implementing research-based instructional methods in the classrooms, accelerating learning, and closing student achievement gaps (Knight, 2007). These early applications showed that teachers with coaching relationships were more likely to practice and apply new skills and strategies than their counterparts who had expanded their teaching repertoire independently because they shared teaching strategies, planned together, and combined their experiences. Joyce and Showers identified the additional need for workshops to integrate theory, modeling of opportunities, providing possibilities for practice, delivering feedback, and ongoing coaching to increase teachers' gains. Their coaching package helped nearly all teachers implement new teaching strategies. Moreover, teachers introduced to this new model could coach others provided they continued to receive periodic follow-up training. In 2002, Joyce and Showers synthesized research findings on staff development to conclude that providing teachers with coaching is crucial for implementing newly acquired skills. When coaching is implemented within natural contexts, almost all participants demonstrated strong knowledge and skill fluency, successfully transferring what they learned to real-world practice.

Nevertheless, the science-to-service gap remains a persistent challenge among practitioners, inspiring much research and framework development. What is known is not always what is adopted to assist children, families, and adults, and there are not always clear pathways to implementation (Fixsen et al., 2005). Substantial evidence suggests that in addition to offering readily available, user-friendly information and materials, the adoption and implementation of interventions or practices require developing and supporting skills through specialized training, monitoring of fidelity of implementation, and ongoing support to include feedback.

Implementation is defined by Fixsen and colleagues (2005) as the specific set of activities used in a program to ensure fidelity to the intervention implemented. The intervention, e.g., the evidence-based practice used by educators, parents, or practitioners, must be well-defined to have the intended effect on the learner or family. In a seminal literature review, Fixsen et al. (2002) examined 1,054 studies of innovative practices and programs in mental health, education, early childhood, and social services. Among the 1,054 studies, only 22 reported the results of experimental analyses. The article summaries were grouped into content areas, and each area was reviewed for common implementation themes and patterns. Examining the critical elements of program implementation, identified *coaching* as particularly significant; training alone cannot change practices without providing coaching. Researchers noted it was a vital implementation component, to include in-vivo observation, intensive feedback, and ongoing support. Coaches facilitate skill implementation, encouraging practice to enact and sustain change (Fixsen et al., 2002). Their findings revealed several components of high-quality training: presenting relevant information, providing effective demonstrations, and allowing individuals opportunities for behavioral rehearsal.

Among positive consequences, actively engaging adult learners can increase their ability to support the development and learning of children (Trivette et al., 2009). Trivette and colleagues (2009) synthesized research on the effectiveness of adult learning methods, reviewing 79 studies, including RCTs and comprehensive group designs, examining which methods were attributed to positive learning outcomes. Among the strategies identified were (a) providing information about the model and model practices, (b) demonstrating the practices by example (for example, by demonstrating using video examples), (c) engaging learners in the implementation of the practice, (d) involving the learners in assessing the use of the practice and

its outcomes, (e) assessing learners' mastery, and (f) determining the next steps for promoting learners' understanding and application of the practices. Approaches that provided adults with the opportunity to practice newly acquired skills achieved far better results than those that did not. As both child and adult learning theories indicate, a larger dose of learning opportunities over a longer period of time proves more effective. (Dunst & Trivette, 2009).

Early Childhood and the Emergence of Coaching

Between 2000 and 2010, coaching with parents became an accepted and increasingly expected practice in early intervention and with young learners with disabilities and their families. This decade marks the first appearance of the term in a broad range of publications (Dunst, et al., 2008; Friedman, et al., 2012; Kaiser & Hancock, 2003; Rush & Shelden, 2011; Woods, et al., 2004). Early intervention practitioners and researchers endeavored to reconceptualize intervention models, such as parent education and parent training, to formulate a model of practice reflecting the reciprocal and collaborative relationships inherent in family-centered care (Kemp & Turnbull, 2014; Rush et al., 2011). Many professional policy statements and guidance documents of the time promoted parent coaching practices (American Speech-Language-Hearing Association, 2008; NECTAR, 2008). Over the past 30 years, legislation has mandated that early intervention services be provided as much as possible in children's natural environments (IDEA, 2004). As part of IDEA Part C, which aims to strengthen parents' abilities to support their children's development, and draws upon adult learning strategies. Coaching stimulates caregiver reflection and problem-solving to apply best practices supporting children during everyday routines and activities in typical home environments (Graham et al., 2010)

When children and caregivers receive services within their natural environments, they are better able to practice and generalize skills to their everyday routines (Dunst et al., 2014;

Kashinath et al., 2006). Research indicates that early intervention practitioners are more likely to integrate caregivers into their related services when they are provided in families' homes rather than in centers or clinical settings (Dunst et al., 2014).

Campbell and colleagues (1997) identified the early childhood practitioner's principal role as a *coach* instead of a service deliverer. Hanft and Pilkington (2000) advocated for educators to rethink their positions and "move to a different position alongside a parent as a *coach* rather than a lead player" (p. 2). By doing so, the therapist or educator has a greater chance to facilitate critical skills than through direct intervention. As Rush (2011) points out, practitioners can help improve children's skills and abilities by acting as coaches.

Coaching parents enjoins confidence and competence to increase their children's developmental outcomes and learning targets. Coaching caregivers can lead to increased positive perceptions of their abilities to respond to their children's needs, supporting self-efficacy, and resulting in a strengthened partnership with the coach (Kemp & Turnbull, 2014). The caregiver is integral to the decision-making process and determines whom to collaborate with, how to implement interventions, and when to do so (Brown & Woods, 2015; Lee et al., 2022; Tomczuk et al., 2022; Wetherby & Woods, 2006).

Nevertheless, providing support to caregivers and children through early intervention programming is multifaceted. The process consists of building upon adult learning strategies for caregivers, emphasizing enhancing their child's development (Inbar-Furst et al., 2020; Woods et al., 2011). An analysis of second-generation research on interventions that integrate coaching practices with caregivers conducted by Kemp and Turnbull (2014) identified eight investigations of practitioners' use of coaching with caregivers. Coaching encompassed characteristics of (a) joint planning, (b) observations, (c) practice, (d) reflection, and (e) feedback. Outcomes included

improved implementation fidelity of parents' use of intervention strategies taught by the coach which produced positive gains in their child's learning. Additional tertiary outcomes noted were, (a) improved response to children, (b) attribution of children's success, (c) reduced caregiver stress, (d) improved relationships with primary care providers, (e) increased parental confidence, competence, and (f) engagement with early intervention strategies.

In a related review, Artman-Meeker and colleagues (2015) examined early childhood coaching literature to identify how coaching was implemented and specified the individual components of coaching. Their inclusion and exclusion criteria yielded a 98% agreement on 49 studies published prior to 2014. These studies examined various early intervention settings (i.e., home, daycares, and community centers) and applied coaching to several different intervention practices and content areas (e.g., language development, literacy, and responsiveness). The researchers concluded, "Converging evidence supports the use of planning, observation, action, reflection, and feedback as essential to the coaching experience" (Artman-Meeker et al., 2015, p.184). These components align with previously identified coaching characteristics outlined by Rush and Sheldon (2011).

Additionally, Tomeny et al. (2020) examined coaching components used in PMI, with a specific focus on (a) collaborative planning, (b) building on caregiver competence, (c) guided practice, and (d) collaborative reflection and decision-making. After a review of 26 studies, they found that less than a quarter used all four coaching components. Most of the studies focused on developing caregiver competence and providing guided practice for caregivers. Components of collaborative coaching, such as planning, reflection, and decision-making, were not consistently applied. These findings highlight a significant gap between encouraging caregiver competence and providing opportunities for practice. Based on the findings of this review, the caregiver

coaching literature has a significant gap. Moreover, early childhood professionals require support in providing effective training and coaching to caregivers of young children with disabilities.

In a notable study illustrating all components of caregiver coaching (e.g., joint planning, observation, action building, and reflection and feedback opportunities) Meadan and colleagues (2016) used a multiple-baseline intervention design to investigate the effects of telehealth training and coaching on the implementation of the Internet-Based Parent-Implemented Communication Strategies program (i-PICS). This 3.5-month study was conducted at the homes of three mother-child pairs. Using video-conferencing software, the interventionists conducted sessions remotely. Researchers examined the frequency and quality of naturalistic interventions demonstrated by parents and their children's social bids and responses during home-based activities and rituals. The research provided videos, handouts, and flow charts demonstrating naturalistic teaching strategies during training. The research team and parents developed weekly schedules intended for implementation as part of family routines. For mothers to record videos of intervention sessions at home, researchers supplied iPads and maintained a secure online file sharing service for the videos. Videos were reviewed by the research team twice a week for an hour, during which feedback was given to mothers. The use of video-conferencing sessions helped children to achieve their communication goals. Researchers found that performance feedback was the key to the program's success, rather than stand-alone digital content delivered through the web-based modules. The researchers concluded that using a web-based platform to support parent-mediated training with coaching was highly effective. All coaching elements were included in the program, confirming its effectiveness as a standard for parent-mediated programs with caregiver coaching elements.

Similarly, Rollins and colleagues (2016) implemented a coaching packaged with crucial coaching elements. They use a multiple baseline design to assess the effectiveness of Pathways, a community-based, government-funded early childhood intervention package that targets social communication among toddlers with ASD. Four parents and their toddlers participated in the study. Pathways offers timely and evidence-based programming designed to expedite caregiver access and includes a pioneering coaching feature designed to (a) connect families to services, (b) involve families in the provision of services, (c) deliver services in accessible and natural environments, (d) support experiential learning, and (e) honor and recognize individual families' schedules. Following the Pathways model, clinicians engaged in joint planning and observed the caregivers every week for approximately 90 min to facilitate eye contact, social engagement, and verbal communication. Caregivers participated in action-building opportunities and received coaching throughout the implementation process. Participants were encouraged to reflect on their experiences, and researchers answered questions. Data indicated that three out of four participants increased their social engagement, eye contact, and verbal reciprocity. Rollins et al. is yet another example of a robust caregiver coaching model that is promising and supports the growing literature base for parent-mediated programs for early learners with ASD.

Providing and supporting intervention programs can be nuanced and require scaffolding caregivers' learning environment to support their children's target goals (Tarbox et al., 2016). Lane and colleagues (2016) acknowledged the importance of embedding adult learning theories into practice and employed three of four essential caregiver coaching components (e.g., observation, action building opportunities, and reflection with feedback opportunities) in supporting families. Using a multiple baseline design across behaviors design, they evaluated if a rapid coaching package for families could increase treatment fidelity of parent implementation of

naturalistic strategies to promote vocal responses with their children. Participants in the program were two parent-child dyads between 31 and 35 months of age with ASD. The training program began with a 2–3 min didactic lecture by interventionists followed by a video example that provided caregivers with an opportunity to observe procedures. An overview of expectations was provided for caregivers to engage them in action-building activities. Naturalistic strategies taught included: (a) narration, referring to the parent re-counting the child's movement or the item the child plays with; (b) imitation, referring to the parent copying the child's action with same, similar, or a pretend item; and (c) environmental arrangement and response, referring to the parent controlling the access of wanted item or the activity and responding to the child's verbal request. Following the program's introduction, caregivers were asked to practice the target behavior with their child during the coaching sessions. An instructional coach provided caregivers with behavior-specific praise as they demonstrated the strategies and offered further application opportunities during this time. After each coaching session, the research team and families watched a video recording of the parents' implementation of strategies; they reflected and discussed innovative ways to use the strategy in future sessions. Results from the study contribute to the existing literature for young learners at risk for ASD and offer a parent-mediated intervention equipped to enhance caregiver confidence and competence through thoughtful coaching features.

Roberts and colleagues (2014) underscored the significance of parent-mediated interventions in EMT and its cascading coaching features, demonstrating the use of three of the four components (e.g., observation, action building opportunities, and reflection with feedback opportunities). The researchers examined the effects of Teach-Model-Coach-Review on the implementation of four language support strategies for children with speech impairment aged 24

to 42 months using a single-subject, multiple baseline research design. The researchers modeled the Teach-Model-Coach-Review method using various age-appropriate toys; and showed parents how to use time delay, expand utterances, match turns, and implement prompting. In the "Teach" component, caregivers participated in a one-hour workshop that provided a definition and rationale for these strategies and a description of when, where, and how to use them during everyday activities. In partnership, the caregiver and researchers discussed ways to develop these skills and shared ideas for implementation without changing or modifying strategies to achieve the intended outcome. In addition to video examples, researchers provided handouts upon request. During the "Model" component, parents practiced the strategy twice a week at the clinic for 40 minutes each. As part of the "Coach" component, caregivers implemented interventions while being coached by researchers, and the coaches delivered detailed and constructive feedback. During the "Review" component, parents had the opportunity to share their concerns about the strategies and reflect on any problems or noteworthy experiences that occurred. Additionally, this was an opportune moment for researchers to expand on strategies for families and affirm their understanding related to the intended outcome. Researchers encouraged caretakers to employ the methods throughout their daily routines. The Teach-Model-Coach-Review instructional approach positively impacted the children's language repertoires, with EMT strategies utilized consistently in the home setting for three of the four families.

Summary

Parent-mediated interventions identify parents as key interventionists, placing them as critical players in the success of transferring learning targets to real-world environments. These interventions allow families to systematically apply procedures within family-based activities and produce multiple means of implementation and various occasions for generalization (Tarbox

et al., 2016). A growing body of empirical evidence since the early 1970s affirms the importance of including parents in intervention programs for children with ASD, chiefly for facilitating maintenance and generalization of program gains (Lovaas et al., 1973). The literature shared outlines the essential characteristics of parent-mediated programs, such as family-focused practices, and caregiver coaching components. Family-centric practices focus on activities and routines unique to caregivers and integrate them into targeted programs to benefit the child and the family. The studies illustrate the efficacy of family-guided interventions across a diverse range of routines and environments (Binnendyk & Lucyshyn, 2009; Brookman- Frazee, 2004; Dunlap et al., 2006; Kashinath et al., 2006; Lucyshyn et al., 2007; Moes & Frea, 2002). Finally, the practical application of coaching procedures, considerate of adult learning theories, preceded by positioning caregivers as experts in their children, facilitates a cooperative approach resulting in strong partnerships with coaches and favorable results for all (Lane et al., 2016; Meadan et al., 2016; Roberts et al., 2014; Rollins et al., 2016).

Despite advances in empirically-based communication models for ASD and growing evidence supporting NLT and PMI, many barriers continue to impede families' ability to access high-quality interventions. Disparities in service access, difficulties with customized training support, time restraints, and family stressors remain primary concerns for many caregivers, resulting in low family engagement and variable treatment outcomes (Stammer, 2005). Moreover, current treatment models may not be accessible for rural communities, individually tailored for culturally and linguistically diverse families, or economically viable for families experiencing such hardships or having limited resources (Fleming et al., 2011; Ingersoll et al., 2020). Further examination of parent-mediated naturalistic language interventions is needed to offer customized, feasible, family-focused language interventions supporting young learners with

ASD and their caregivers. It is warranted to conduct further research evaluating RBI efficacy. In addition, the social validity of this naturalistic language instruction requires investigation.

CHAPTER 3: METHOD

For this study, I used an experimental, single-case, non-concurrent multiple baseline across participants design (Baer et al., 1968; Cooper et al., 2020; Ledford & Gast, 2018) to evaluate the effects of a naturalistic caregiver verbal behavior training package on the fidelity of implementation of RBI procedures for two caregiver-child dyads. This was an adjustment to the original proposed study. As a result of the current difficulty in recruiting participants and concerns with retention, I was required to shift from a concurrent multiple baseline design to a non-concurrent multiple baseline design across participants. The decision to pivot to a non-concurrent design was based primarily on contextual variables within the community I was recruiting (e.g., family schedules, preferences, limited resources such as internet access, time constraints, and work commitments). Given my research questions, time restraints, and contextual considerations of the community of our participants, the flexibility of the non-concurrent multiple baseline provided a better option. I also assessed parents' expectations and participation in the RBI training package via Seidman's Three-Part Interview Series (Seidman, 2013).

Specifically, my research questions were as follows:

1. What are the effects of a naturalistic caregiver training package on the accuracy of parents' implementation of Parent-Mediated Referent-Based Instruction (PM-RBI)?
2. Following intervention do children's verbal behavior repertoires increase, i.e., functional proportionality of requesting, labeling, echoing, replying as indicated by post Stimulus Control Ratio Equation (SCoRE)?

3. What were parents' experiences of learning and participating in the RBI training package? (Seidman's three-part interview process)

Participants and Setting

Two dyads, each composed of one child and caregiver, participated in the study. Participants were between 3 and 6 years old, demonstrated a need for language training during their intake and assessment, and were diagnosed with ASD. Both caregivers had guardianship or legal decision-making powers for the participating child, lived in the same home with the child, and had access to a device with Internet connectivity and Wi-Fi. Both also participated in four or seven video-recorded baseline sessions (no intervention), completed pre- and post-assessment reports, and attended up to 26 video-recorded intervention sessions biweekly.

For this study, I conducted all observations and training procedures via videoconferencing, i.e., Zoom. In accordance with recommended practice guidelines, I trained parents to implement procedures in the children's natural environments (Division for Early Childhood, 2014). All sessions occurred during families' preferred everyday activities and routines. Caregivers practiced intervention and received coaching in the same setting across all video conferencing sessions. Families attempted to keep their rooms as distraction-free as possible. Family members or children entering the room were also asked for their consent. The researcher used a private office area for all sessions.

Recruitment

To recruit participants for this study, I reached out via email to Bloom's Children's Center, an international autism center located in Monterrey, Mexico, providing underserved families and children with therapeutic services and support. I sent a recruitment email with a flyer, scheduled a virtual or face-to-face meeting with related personnel and the center director,

and had them share the information with interested families seeking services and families on their waiting lists for services. The email included information about the research study and asked for permission to provide them with recruitment materials (Appendix C). Any interested families were given my name and contact information.

Consent. Caregivers who indicated interest in participating in my study were provided consent forms via DocuSign (see Appendix D). All digital materials were downloaded and stored in a secure, protected Dropbox account. Materials were only shared with research team members approved by the university's institutional review board.

Participant Demographic Information

I also collected relevant information about child and caregiver participants, I had caregiver participants complete a brief form with identifying information (Appendix E). For the caregiver participant form, I requested information that included their age, race/ethnicity, relation to the child, occupation, and previous parent training experience(s).

On the child participation form (see Appendix F), which also was completed by the caregiver, I requested the child's gender, age at onset of study, diagnosis, and any related services provided currently or in the past.

Upon receiving these responses from caregivers, I downloaded them, stored them in a password-protected Dropbox account, and deleted the responses permanently from the UNC Google Drive.

Dyad 1

Caregiver Participant 1 (Lina). Lina was a 37-year-old Mexican Indigenous woman; she worked as an administrative assistant and was the primary caregiver to two sons under the age of 6 years. Current therapeutic programming involved cognitive behavior coaching sessions

with a child psychologist and participation in a pediatric feeding program with a Board Certified Behavior Analyst at a university-based clinic.

Child Participant 1 (Mario). Mario was a 5-year-old Mexican indigenous male diagnosed with autism spectrum disorder level 2. He received cognitive behavior therapy with a child psychologist and participated in a pediatric feeding program at a university-based clinic with a Board Certified Behavior Analyst.

Setting. The PM-RBI sessions took place in Lina's home on Mondays, Wednesdays, and/or Fridays after 12 p.m. Typically, Mario and Lina sat at a table reserved for family activities away from distractions in their living room, using an iPad to connect to Zoom sessions.

Dyad 2

Caregiver Participant 2 (Gina). Gina was a 42-year-old Mexican-white woman, an elementary school teacher, and the primary caregiver for her two sons. Prior to this, Gina had never participated in therapeutic programming for her children or received parent training.

Child Participant 1 (Lucas). Lucas was a 3-year-old Mexican-white male diagnosed with Autism Spectrum Disorder Level 2. He had not previously received therapeutic services and was not currently receiving services of any kind other than attending a preschool program.

Setting. PM-RBI sessions were held in Gina's home on Wednesdays and Fridays after 3 p.m. It was customary for Gina and Mario to sit at their dining room table or sit on their living room floor, where many of Lucas' preferred activities or toys were stored. Gina used her iPhone to connect to Zoom sessions.

Experimenter

I served as the primary experimenter for this study. Caregiver participants served as primary interventionists in delivering the PM-RBI intervention to child participants. My

responsibilities included (a) speaking with caregivers via Zoom at the onset of the study, (b) providing caregivers with the researcher-developed presentation using the RBI Parent Guide (Appendix R) with related materials for caregivers via Zoom and answering any follow-up questions, (c) reviewing child participants' existing verbal behavior assessment, (d) working with the family to identify preferred family routines to conduct RBI, (e) training caregiver participants as interventionists in the delivery of RBI; (f) providing parent-participants with caregiver coaching sessions via Zoom two days a week, and (g) collecting caregiver data during baseline, and intervention. I have a master's degree in Special Education with an emphasis on autism interventions in ABA, am a bilingual Board Certified Behavior Analyst (BCBA), and am currently a doctoral candidate in special education at UNC Charlotte. I have worked with diverse families of children with ASD for over 15 years in various capacities, including in-home trainer, special education teacher, BCBA, and provided caregiver workshops.

Materials

Materials in this study included a researcher-developed video presentation and parent guide (Appendix R) for caregivers presenting the rationale and support for parent-mediated programming. Participating families were provided an overview of Referent-Based Instruction describing its critical features, caregiver strategies for capturing children's motivation to increase functional language repertoires, practical tips for arranging the home environment for success, and 5-minute video models. Participants and the researcher also had a hard copy of each participant's verbal behavior treatment plan (see Appendix J for sample) and materials (e.g., caregiver tip sheets). Families joined all sessions on their choice of a laptop computer, iPad, or preferred recording device. Child participant materials included any preferred item, materials

identified through preference assessment. The researcher used a Dell laptop computer for all sessions.

Dependent Measures

The primary dependent variable was parents' fidelity to the six RBI implementation procedures using the RBI Fidelity Checklist (See Appendix P).

Parent Fidelity of Referent-Based Instruction Procedures

The RBI Fidelity Checklist measured parents' fidelity to implementing the RBI procedures (See Appendix P). During each session, I scored parents' completion of steps of RBI procedures. Correctly demonstrated steps were marked with a "+," and incorrect or missed steps were marked with a "-." Each session's treatment fidelity was calculated by dividing the number of correctly implemented steps by the total number of steps and multiplying by 100. A trained coder and researcher analyzed video recordings of all sessions to determine RBI accuracy.

Child Functional Verbal Responses

The child's functional verbal responses were measured by conducting a verbal operant experimental (VOX) analysis after completing participation in parent-mediated RBI. A VOX analysis was used to identify specific functional language deficits and differences in verbal operant strengths. The SCoRE metric describes the disproportionality of verbal repertoires associated with the diagnosis of ASD (Mason & Andrews, 2014; Sundberg, 2008). This analysis consists of a series of verbal episodes systematically designed to assess the ability of the children to evoke the same verbal response under different sources of control. During the assessment, the assessor manipulated the environment, managed contingencies, and recorded the occurrence of verbal responses. Each verbal episode was designed to evoke four unique operant responses that were individually assessed: tact, mand, echoic, and intraverbal control. Depending on the

speaker's responses, a VOX analysis consisted of two to four verbal episodes to obtain an adequate sample size (Mason & Andrews, 2022). The VOX analysis and SCoRE metric were used as a pre-/-post test and conducted one week before baseline sessions and post-intervention with families' current treatment provider.

Social Validity

Social validity of the PM-RBI was measured at the conclusion of the study, using an adapted version of Irving Seidman's Three-Part Interview-Series (2013). The interview provides an "in-depth interview process" and elicits detailed and authentic accounts of parents' experiences in the intervention program. Holt (2010) asserts that a fundamental component of narratives is assembling the precise sequence of events consisting of a beginning, a middle, and an ending, telling a story of sorts in which individuals claim, confirm, and validate their identities. The open-ended questions produced a chronological account of caregivers' life events and associated reflections. These narratives provide detailed reports of caregivers' experiences, rich with personal references and nuanced descriptions of events. The central purpose of the three interviews was to provide caregivers with an opportunity to recall, reflect and reconstruct their experiences within the dialogue. The interview's open-ended, in-depth inquiry format required a focused structure, created a foundation of detail that led to each subsequent interview session. This process occasioned a series of questions premised first on children's diagnosis, initial developmental history, caregiver experiences in accessing services and resources, and other programming options considered (e.g., *Tell me about your child's developmental history; When did you first notice a language delay? At what point did you determine that your child needed language intervention?)* [Interview 1], detailed experiences regarding parents' perceptions of the intervention (RBI) (e.g., *How would you describe referent-based instruction?*

What did you do during RBI? What did you see your child doing during RBI?) [Interview 2], and parents' reflections on the experiences participating in RBI. (e.g., *What were you hoping to get out of RBI? Tell me if and how these expectations were met or might have changed as you and your family participated in RBI; Tell me a little about your understanding of the program itself.*) [Interview 3]. Each interview was approximately 45-min in length.

Given this study's purpose, the three-part interview method allowed the researcher to engage in a deeper and more intimate discussion of the intervention. The three-part interview format provides a phenomenological framework to support this exploration. Following the completion of the three interviews, data were transcribed and analyzed. Caregivers' accounts were categorized by listening, reading, re-reading, and marking of interview transcripts. I explored the intra-dynamics of each caregiver, such as how specific characteristics of the caregiver relate to their perceptions, feelings, and behavior. Through empathy, skillful questioning, and curiosity, I created an open, welcoming, and safe environment for caregivers to share their experiences. Then, I examined variations and connections among the caregivers. In addition to synthesizing the individual participants' experiences, I made notes and comments on the interviews. Cross-case analysis was used to identify common themes and variations between narratives (Ayres et al., 2003). Reviewing each caregiver's account assisted in identifying what Seidman (2013) describes as "connective threads," i.e., themes, ideas, or experiences that link different aspects of each participant's story. Highlighting and circling essential passages in the transcript allowed for identifying patterns, which helped develop main themes and then sub-themes. Findings were divided into three major categories, which reflect the major themes in parents' experiences and participation in RBI. Within each main theme, various subordinate themes were isolated that represent specific aspects of the global theme. A table was created to

illustrate main and sub-themes capturing the individualized experiences in participating as primary interventionists delivering RBI while receiving caregiver coaching.

Data Collection

All sessions were held via Zoom platform, which is commonly used and familiar to many individuals, providing for the automatic recording of sessions and offering a cloud storage system for large videos. Zoom is free to download and use, so it did not place any additional financial burden on study participants. Asynchronous video reviews were used for direct observation data collected by the researcher and a trained practitioner using pen and paper.

Experimental Design

To study the effects of a naturalistic verbal behavior training package on parents' fidelity of RBI procedures for two caregiver-child dyads, I used an experimental, single-case non-concurrent multiple baseline across participants design. To address the difficulties in participant recruitment and retention, it was necessary to switch to a non-concurrent multiple baseline design across participants. Watson and Workman (1981) suggested the non-concurrent approach to applied research, as it may not always be feasible to collect participant data simultaneously (e.g., recruitment issues; Christ, 2007). Further, the current literature supports its use within applied research as a reliable and robust design that demonstrates experimental control (Slocum et al., 2022). As the participants in this study were not all recruited at the same time, this design was particularly suitable. Baseline sessions for the first caregiver dyad started in April 2023. Caregiver dyad 2 began baseline sessions in May 2023. The across-participant design with staggered intervention implementation allowed for three demonstrations of experimental effect at three different points in time, and as recommended I varied the number of baseline sessions (Horner et al., 2005; Kratochwill et al.,2010).

As part of my efforts to minimize internal validity threats, the following steps were taken: Prior to beginning the study, I scheduled at least two Zoom meetings with families to establish trust and rapport. Caregivers spoke openly about their experiences with their children, their strengths, and their concerns. In addition, they were encouraged to share any prior intervention experience. Developing credibility and establishing trust with families fosters openness to report circumstances that may affect study findings. These accounts helped to identify any unusual changes in caregivers' behaviors, potentially minimizing history threats.

Developing relationships with participants also minimized the Hawthorne effect as well as the adaptation threat. The Hawthorne effect suggests that parents might demonstrate a better version of themselves while recording. When applied to real-world situations, the Hawthorne effect may not be controllable, so it is essential to be aware of its existence and effects. Having had the opportunity to Zoom with parents and their children at least twice before the study also helped ensure comfortable communication and recording. Prior to requesting consent, I explained the study in detail to both caregivers. My discussions with the parents included using their camera device to record videos and the opportunity for them to ask further questions. As an additional measure, I ensured my laptop was prepared for each session and texted or emailed families before each session to remind them to prepare their recording devices (Horner et al., 2005; Kennedy, 2005).

Data Analysis

I used visual analysis to inspect graphed data to evaluate the effects of the naturalistic verbal behavior training package on the caregiver's implementation of RBI procedures. I examined the level, trend, and variability within and across conditions. Further, I examined the

immediacy of effect when the intervention is introduced. Finally, I examined the amount of data-point overlap that occurs per dependent variable (Ledford & Gast, 2018).

Procedures

Pre-baseline

At least one week before baseline sessions, the current treatment provider calculated child participants' verbal behavior SCoRE. The SCoRE was calculated from data collected through a VOX analysis. These results generated an individualized treatment plan for each child participant in the study, providing errorless language learning opportunities that were used to condition each verbal response through an individualized system of most-to-least prompts. The initial prompt hierarchy for each child was determined by ranking child participants' verbal operants' strengths from most significant to weakest. This most-to-least prompt hierarchy was used to shape vocal verbal responses to each child's specific family and community circumstances.

Baseline

Immediately prior to the baseline condition, I provided caregivers with an initial 60 min didactic training on the basics of RBI delivered via Zoom. This training included individual reflection and intervention planning opportunities, all using the RBI Parent Guide (Appendix R). The didactic training included information on the RBI implementation procedures: (1) setting up the environment and allowing their child to select the referent, (2) restricting access to the referent, (3) presenting the target level of antecedent (e.g., referent or question), (4) waiting 5 s for a verbal response, (5) if the child made an error or didn't respond within 5 s, providing them with a prompt, and (6) reinforcing the verbal behavior with access to the referent and/or generalized praise. After attending the Zoom training, I asked caregivers to read the RBI Parent

Guide. Baseline sessions via Zoom included parents implementing RBI with their child twice a week for a minimum of 15 minutes. I began each baseline session by stating, "For the next 15 minutes, please demonstrate RBI procedures within your family-selected routine to the best of your ability. I will not provide you with additional information or assistance during this time. This session will be recorded. Please do your best to stay within a space to capture your family routine on camera. Do you have any questions before we begin?" All videos were recorded via Zoom and coded for intervention fidelity using the RBI fidelity checklist (See Appendix P).

Caregiver Coaching

A week after baseline, as part of the first intervention meeting with caregivers, I reviewed and described the role of the primary interventionist with each caregiver. Using the “Getting to Know You” document (Appendix G), together, we identified family goals and targets. During this 60-min Zoom visit, I worked with families to identify their child’s likes and dislikes and selected and prioritized routines and activities to embed RBI based on their children’s preferences and the functionality for their family life (See Appendix H; Learner Profile and Appendix I; Family Routines Grid Handout).

The maximum duration of the intervention sessions was 60 min. Caregiver-researcher Zoom sessions were recorded to provide support during RBI implementation. During the treatment phase, I applied the naturalistic caregiver verbal behavior training package, which consisted of caregiver coaching components including adult learning elements, a procedural fidelity checklist, role-play opportunities, a 5-minute video tutorial, real-time performance feedback, and caregiver reflection.

Subsequent to the baseline sessions, I implemented caregiver coaching which included four key elements to build caregiver capacity for RBI implementation procedures: (a) Making

Connections to Create Opportunities, (b) Teaching and Practice, (c) Observation and Feedback, and (d) Session Review and Reflection. Using these core elements, I coached caregivers through the six RBI procedures: (1) setting up the environment and allowing the child to select the referent, (2) restricting access to the referent, (3) presenting the target level of antecedent, (4) waiting 5 s for a verbal response, (5) if the child made an error or didn't respond within 5 s, providing a prompt, and (6) reinforcing verbal behavior with access to the referent and generalized praise. I used the four key elements to facilitate caregiver learning during at least two 60-minute Zoom sessions a week across 11 and 16 weeks, respectively. A brief summary of the key elements and activities that were used to support the implementation of RBI procedures during intervention sessions is outlined in Figure 2.

During every caregiver coaching session, I reviewed the six RBI implementation steps. I implemented strategies to develop rapport and established connections with caregivers at the beginning of each intervention session to create meaningful learning opportunities. I gathered information from caregivers about family updates, recent experiences and events, and immediate family needs by asking caregivers what had happened since our last meeting. I asked caregivers how their child had been progressing and if they had any family news to share. I used the Family Routines Handout to review the family-selected routines and referents identified during the intervention meeting so they were ready to use during the current session. Likewise, I referred to how the specified family routine connected to families' initially shared goals and targets (Getting to Know You Handout). Next, I used the RBI fidelity checklist, I reviewed RBI implementation steps with caregivers and modeled each as applied in the family-selected routine. We viewed a 5-minute video tutorial on RBI procedures during the first intervention session. Families had the opportunity to view the video tutorial as needed throughout the remainder of the study. I narrated

the video demonstration, emphasizing points caregivers needed to remember. I revisited and reviewed the family-selected routine with caregivers and discussed the rationale for choosing the routine together. Subsequently, role-playing exercises on RBI procedures were presented to caregivers; these provided experiential learning, and they were followed by an open discussion and an occasion for participants to ask questions. For example, within the context of their family-selected activities or engaging with their child's preferred items, and using familiar examples and language, I assumed the role of the parent, while the caregiver acted as the child in order for the caregiver to experience each RBI step from their child's perspective. Afterward, we would switch roles so the caregiver could practice the steps of the intervention while I provided immediate feedback to reinforce and refine their execution. Following this, caregivers demonstrated four implementation trials of RBI procedures within their selected typical daily routine with their children as I provided coaching support through immediate feedback, problem-solving suggestions, and prompting. I provided real-time feedback based on observed caregiver RBI implementation procedures and their child's responses during the observation. I encouraged caregiver participation by providing positive feedback on their interactions with their child during their routine, and posed at least two questions or shared comments to promote occasions for the caregivers to resolve issues that might be encountered as they perform the intervention. Questions asked included, "Do you find it more challenging to reinforce mands in certain situations?" or "Have you noticed anything particular that your son is highly interested in lately?" During the final 15 min of the intervention session, I delivered general feedback to caregivers on implementing RBI procedures within the family routine. I discussed my observations of specific caregiver and child behavior. I asked caregivers to reflect on implementation steps, identify additional family activities to extend RBI, and requested they commit to at least one opportunity

to practice RBI procedures before the next intervention session. Caregivers' accuracy in RBI implementation was measured during each family-identified routine of at least a 15-minute duration. Researchers reviewed Zoom audiovisual recordings of all sessions using the Referent-Based Instruction Implementation Checklist for four trials.

Referent-Based Instruction. As Mason and Andrews (2014) explain, Referent-Based Instruction (RBI) combines both natural language teaching (NLT) and frequency building to strengthen verbal behavior. A *referent* is an identified item, activity, or event that is the basis of the verbal behavior training, the hub around which the four elementary verbal operants are taught. RBI begins with a free operant condition, i.e., the caregiver identifies the child's source of interest as determined by the length of time allocated to attending to that object and/or event.

Similar to several other behavior-analytic approaches, RBI is grounded on established empirically supported methods, such as multiple exemplar training and errorless learning. Additionally, RBI draws upon incidental teaching and pivotal response training. A key component of RBI is transferring stimulus control across verbal operants to shape novel responses to stimuli.

In accordance with the relative strengths of the verbal operant conditions as evaluated through the VOX, prompts are provided through the convergence of these conditions, most-to-least, until the individual operant response is independently evoked. During RBI, the referent evokes requesting, labeling, naming, and replying, incorporating milieu and discrete-trial training.

Naturalistic Language Teaching (NLT). During NLT sessions, caregivers spent the first 9 min engaging with their children in their selected naturally occurring activities and routines; the identified referents served as a locus of control for conditioning language,

functioning as reinforcers. Subsequently, caregivers conducted a one-minute fluency probe beginning with the presentation of the preferred items or activity and asking the child to label such, e.g., referencing a toy snake and saying, "What is it?" then providing an imitative stimulus to their child, "Say snake!". After restricting access to the item or activity, the caregiver asked, "What do you want?". Finally, they provided a fill-in-the-blank frame reflecting how their child engaged with the item during play, "Ssss goes the _____." Then, the caregiver continued with RBI within the context of family routines and play-based activities, e.g., continuing to play with the toy snake, swinging, piling blocks, painting, drawing pictures, and interacting with caregivers. The goal was to teach corresponding mands, tacts, echoics, and intraverbals for each stimulus or activity under motivational control. During training sessions, access to the referent was restricted, prompting the child to request. When the learner was engaged with the referent, the caregiver (a) presented the referent as a visual stimulus to evoke the tact function, (b) modeled the target response for an echoic, (c) restricted access to promote the mand function and (d) provided a fill-in-the-blank frame to produce an intraverbal. For instance, when a child plays with a toy truck, the echoic is evoked by the caregiver saying to the child, “Say truck”. Referencing the toy truck, the caregiver says, “what’s this?”, for a tact response. Restricting access to the truck, the caregiver will say, “what do you want?” for the mand condition. For the intraverbal, the caregiver provides the fill-in, “Vroom goes the _____”. During RBI the child’s preferences were continuously being assessed; caregivers allowed their children to play as they chose, not requiring engagement in any particular activity. RBI involved following the child’s lead.

Maintenance

Coaching was initially proposed to end for caregivers upon demonstrating 80% mastery of fidelity of implementation of RBI steps. Unfortunately, intervention sessions were discontinued for both caregivers before they could reach 80% mastery due to participant scheduling concerns and time constraints. Three and three and a half weeks later, two 15-minute maintenance probes were conducted to determine the caregivers' fidelity of implementation. During this time, no feedback or coaching was provided. Each caregiver dyad participated in two maintenance sessions.

Interobserver Agreement

A secondary observer (a Board Certified Behavior Analyst and trained practitioner in RBI) was trained to code RBI fidelity reliably before coding videos; operational definitions were provided. Prior to coding participant videos, they practiced coding videos to establish inter-rater reliability. Data on interobserver agreement was collected for 30% of randomly selected video submissions across all participants and conditions. In order to determine total interobserver agreement, point-by-point agreement was calculated by dividing the overall agreement number by the total agreement number plus disagreements and then multiplying that number by 100.

For caregiver dyad 1, Lina and Mario, average IOA for RBI fidelity at baseline was 100%. During intervention, mean IOA was 95.42% (range=93.46-100%) and during maintenance, the mean IOA was 95.02%. For caregiver dyad 2, Gina and Lucas, average IOA for RBI fidelity at baseline was 100%. During intervention mean IOA was 94.2% (range=91.01-100%) and during maintenance, the mean IOA was 95.26 (range=93.03-100%).

Caregiver Coaching Procedural Fidelity

To evaluate the consistency of the naturalistic caregiver verbal behavior package implementation, 40 percent of the caregiver coaching sessions were selected at random for fidelity scoring. A trained observer assessed procedural fidelity using a checklist based on the researcher's behaviors during recorded caregiver coaching sessions. Percent compliance was calculated by dividing the number of tasks completed during the coaching session by the total number of tasks and multiplying the result by 100 (see Appendix Q). Procedural fidelity across sessions was 100%.

Key Element	Brief Description of Activities Used
Making Connections and Creating Opportunities	1. Establish rapport with caregivers, sharing comments and information to enhance the caregiver and coaching connection. 2. Ask caregivers to provide any updates on family, recent events, recent challenges if any. 3. Share any information relevant to family needs. 4. Use Family Routines Handout to review family selected routine and referents (materials) used for session.
Teaching and Practice	1. Review RBI implementation steps with caregivers using RBI fidelity checklist and model each step 2. View 5-min video tutorial for RBI steps 3. Review family selected routine again and discuss rationale for use 4. Provide role play opportunity 5. Answer caregiver questions
Observation and Feedback	1. Provide coaching while caregiver practices RBI steps with their child during family routine of up to 15 min 2. Deliver real-time performance feedback throughout observation 3. Feedback may be specific (something observed) or general (encouraging or affirming)
Session Review and Reflection	1. Provide general feedback on overall caregiver and child behavior 2. Facilitate identification of additional family routines or activities throughout the week to embed RBI 3. Support caregiver to reflect on RBI procedures and plan for implementation within one family routine before next session

Figure 2

Brief Description of Key Elements

CHAPTER 4: RESULTS

The following sections report the study's outcomes. A visual analysis of graphed data is used to interpret data for research question 1. Changes in level, trend, variability, and immediacy of effect across conditions were examined. The verbal behavior Stimulus Control Ratio Equation (SCoRE) metric, as derived from the Verbal Operant Experimental Analysis (VOX), was used to determine child participants' proportionality of verbal repertoires and to report data for research question 2. An analysis of the strength of mand, tact, echoic, and intraverbal relations is provided. Additionally, an adapted version of Irving Seidman's *Three Part Interview-Series* (2013) was used to report on parents' experiences of learning and participating in the RBI caregiver training package. In-depth interviews are used to elicit detailed and authentic accounts of parents' experiences with the intervention.

Results for Research Question 1: What are the effects of a naturalistic caregiver training package on the accuracy of a parent's implementation of Parent-Mediated Referent-Based Instruction (PM-RBI)?

The primary dependent variable was caregivers' fidelity to the implementation of the six RBI procedures. Results for each caregiver participant are presented in Figure 3.

Overall, data suggest that following the introduction of the PM-RBI coaching package both caregivers improved their implementation fidelity from 0 to 75% and 0 to 66%; subsequently at maintenance fidelity improved, 83% and 71%. During the caregiver coaching intervention phase, plotted data revealed a slow but increasingly stable trend. During the maintenance phase, the positive effects of the caregiver coaching intervention remained consistent. Each graph presents participant data across baseline, intervention, and maintenance sessions.

Lina and Mario

During baseline sessions, Lina did not adhere to RBI procedures as written in the checklist. After the introduction of caregiver coaching, data indicated an immediate effect with a steadily increasing trend. Lina's performance increased to 8% on the first session and then steadily increased to 75% during the 9th coaching session. To address consistent implementation errors (i.e., *not waiting 5 s for a verbal response*), I conducted directed rehearsal immediately preceding the 6th and 9th intervention sessions. Following those sessions, Lina's performance increased relative to the previous session. Lina participated in a total of twelve intervention sessions and did not meet the 80% mastery criterion. Once meeting 75% accuracy, her performance remained stable with no improvement until her work and scheduling conflicts made it impossible for her to continue participating in Zoom sessions.

I conducted two maintenance probes three and three and a half weeks after coaching had ended. During this time, Lina was not coached or provided with any feedback. At follow-up, she demonstrated high levels of RBI implementation, with 83% of steps being executed correctly in both instances.

Gina and Lucas

During baseline sessions, Gina did not adhere to RBI procedures as written in the checklist. After the introduction of caregiver coaching, data indicated an immediate effect with a slowly increasing trend. Gina's performance increased to 21% in the first session and then steadily increased to 66% during the 14th coaching session. To address consistent implementation errors (i.e., *not waiting 5 s for a verbal response*), I conducted directed rehearsal immediately preceding the 11th and 15th intervention sessions. Following those sessions, Gina's performance increased from previous sessions. Gina participated in a total of sixteen intervention sessions and

did not meet the 80% mastery criterion. Once meeting 66% accuracy, her performance remained stable with no improvement until she was not able to continue participating in Zoom sessions due to family scheduling conflicts.

I conducted two maintenance probes four weeks after coaching had ended. During this time, Gina was not coached or provided with any feedback. At follow-up, she demonstrated high levels of RBI implementation, with 66% fidelity on the first probe and 71% of steps being executed correctly on the second follow-up session.

Results for Research Question 2: Following intervention, do children's verbal behavior repertoires increase, i.e., functional proportionality of requesting, labeling, echoing, replying as indicated by post Stimulus Control Ratio Equation (ScoRE)?

Child participants' balancing of verbal repertoires towards fluency as indicated by the verbal behavior Stimulus Control Ratio Equation (ScoRE) metric, derived from the Verbal Operant Experimental Analysis (VOX) was measured before intervention and after caregivers completed participation in PM-RBI. Pre-/post ScoRE metrics are presented for both child participants in Figures 4 and 5.

Data indicate an increased proportionality of mands (requests), tacts (labels), echoics (verbal imitation), and intraverbals, (replies) after caregivers' participation in PM-RBI across 12 and 16 weeks, respectively. Marios' pretest ScoRE increased from 0.39, a practical speaking repertoire, to 0.67, now classifying him to have a moderate repertoire, a difference of 0.28. Prior to beginning RBI, Mario's verbal repertoire was predominantly echoics with no mands or intraverbals. Subsequent to RBI, a more balanced repertoire developed with notable mands and emerging intraverbals. Lucas' pretest ScoRE increased from 0.82 to 0.92, presenting with a strong verbal repertoire and nearing a perfect post-test ScoRE, a difference of 0.1. While initially

presenting with fairly balanced verbal behavior, post-RBI, notable gains were observed for Lucas with improved intraverbal behavior.

Results for Research Question 3: What were parents' experiences of learning and participating in the RBI training package? (Seidman's three-part interview process)

Wolf (1978) defined social validity as the appropriateness, acceptability, and usefulness of interventions as processes and outcomes. Assessing social validity within parent-mediated interventions is critical. It ensures that strategies are effective not only in theory or controlled settings but are also practical, valued, and meaningful in real-world contexts where families live and interact. Traditional outcome measures might focus on specific behaviors or skills. Schwartz and Baer (1991) recommended using multiple data sources and methods to evaluate the intervention's social validity. Social validity of PM-RBI was conducted after the study, using an adapted version of Irving Seidman's Three Part Interview Series (2013) to report on caregivers' experiences of learning and participating in the caregiver coaching package. In-depth interviews helped elicit detailed and authentic accounts of parents' experiences with the intervention.

For many caregivers, receiving a diagnosis of ASD is the beginning of a life-changing experience. Parents often find themselves relentlessly searching for solutions, scouring for resources, and seeking expert advice to meet their unique challenges. In this regard, caregivers play the crucial role of natural change agents, seamlessly integrating instruction with play and making learning fun for their children. Most importantly, however, they evolve into effective interventionists for their children, adapting and customizing strategies to meet their unique needs, celebrating their successes, and helping them thrive and communicate effectively. Three main themes emerged from the participating caregivers' narratives: *No Answers*, *No Support, Learning to Teach: How to Begin and Keeping the Joy, and lastly, From Caregivers to*

Language Coaches, which reflect caregivers' lived experiences and participation in RBI. Each main theme has multiple sub-themes, each representing specific aspects of the main theme manifested in the participants' experiences and sense-making. Table 1 illustrates these themes, capturing caregivers' thoughts, learning, and experiences in PM-RBI. A chronological order of caregiver experiences is reflected in the main themes and sub-themes presented.

No Answers, No support

A caregiver's perception of their child's needs, milestones, and care is grounded in their parenting experiences or lack thereof. Some parents may notice a persistent disconnect, a series of behaviors, or patterns that may seem out of step with the typical developmental trajectory other parents speak about, i.e., difficulties with language, behavior issues, and social interactions. Their observations of behavior anomalies or challenges can evoke a storm of emotions: concern, confusion, fear, and an innate desire to understand and support. Suspecting that a child may have autism can be an overwhelming experience, filled with questions and a yearning for answers, as parents strive for a comprehensive response to their child's needs. Many families facing concerns begin with a desire for answers and an earnest quest for support. Both caregivers candidly detailed their challenges and the complicated series of events leading to receiving an autism diagnosis and seeking subsequent care.

A Loss for Words. Lina shared her early concerns for Mario, stating, "Well, it was at about a year, 8 months, Mario was already starting to say some words: he was babbling more than anything else, some words like *mama* and *agua*, and they were few, but he did say them, and when he was 2 years old, it was like he entered kindergarten and I thought that it had maybe been a very drastic change."

Gina similarly stated Lucas began pulling her hand to request items, "*me agarraba de la mano*" and would often line up toys or place them into piles more and more. "I said, it just doesn't add up to me anymore, ***no me gusta***, **I don't like it**."

> He was very sociable. He would go out with everyone, and he started not to be interested in smiling and being with people; he just wanted to be with me, and the only thing he would say was "mom," it wasn't even "mom" anymore, it wasn't even babbling, it was like sounds, like "ma" so after a year I said, I don't like this, I have another son, and I know they are different, ***these things don't fit together***.

Tears and tantrums. Lina continued to share how beginning daycare did not make a difference or seem to help Mario. "He was detached," she said, as he began kindergarten, "there was not a day that passed that teachers didn't call to give me some kind of **complaint** about Mario, "*todos los días, todos los días me daban alguna queja de Mario*." She further said that it was in conversations with friends and other parents that she grew increasingly concerned, sharing:

> In talking to friends and other moms, well, maybe it was just because of his age. Maybe he was very young. Maybe he was still too young, and he was maybe going to do all those things later on. That he was going to speak; well, that I should give him more time, but ***I knew*** that something was happening to him because he was already 2 years old, and he **did not speak** many words, and he had also stopped eating. So, that's when I started looking for what was happening at 2 years old. But then I saw that maybe it was what they say is the terrible 2 years, that it is a stage when they stop eating. But he was showing a lot of behaviors. You know, like **tantrum-like** and things like that.

Likewise, Gina shared that while Lucas was "very, very sociable and was very cheerful, *giving his arms to everybody* indicating wanting to be carried and held, she became worried at about one year old.

> I noticed that he was very restless, and then down the road, I also began to see that when I talked to him, when I was around him… I would say, "Lucas, Lucas", he did not turn around so easily. So many times, I had to yell "*Lucas* I'm talking to you", and sometimes he did not pay attention to me. He would turn away when we would go to a party, and when people would clap at parties, it was **traumatic**. For him, the word "bravo!" was traumatic. If people screamed, "*bravo*" when cutting the cake, he was horrible. It was an unbearable cry, I mean, it bothered him, irritated him so. I said, "***I don't like that".***

Lina also shared similar concerns about Mario, stating that by 3 years old, Mario's behaviors had worsened; stronger tantrums and constipation persisted, as did his limited language skills. Desperate, she found a pediatrician and hoped for some answers. She conveys

> And walking in, I remember, walking into the **doctor's office**… The doctor told me, ***your child is autistic.*** I said, "*No*, I brought him for something else". "He is autistic", he said. "I'll show you."

In recounting the pediatrician's assessment procedure, Lina described a series of questions and commands the doctor asked of Mario. She stated that as she exited the office, she told herself, "I'm going to look for what autism is, I don't even know what autism is, but I will look for what it is, and that same day, I started to look for help." The same was true for Gina; she shared that she was not able to ignore her concerns about Lucas. She, too, made an appointment with her pediatrician, who unfortunately said Lucas was still too young and he could not reliably assess or provide a diagnosis, advising her to return in a year. As Lucas started preschool, Gina began receiving frequent phone calls from his teachers as well. Gina related these accounts, stating"

> The teacher would call and say, "**he hits, he throws, he doesn't wait his turn, and screams."** And it was then, at two-and-a-half years, that I asked them, well, what do you recommend? They recommended I take him to a psychiatrist. ***No Podemos definer.*** We are unable to define it. Because we cannot be sure until 5 or 6 years of age, he said. But I do see autism, he told me. I remember he referred me to ***Doctora*** *Lorena*, and she gave him a diagnosis. It was a low level of autism.

Failed services and support. Both women shared that they sought services with multiple agencies but found it challenging to find the proper guidance and support for their children and families. Lina recalled enrolling Mario at a specialized center for children with autism but stated she was not in agreement with their rigid methods, stating:

> They wouldn't let him touch anything. They would sit him against the wall with the table on his stomach, pressing against him. Not able to move, not able to touch anything, not able to grab anything. So, I said no, this doesn't work for me. That's it. So, we left.

Lucas' mother, Gina, stated she was recommended to connect with several local autism and disability organizations and, upon making contact, was only able to register Lucas for services and placed him on a one-year-long waiting list. The two mothers ultimately were referred to participate in parent-mediated RBI through word of mouth by their respective healthcare professionals after both experiencing failed attempts to find providers that were able to support their needs. Lina cites, "A year and a half in therapy, we progressed nothing. When ***Doctora*** Varsovia shared this opportunity, we were interested. We have no speech or language services here." Gina similarly reported, "I couldn't figure out what else to do after being all over the place and not knowing what he had, what Lucas had, or what to do. And we decided to start this intervention (RBI)."

Learning to Teach: How to Begin and Keeping the Joy

Teaching consists of a systematic process: a data-driven and individualized set of procedures designed to meet the unique needs of learners. Teaching involves identifying environmental variables influencing behavior and leveraging this understanding to promote meaningful behavior change and skill acquisition. Learning is an active process; outcomes are actively shaped and reinforced by the teacher. Teaching establishes an environment where desired behaviors are encouraged, reinforced, and ultimately generalized.

Engagement. Both women described critical components of RBI, discussed their learning experiences, and detailed how they began and maintained momentum through the process.

Lina began by recounting:

> I learned how I could get the most language out of my child with those objects that he liked the most: *el mayor language con objetos que más le gusten*. I could see it, *Yo lo veia*, I saw him. He was very **imaginative and excited**, and sometimes, he **surprised** me when he would say words that I had not taught him.

She continued to share that while she was surprised to hear Mario say new words, she felt Mario was equally stunned as he stayed engaged and attentive during RBI sessions, noting that Mario was happy:

> I saw him happy; I saw him **happy**; I saw him excited. Sometimes, he was surprised because even he himself, I think, was surprised by what he was doing. But when we made these interventions, even *he* wanted more. In fact, he wanted to continue playing. He wanted to keep **playing**. He wanted to keep imagining, he wanted me to sit with him longer.

Lina recalled "I would say to myself, I want us to work and play with all those toys and things that he likes, his favorite things! Those things that interest him. So, he can stay with me. So, I used playdough and zoo animals. The playdough helped a lot!"

Gina also revealed that Lucas always seemed eager to engage in sessions and was **always ready**, recalling:

> What I liked about him; for example, even though he was sick, we had some sessions when he was sick, I tell you something, he always showed interest in connecting to Zoom. I mean, we would always come home, and I would tell him we were going to eat first, and he already knew it was time for the session, and then he was already waiting for me to connect because he already wanted to go. To sit down to see what we were playing. I felt like it was his reward for the day.

Gina detailed her comprehension of RBI and working with Lucas, stating, "it was the way it was explained to me first. I was not aware. I did not know about verbal operants. It was a wonderful experience. I learned about all four verbal operants. I would not have focused on all four. I didn't know. It was the way we were guided, **the way I learned** to help him, to help Lucas ask for things." Gina expounded on her description of RBI sessions, sharing:

> Lucas was so **engaged**. We would get into his **world of play,** and if we could get him to be attentive to the activities, we would ask him questions because it was related to what he was doing, what he was doing with the little pig or with Paw Patrol or with the patterns we had. What he liked, what we were doing, and what we were going to do. So, I feel that for him, it was a moment of targeted skill and **something fun**, He never said to me, I don't want to do this, I don't want to be on Zoom. At the end, when I was talking to you about my doubts, he wanted to leave, but I really felt that during the sessions, he was

> focused and played and wanted more activities and asked me for more, so I feel that for him, it was a stimulating game and lots of fun.

Connecting. Lina echoed her motivation for participating in RBI, explaining that she was interested in learning how to help Mario communicate and connect with others. She stated, "I wanted to help him increase his language, to speak more fluently, so others understand him. I want him to communicate with others because it is not just me. It is my brothers, my nephews. I want him to connect to others." Gina similarly described the struggles she had trying to find ways for Lucas to connect, noting:

"We were at "0", and I felt like we were at "0" before all of this. Now, we have moved ahead! Today, we listen to and sing songs together. We are driving in the car, and an English song comes on the radio, and he begins to sing and repeat it! As we drive, he points out things he sees and wants to tell me about them. He says "hello" to people when we are out. He has an interest in other things and people."

Development. Lina explained Mario's development as well as her understanding of RBI, "he made a lot of **progress**. His language was quite notable in the impact it had on him because, later, ***Doctora*** Varsovia also said that his language was more **fluent**. I mean, even other people said that to me." Mario also was receiving pediatric feeding services at a University Clinic at this time, and Lina commented, "When I would arrive there, they would go on with their other things and activities, but I would explain to them what I was learning. And where did you learn it, they asked. And I would say with Janet. She would say: wow. Yes. So, we have to follow the game. The intervention." Gina recalled Lucas' sessions progressing rapidly and ensuring she was well-prepared and ready to follow his lead to increase development of the verbal operants.

> Well, during the sessions, I sometimes wondered and said to myself, how am I going to look in the video? Then I saw that I got involved a lot. As you had mentioned. I didn't have to talk so much. It was good to evaluate myself to see my mistakes, but for example,

> I felt that sometimes I was very worried about trying to have him work on the four operants. But I often had my little sheet next to me to try to guide me with examples. And according to what he chose to do, that's what I would say. None of the operants could escape me. Sometimes, there were activities where Lucas would focus on one thing, and I would forget to do the one with fill-in-the-words, and so we would forget one. But Lucas was always, always happy.

Gina further recounted her own progress in RBI procedures and language development for Lucas, stating, " He is now able to participate in a conversation. The conversation is more fluent now. He did not have these words before, and today, he can have a short conversation with me". She continues, "I know I can help more; I can do better to teach him now. We need to do more work. Believe me, I will do it."

Both women related their efforts to ensuring sessions were engaging and joyful for their children. Lina expressed:

> When they told me 35 minutes, I said: 35 minutes? I wouldn't have been sitting with him for more than 15 minutes before. But when I could sit with him, and it was 35 minutes, and then it was 40 minutes! I said I'm going to do it. But when I saw that he was in the zone, I would say I will not let him stop so that he would not lose the rhythm; more than anything else, I did not want to lose the rhythm, and so we would play the whole time!

Caregivers to Language Coaches

Language is a bridge connecting individuals to their surroundings and one another. For children with autism, this bridge can seem obscured, making communication challenging. Parents spend most of their waking hours with their children during daily routines and activities. Through coordinated interactive experiences within everyday contexts, they facilitate their children's communicative development, promote language development, and evolve into language coaches using their children's interests as a bridge to harness communication and facilitate connectedness.

Both mothers reflected on their experiences and recalled their initial expectations and concerns. They related how participation in RBI met expectations for their sons and families, and further shared the significance of developing language skills for their children.

Conversations and Connections. Lina shared sincerely that the intervention contributed to **meaningful play** between Mario and his younger brother, Thomas. She observes them spending more time playing together.

> Yes, yes! And yes, it did help a lot, *Si, si! Y si le ayudo mucho!*
> Because then the two of them started to **play**. I started to see that the two of them played more. This imaginary type of games together, because before, for example, Mario would play on one side, and Thomas would play on the other side, and each one would play his own game. And now they play the same game **together**, and after a long time playing, yes, of course, there comes a moment when Mario is over it and stressed. And that's when the screeching comes. The yelling of Mom! He hit me! But that's normal.

She stresses that the key, "the strategy, more than anything, was the "***pure game,"*** the "***flame that lit the fire***" was the game. Knowing how to maintain and sustain sessions brought moments of struggle, however. Lina recalled how she would walk home from work, often "thinking how I was going to play with him today, and what were all his favorite things to use." She soon found out Mario was motivated by kinetic sand, Play-Doh, and drawing.

Language and socialization remain Lina's primary motivation for participating in RBI, stating she could continue the intervention unaided, stating:

> And it is worth it. I want him to be able to **socialize**. I would like him to be able to socialize and have a whole conversation with someone or whatever. And if someone is asking him, Mario, how are you, how are you feeling, what happened to your hand, does it hurt, something like that, he could do it a little bit more right now.

Gina also reflected on her experiences and described her initial hesitation to participate:

> Well, from the beginning, I didn't know much. I said, well, I do not know what this is going to be about, but surely there is a reason why God sent me these individuals, *you*. And there is a reason why I am in this; so, at the beginning, I did not understand much when I read what you sent us, and well, you say that they are interventions and everything, but I was kind of lost at the beginning. But once you gave us the guidance

> and everything, I said, now I understand where this is going. So, I think that, well, it is a program that helped me. I understood it, that is, I managed to understand it, what at the beginning I felt like I did not even know how to do; you talked to me until I understood it, and for example, with the interventions, where you showed me, with Lucas, and you used the verbal operants, and he answered you.

She likewise described her struggles to facilitate language and discussed her principal objective for Lucas was to communicate.

> He did his best, even if he didn't know how to say it perfectly, you would tell me, even if he doesn't say it perfectly, because I would often correct him and tell him, no, it's not like that. It's not "*opa*" (oop) it's *"sopa*" (soup), but he had the intention you would tell me. It's a mand, *es un mando*. Something he did not have before.

She further shared her excitement in seeing Lucas forming 3-word utterances, something he had not demonstrated in the past.

> He can form short sentences with some structure. Two or 3 words. Before, it was only one, maybe. Maybe it was milk. He didn't know how to tell me. He pointed it out to me. And now, Mom, milk, please! I mean 3 words; he already got them!

Eyes Wide Open. Caregivers candidly discussed their most poignant experiences during RBI. Alongside parenthood's day-to-day challenges, efforts to bridge communication gaps continued, with moments of clarity shared. Lina stated, "To this day, I am amazed at all that he can do with these items," she says. Reflecting on the program and its use on preferred activities and items, she states, "Some days I was surprised. And it was one day after another I did not let him rest. Well, I've come this far, I would say." Gina described RBI thoughtfully, "It is like a little circle that you're working on. You have to try to enclose everything so that he understands without pressure; he needs to enjoy the game and have fun." She continued to relate the intervention's impact through her daily routine with Lucas sharing "Believe me that every time I talk to him or we go somewhere, you are very present with us because I think of the verbal operants."

Towards Sustainability. Though separated by miles and circumstances, both mothers shared a similar purpose: facilitating their children's language development and ensuring its sustainability. Lina comments on RBI and her future goals stating, “This is worth it. Sometimes I would say, he's not going to sit here. But I was surprised. Now, it's about working on getting him to socialize. I wish he could socialize more. It will be about **building** on what I've learned to work on his language for that part now. Gina also emphatically expressed, “There is no turning back. Keep going with the verbal operants, keep going. Because I saw our jump, we are advancing. We go forward.”

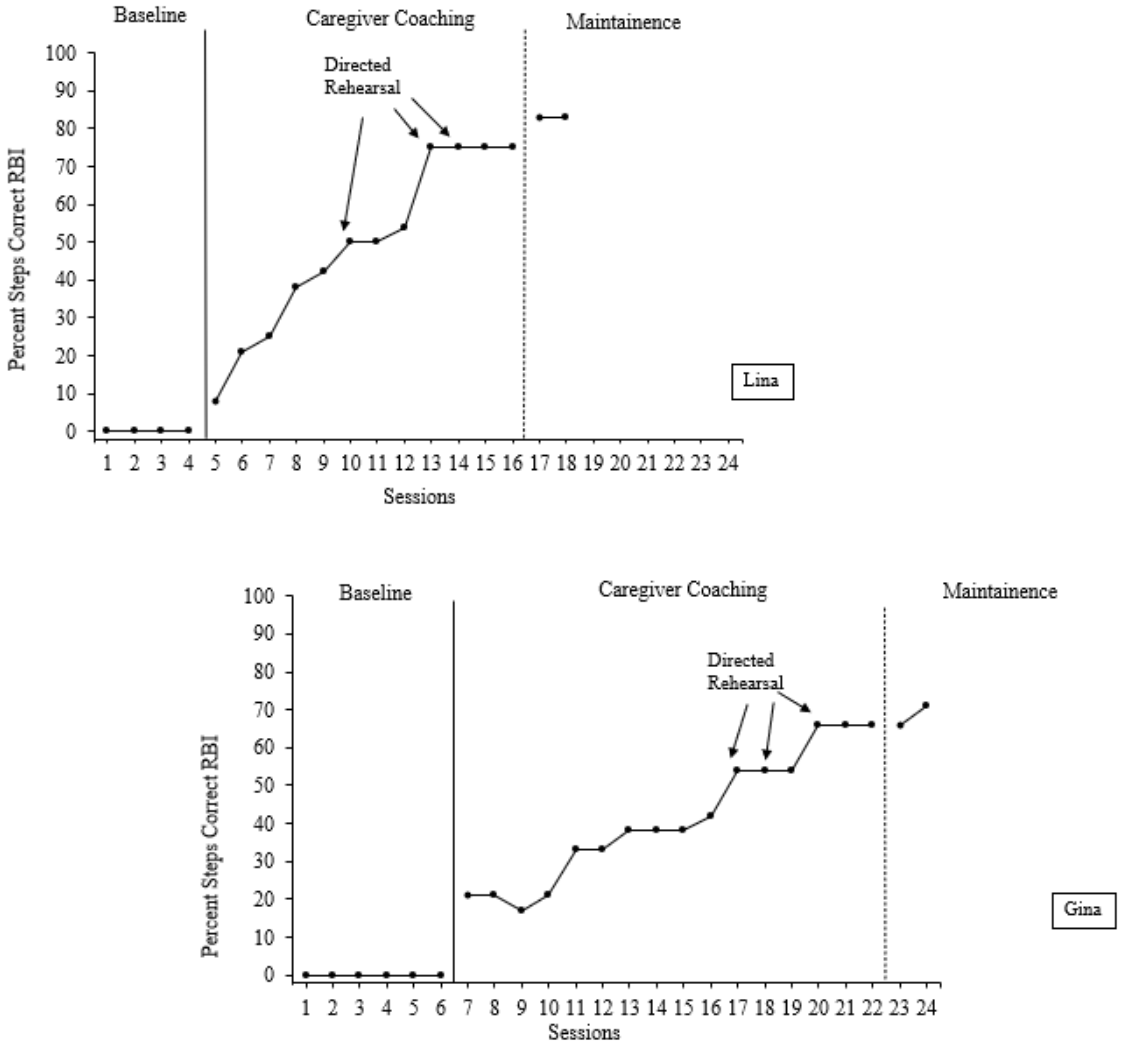
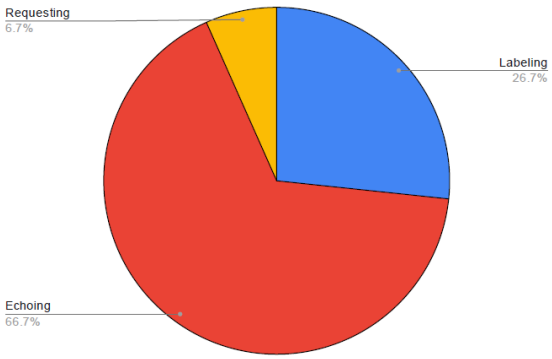
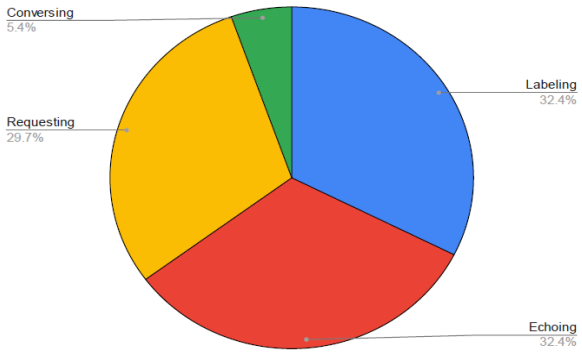


Figure 3

Percent Steps Correct of RBI



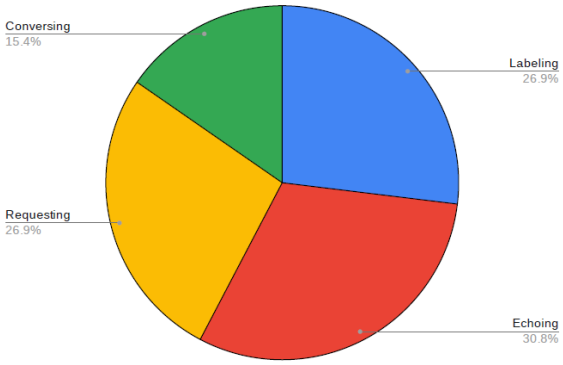
Mario Pre-test SCoRE



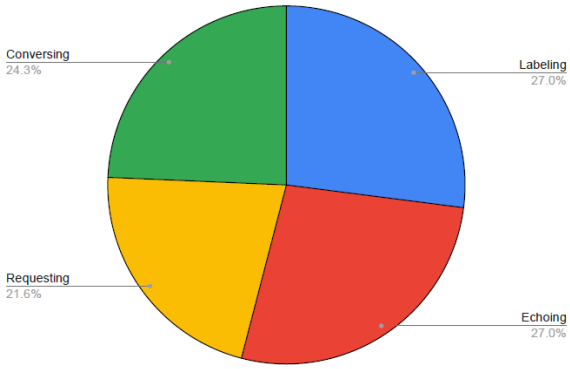
Mario Post-test SCoRE

Figure 4

Pre-/Post SCoRE Metrics Mario



Lucas' Pre-test SCoRE



Lucas' Post-test SCoRE

Figure 5

Pre-/Post SCoRE Metrics Lucas

Main Themes	Subthemes
(1) No answers, no support	● A loss for words ● Tears and tantrums ● Failed services and support
(2) Learning to Teach: how to begin and keeping the joy	● Engagement ● Connecting ● Developing
(3) Caregivers to Language Coaches	● Conversations and connections ● Eyes wide open ● Towards sustainability

Table 1

Three-Part Interview Series Participant Themes and Sub-themes

CHAPTER 5: DISCUSSION

This study examined the effects of a naturalistic caregiver training package on the accuracy of parents' implementation of a verbal behavior (i.e., requesting, labeling, echoing, replying) training intervention. Despite advancements in evidence-based care for individuals with ASD, barriers to service accessibility, challenges with training customization, scheduling issues, and stress among families persist as significant obstacles. The need for parent education is unmet by many families worldwide (Pickard & Ingersoll, 2016). Comprehensive, flexible programs considering caregivers' needs and preferences are essential to addressing these challenges. Caregiver coaching emphasizes caregiver-child interactions to ensure parents implement language intervention procedures at home (Green et al., 2010; Kasari et al., 2015). I used an experimental, single-case, non-concurrent multiple baseline across participants design (Ledford & Gast, 2018) to evaluate the effectiveness of a caregiver coaching intervention package. This package consisted of an initial 60 min didactic training on the basics of RBI delivered via Zoom, researcher-made caregiver materials to include, RBI Parent Guide & Family Handbook (Appendix R), Getting to Know You document (Appendix G), Family Routines and Activities Grid (Appendix I) and a Learner Profile Handout (Appendix H). Caregiver coaching sessions included four key elements to build caregiver capacity for RBI implementation procedures. Results indicated that the introduction of the naturalistic caregiver training package increased the accuracy of parents' implementation of RBI steps. Data indicated an immediate effect upon introducing the PM-RBI coaching package, with steadily increasing fidelity for both mothers. Fidelity improved significantly for both caregivers, from 0 to 75% and 0 to 66% at maintenance, correspondingly, fidelity increased to 83% and 71%.

In examining the collateral effects of the caregiver coaching package on child participants' effects, post-VOX analyses were conducted to determine improvements in child participants' verbal behavior as indicated by the SCoRE metrics. Both child participants demonstrated a more balanced verbal repertoire. Finally, I examined the social validity of the naturalistic caregiver training package using Irving Seidman's Three-Part Interview Series (2013), collecting detailed accounts of caregivers' experiences from which three common themes emerged. In this chapter, I discuss outcomes from the study for each research question and relevant themes. Lastly, I present contributions, limitations, suggestions for future research, and implications for practice.

Discussion for Research Question 1: What are the effects of a naturalistic caregiver training package on the accuracy of a parent's implementation of Parent-Mediated Referent-Based Instruction (PM-RBI)?

Visual analysis indicated that parents' fidelity to implementing the six RBI procedures increased only upon introducing the naturalistic caregiver coaching package. Implementation fidelity improved from 0 to 75% and 0 to 66%, consistent with existing literature on training and coaching (Eleck & Page, 2019). These results show that parents can improve their fidelity to implementing RBI procedures, taking on a critical role as language interventionists, upon participation in the naturalistic caregiver coaching package. The package comprised vital elements to build caregiver capacity for RBI procedures through (a) Making Connections to Create Opportunities, (b) Teaching and Practice, (c) Observation and Feedback, and (d) Session Review and Reflection. Several of these elements are consistent with coaching practices in business, sports, and cognitive psychology (Rogers et al., 2021). These components align with crucial research in support of family-centered care and practices (Dunst & Trivette, 2009).

Family-centered practices set parents and their children at center stage, assisting caregivers to incorporate their children's intervention into their everyday routines, as presented in this study, which identified preferred family routines, activities, and items for PM-RBI. Contrary to parent education or training, caregiver coaching is rooted in family-centered care, emphasizing family needs, strengths, values, and preferences (Turnbull et al., 2014). This study provides further evidence of the effectiveness and an example of a family-centered caregiver coaching verbal behavior model practical for implementation. Moreover, it is noteworthy that PM-RBI integrates materials that are cost-free, family-selected, and highly preferred, which reflect caregivers' and cultural preferences (Enriquez, 2023; Mason & Andrews, 2014; 2021), responsive to families of any race or ethnicity. These findings further align with those of Wattanawongwan and colleagues (2022) examining the use of virtual coaching to instruct caregivers of children with ASD, and previous literature on parents supporting increasing their children's communication repertoires (Meadan et al., 2017; Pickard et al., 2016; Vismara et al., 2014;). Accordingly, the current study similarly addresses the need to develop family interventions that are effective, feasible, and acceptable to family members (Ellison et al., 2021).

Motivation and Reinforcement

At the onset of this study, I assessed parental motivation for both caregivers, i.e., caregivers' goals, which they identified as increasing language and communication in their children. A concept identified by Knowles (1980) asserts that behavior change begins when adults feel compelled by intrinsic values, i.e., of particular essential worth. As caregivers developed into being their child's principal interventionist, they capitalized upon their children's preferences and interests within sessions. RBI integrates the child participants' interests and preferences; teaching trials are based on preferred items or activities, referred to as referents.

Once the preferred referent is identified, the caregiver uses it to teach the verbal operants, potentially establishing the caregiver and instruction as effective reinforcers. Caregivers described RBI sessions as largely positive, enjoyable, and engaging for their children, reporting that their children took pleasure in daily activities with them using their favorite items.

In general, caregivers reported RBI procedures to be straightforward and that the format of the sessions was easy to follow. They also reported that activities were relevant and aligned with their family values. The consistent engagement of their children as their language progressed may have been the caregivers' most potent reinforcement for faithful RBI implementation. Consistent with previous research findings, effective coaching can lead to parents' adherence to the intervention steps, consequently improving outcomes for their children (Stahmer et al., 2011). Focusing on the family unit rather than the researcher's point of view is likely an essential aspect of coaching.

During the initial stages of PM-RBI, I guided caregivers to recognize their motivation; we identified family goals and targets using the "Getting to Know You Handout." Among the questions posed to caregivers were what they sought with the intervention, what worried them most about their children, and their most significant challenges as a family. This package could benefit from expanding methods for identifying additional reinforcing contingencies to include in weekly parent practice handouts, notes, and periodic reminders such as session reminder e-mails, voice messages, weekly video reminders, or text messages. Consequently, caregivers' goals are further supported, confidence is promoted, and children's outcomes are enhanced.

Directed Rehearsal: Prompting and Time Delay

Both caregivers' data revealed a slow but stable trend during the caregiver coaching intervention phase. In efforts to support caregivers' consistent implementation and accuracy of

RBI procedures, directed rehearsal sessions were introduced to address missing or incorrectly executed steps. Directed rehearsal began with describing the intervention steps that were missed or implemented incorrectly. Before the next training session, we engaged in three role-play opportunities to practice this step. These role-play exercises addressed challenges noted during previous sessions. We reviewed previous video clips and then modeled the correct implementation. Participants were subsequently given the opportunity to ask questions.

This corresponds with essential elements of effective caregiver coaching and education research that includes the provision of direct instruction, modeling, role-playing, and providing feedback (Kaiser & Roberts, 2013; Laski et al., 1988; Matson et al., 2009; Romano & Schnurr, 2022). Previous studies have noted that directed rehearsal procedures can effectively improve levels of participant fidelity to 100% (DiGennaro Reed et al., 2018; Stenhoff et al., 2020; Ward et al., 1998). Directed rehearsal has been shown to be highly effective in correcting spelling errors, oral reading, teaching signing to learners with and without disabilities (Grskovic & Belfiore, 1996; Conaghan et al., 1992; Ward et al., 1997), and most recently in facilitating caregivers' instruction for individuals with ASD and complex communication needs during COVID-19 and school closures (e.g., Stenhoff et al., 2020).

During coaching sessions, I used directed rehearsal to address errors made during the implementation of time delay procedures. Specifically, caregivers often failed to deliver a controlling prompt and wait the specified delay interval prior to delivering the prompt. These challenges in implementing time delay are consistent with those in previous investigations. Gillett and LeBlanc (2007) examined using a Natural Language Paradigm (NLP) intervention with three children with autism and their mothers. Caregivers received NLP training as part of their efforts to support predominantly nonverbal children. Mothers sat on the floor with various

toys and books, facing their children. Parents often used a variety of preferred stimuli to encourage vocalizations. Mothers described the toys' actions and then wait up to 5 s for the child to respond. Researchers noted that mothers struggled most with providing a delay during which spontaneous vocalizations could occur. Mothers were instructed to continue modeling the vocal behavior for three more trials if no response occurred. Using various objects, they repeated this method. Two of the three children showed significant improvements in their play. Caregivers reported the intervention to be valuable and straightforward to use.

Similarly, Wright and Kaiser (2017) assessed the effectiveness of the Teach-Model-Coach-Review strategies on parents' use of Enhance Milieu Teaching to increase young children's communication skills and also found caregivers presented challenges implementing time delay procedures and also had difficulty generalizing and maintaining their use. According to Trivette and colleagues (2009), training methods where learning experiences occur for more than 10 hours produce better learning outcomes for adult learners. As a practical matter, parents need ample time to learn to use time delays and prompts correctly. It may be better to dedicate time upfront in the intervention program to teach these specific procedures, and create video models for these critical steps to ensure consistency and have caregivers practice these methods sufficiently. Approaches addressing over-prompting and mis-prompting can include instructions on effectively delivering controlling prompts using video demonstrations.

Discussion for Research Question 2: Following intervention, do children's verbal behavior repertoires increase, i.e., functional proportionality of requesting, labeling, echoing, replying as indicated by post Stimulus Control Ratio Equation (SCoRE)?

SCoRE metrics, as generated from the VOX analyses, indicated an increase in the proportionality of mands (requests), tacts (labels), echoics (verbal imitation), and intraverbals,

(replies) after caregivers' participation in PM-RBI across 12 and 16 weeks. Mario's pretest SCoRE increased from the practical category of 0.39 to the moderate category of 0.67, as such, resulting in a more balanced repertoire, increased mands and the emergence of intraverbals. Lucas' pretest SCoRE increased from an already strong repertoire of 0.82 to 0.92; while initially presenting a relatively balanced verbal behavior, his intraverbal responses improved notably after RBI.

Lucas' moderate improvement in intraverbal skills is notable, as these skills are considerably more complex, requiring the judicious conditioning of intraverbal responding and the development of advanced verbal repertoires. Sundberg and Sundberg (2011) contend that many learners with ASD or language disabilities may often acquire modest mand, tact, and listener responding skills yet fail to develop complex intraverbal skills. These learning challenges might be because most intraverbal behavior involves complex verbal stimulus control (Axe, 2008). Skinner (1957) introduced the concept of ‘‘compound verbal stimulus" (p. 76) in the context of intraverbal behavior evoked by multiple verbal stimuli related to a single antecedent event. Sundberg and Sunberg (2011) suggested the more precise term of verbal conditional discrimination (VCD), that is, consisting of two or more elements of a verbal stimulus where one verbal stimulus modifies the evocative effect of another verbal stimulus (or vice versa) within the same antecedent event. The development of verbal conditional discriminations becomes increasingly more challenging as we add more verbal stimuli, primarily by adding language modifiers such as conjunctions, adjectives, or prepositions. A lack of consideration of VCD programming may inadvertently result in a speech pattern associated with ASD (Sundberg & Sundberg, 2011), as evidenced by caregivers reporting a shift from their children's previous rote verbal responses to the emergence of 3-word utterances and increased

intraverbals after RBI participation. Thus, identifying the conditions that lead to complex intraverbals is vital to understanding a learner's language development and determining effective interventions (Sunberg & Sundberg, 2011). Previous research has indicated that teaching intraverbal behavior requires a sophisticated skill set involving verbal conditional discrimination (Axe, 2008; DeSouza et al., 2017; Sundberg & Sundberg, 2011). Future research should examine controlling variables and contexts such as motivating operations, preferred items, or activities for developing advanced intraverbal behavior in young learners with ASD.

RBI emphasizes teaching the verbal operants interdependently, stressing the transfer of control across all four verbal operants as the principal objective (Mason & Andrews 2014; 2019), which was evident across both child participants' post-SCoRE results, particularly as evidenced in their increased number of mands and intraverbals. Skinner underscored this importance in his seminal work, *Verbal Behavior*, and subsequently, researchers have observed that learners with ASD have specific challenges generalizing their verbal responses across conditions (DeSouza et al., 2019; Ploog, 2010). As a result, language programs such as RBI have systematically taught the verbal operants across conditions, and include procedures for transferring stimulus control between operants, progressively fading contrived stimulus control sources until spontaneous responses are achieved (e.g., Mason & Andrews, 2014; 2020; Sundberg & Partington, 1998).

Caregivers' attempts at transfer of stimulus control proved at times challenging, noted by plateaus in their fidelity data. Facilitating spontaneous responding required caregivers to systematically fade stimuli during Zoom sessions and employ intentional prompts. For instance, when a learner was playing with play-dough, to evoke the echoic, the parent would say to the learner, "Say play-dough," then quickly referencing the play-dough, the parent would say, "What is this?" for a tact response. The parent would then remove the play-dough and say to their child,

"What do you want?" evoking the mand condition. To evoke intraverbal responses, parents would provide a fill-in opportunity like, "You Squish, squish, squish the_____." This was a complex procedure for both caregivers to learn; however, it was a necessary technique to produce the desired outcome of a balanced, fluent verbal repertoire.

Discussion for Research Question 3: What were parents' experiences of learning and participating in the RBI training package? (Seidman's three-part interview process)

As Wolf (1978) outlined, social validity consists of three elements: the intervention's goals, the procedure's acceptability, and the social consequence of the intervention. According to Wolf, intervention goals should reflect societal interests; procedures should be acceptable and feasible, and participants should be satisfied with both intended and unintended effects. An intervention is more likely to be effective and garner approval if it targets meaningful objectives of central concern to the consumer or caregiver and provides practical procedures for implementation (Leko, 2014).

To assess social validity, I conducted semi-structured interviews with both caregivers. I added to existing literature on PMI through an in-depth analysis. Seidman's Three-Part Interview Series (2013), a phenomenological interviewing model, was used to explore social validity by considering the intervention components, contextual factors, caregiver experiences, and beliefs leading to the successful implementation of the intervention. Parent interviews generated three main themes: *No Answers*, *No Support, Learning to Teach: How to Begin and Keeping the Joy, and lastly, From Caregivers to Language Coaches*.

Caregivers drew upon the experiences that led them to participate in RBI, recounting their complex journeys to receiving a diagnosis, describing their initial concerns about their children's limited language and behavior challenges, and detailing their unsuccessful attempts to

access services. Next, they described their involvement with RBI implementation, primarily personal accounts of their children engaging and actively responding favorably in the sessions. Caregivers provided candid accounts of their hopes and aspirations for their children. Targeted goals centered specifically on the development of language; both mothers sought to improve their sons' communication skills.

Gina affirmed the significance of RBI for her during her caregiver interview, stating, “It teaches you to question them; it teaches you to help them to express themselves.... That makes you, as an adult, practice and rehearse, and then you can use it as a game to teach language.” Wolf (1978) emphasizes that successful intervention requires we address meaningful and significant goals to clients. These data support this tenet, as Lina also further shared:

> Well, I wanted Mateo to be able to tell me, “Mom, this is happening to me, Mom.” I needed him to be able to share his needs, because if he couldn't communicate, how would I know that Mateo was maybe sick? I wouldn’t even know that Mateo was sick. I needed Mateo to tell me what he was feeling, so I could help him.”

Both caregivers admitted their initial apprehension upon being introduced to the RBI procedures but shared that, subsequently, they were encouraged by their children’s responses to the intervention. Gina recounted her initial thoughts and implementation steps:

> I mean, I told him everything. Because I didn't even know how to guide him. And I gave him everything. I solved everything, and now I understand that I should not have done that. I mean, I know now that I should encourage him to use his words. That’s one thing I was taught.

Moreover, a component of PM-RBI has the caregivers and child participants identify preferred family activities and select materials for each session. This study underscores the essentiality of

focusing on family priorities. As a result of meeting family preferences and needs, intervention sessions became more interactive, communicative, and reciprocal between caregiver and child, which positively impacted social validity; a finding supported by prior research (Ogilive & McCrudden, 2017; Yang et al., 2020).

During Lina's caregiver interview, when asked if RBI had met her expectations, she responded, “Yes, yes, it helped because he has many more words, but I feel that yes. He still lacks more, and I know it’s not overnight, but we are working on it.” Furthermore, beyond the structured RBI sessions, the caregivers extolled the benefits of PM-RBI. The interviews revealed the positive social consequences families experienced post-intervention, as parents noted their children’s increased language abilities, as evidenced by two observations: play interactions with siblings outside of RBI sessions and singing songs in the car with caregivers.

Neither caregiver reported the virtual delivery of the intervention as challenging, but rather they endorsed the intervention delivery model as a feasible option. Our findings are consistent with those of similar investigations. Little and colleagues (2018) evaluated a telepractice model of early intervention that was rated equally feasible and effective by parents. Similarly, Wallisch and colleagues (2011) assessed caregivers' perceptions and acceptance of an occupational therapy intervention delivered via telehealth and found that families rated telehealth delivery as collaborative, feasible, and compatible with their lives. Researchers have asserted that expanding considerations of social validity must include sustained improvement in behavior change (Kennedy, 2002); as such, maintenance probes of caregivers’ fidelity of implementation indicated the continuance of skills learned, 83% and 71%, supporting PM-RBI’s social validity.

Overall, their reports on PM-RBI were overwhelmingly positive, with parents describing their children as “happy, joyous, and engaged” when participating in the intervention and

characterizing it as timely and beneficial for their families. This is unsurprising as it is consistent with previous research findings. Resua-Tomeny (2020) examined the social validity of telecoaching to support working with families of toddlers with or at-risk for ASD and obtained highly positive responses from caregivers, likewise, obtaining the highest overall ratings for interventions that were collaborative, feasible, and focused upon family and child communication, and socialization outcomes.

Qualitative research may view subjectivity as an adversarial element in research requiring control. However, surrendering to our subjectivity yields more passionate and authentic inquiry. Peshkin (1988) underscores the need to be meaningfully attentive to their subjectivity and asserts it is "like a garment that cannot be removed". The researcher's identity plays a significant role in research as it can impact the study's design, conduct, and interpretation. Acknowledging and addressing the researcher's identity is essential for transparency and ensuring the research's trustworthiness.

I am a Mexican-American female non-traditional doctoral student. I have developed my perspective as an Autism Education Consultant, board-certified behavior analyst, and researcher through my professional background, experiences, and education. My 17 years of experience working in schools, social service settings, providing professional development, and having a sibling with a autism diagnosis, have led me to pursue this research. First-hand experience has shown me how Latino families face significant challenges because of a lack of access to programs, services, and behavioral support for their children. As a result of language barriers, immigration status, financial hardships, and transportation issues, they faced countless obstacles. My lived experiences and interactions with my environment largely shape how I view the world. This research is influenced by values and beliefs that are unique to me, and I need to detail those

values and beliefs to remain intellectually sincere. This prompts me to examine my values and biases toward multicultural and linguistically diverse families in general and families of children with ASD in particular.

Contributions of this Study

This study contributed to the parent training and coaching literature in several ways. First, by demonstrating that brief parent training, customized caregiver resources, and virtual coaching interventions can increase the accuracy of RBI implementation, leading to meaningful communication gains for young children with ASD. In addition, parents expressed positive experiences regarding the intervention. Specifically, the caregiver intervention package incorporated critical elements of joint planning, observation, teaching, and reflection opportunities to build caregiver capacity for RBI procedures. These are vital components referenced in the caregiver coaching literature that may provide an effective model for achieving fidelity. Similar to previous studies, this investigation illustrates that virtual coaching models are both acceptable and valuable to caregivers (Biel, 2020; Shire et al., 2021).

Additionally, this study demonstrated the extended utility of RBI through the participation of caregivers as natural change agents involved in everyday routines and activities within their natural home environments. Further, these results help to inform service providers, practitioners, and researchers to consider naturalistic teaching models, such as PM-RBI, to support training and intervention for families of children with ASD. Insomuch as the participants in this project were residents of Mexico, where support services for children with ASD and related disorders are scarce, the outcome of this research provides potential options for families of underserved communities, contributing to the development, expansion, and evaluation of virtual service delivery.

Limitations of this Study

These results are encouraging; nevertheless, there were limitations that should be considered when interpreting them. First, I used a nonconcurrent multiple baseline single-case design methodology with only two participants. The nonconcurrent multiple baseline design is limited in detecting causality because of the lack of simultaneous intervention implementation across baselines or participants. While it sufficiently controls for individual differences, it does not control for time coincidences as well as a concurrent multiple baseline design across participants. Despite this weakness, several researchers have suggested that the design poses only minimal risk. Slocum and colleagues (2022) recently asserted that nonconcurrent baseline validity requires attention to three dimensions of lagged phase changes across tiers. This across-participant design with staggered intervention implementation allowed for two demonstrations of experimental effect at two different points in time, but as recommended, I varied the number of baseline sessions (Horner et al., 2005; Kratochwill et al., 2010; Slocum et al., 2022). Slocum et al. suggest that some experiments will benefit from the use of a concurrent design (e.g., research that happens within the same classroom, MBL across behaviors) in which it may be important to control for cross-tier threats to internal validity. While other experiments will benefit from a non-concurrent design (i.e., the majority of experiments in which cross-tier threats are unrealistic), which insulates any potential coincidental timing effects. This is an applicable example to the current study in which two caregivers participated in intervention from two different states in Mexico at two different times with a minimal risk of coincidences. Slocum et al. (2022) findings provide support for the idea that nonconcurrent multiple baseline designs can rank as highly as traditional multiple baseline designs (Kratochwill et al., 2022).

Second, we only collected four baseline data points due to scheduling constraints for Lina. Despite the preferred recommendations for a minimum of five by What Works Clearinghouse standards, three meet the minimum criteria for single case research design methodology (Horner, 2005; Lane & Gast, 2014; WWC, 2022). A third limitation was that I conducted the study online via Zoom technology. The remote technology presented unique obstacles to caregivers' attention and participation. During some sessions, participants and the researcher faced issues related to internet connectivity, hardware problems, and navigating the use of new devices to participate. At the start of the intervention, the researcher provided technological coaching and modeling on using the Zoom platform, proactively addressing factors which may potentially impact parents' response efforts during the intervention. A fourth potential limitation involved the delivery of RBI in an unstructured environment. Because caregivers participated in the intervention within their natural settings (i.e., their homes) they were more likely to be distracted than if they attended a center-based intervention program or received an in-person consultation. Both caregivers had additional children under their care during scheduled intervention sessions. Balancing parenting responsibilities, taking on the role of primary interventionist, and coordinating household tasks was reported to be or was likely challenging. Moreover, another limitation to note is that intervention sessions stopped before participants could reach 80% mastery criteria due to various schedules and life events for both caregivers.

A sixth limitation was that although maintenance probes were conducted, generalization probes to novel settings or change agents were not incorporated into the intervention. Naturalistic teaching has particular utility for teaching social-communication skills to young learners with ASD. Integrating these practices within everyday routines in the home and the community is

critical, as is the inclusion of additional communication partners, allowing for repeated practice leading to further language acquisition and generalization. Future research is needed to demonstrate external validity, determining whether results of this study are applicable to real-world contexts beyond the research setting. Additionally, generalization probes are necessary to assess whether the effects of this caregiver coaching package generalize under various circumstances and individuals.

Lastly, I collected social validity data using caregiver-participant interviews, subject to perceived sources of biases and threats to validity and reducing reliability. The most common risk associated with participant interviews is social desirability bias. As a result of social desirability bias, participants respond in a way considered socially acceptable or desirable rather than honestly. A possible solution to this may be to not only involve the participants but also include other individuals impacted by the intervention, i.e., siblings, grandparents, close friends, or relatives. In addition, the use of supplementary social validity instruments such as questionnaires or focus groups may be explored. In addition, as part of ensuring the assessment of social validity accounted for the trustworthiness of the data, an additional researcher was not retained for member-checking purposes. This process assists in validating the accuracy and reliability of the data and fosters a collaborative and transparent relationship between researchers and participants. Future studies should incorporate this crucial technique to ensure alignment with participants' perspectives and experiences, increasing the credibility and dependability of the research.

Finally, it is advisable to assess social validity during the intervention. A number of studies report that conducting social validity assessments before or during treatment development increases participants' overall satisfaction with the program (Baer et al., 1987;

Kennedy, 2002). Future research should continue to evaluate flexible and responsive methods to assess social validity of intervention for caregivers.

Suggestions for Future Research

Although this study's findings support the efficacy of naturalistic teaching models of PMI, demonstrating that the training is socially acceptable and valuable for caregivers, future research is warranted to extend and further develop this caregiver training program to increase modality options. The acceptability of the intervention should be closely examined across all participants to include siblings, and or related service providers such as teachers, therapists, and other family members. This may result in more effective procedures for consumers. Future studies should investigate and develop innovative approaches to incorporate the perspectives of those who may find it challenging to participate in social validity measurements, such as those who use speech-generating devices, individuals who speak a language different from the researcher, or young learners who may not have vocal verbal behavior (Snodgrass et al., 2022). Additionally, a self-reflection resource for caregiver coaching may be warranted to support effective and responsive family and learner outcomes. Reflection is a valuable tool for early childhood practitioners to strengthen their caregiver coaching relationships with parents. Reflection opportunities to support self-awareness, active listening empathy and perspective taking, and consideration of communication style are suggested as future areas of investigation (Inbar-Furst et al., 2020).

Previous research has determined that families of children with disabilities face increased health and economic challenges, contributing to decreased quality of life (Garcia et al., 2020; Hassanein, 2021). Flexible and customized web-based or hybrid models of programming are necessary to accommodate caregivers' busy schedules. In the current study, the researcher

delivered the intervention via videoconferencing to one caregiver dyad at a time. Future investigations can examine comparisons across asynchronous and synchronous modules of PM-RBI available to a larger number of caregivers.

Next, future researchers could evaluate methods for scaling up PM-RBI training opportunities through thoughtfully crafted parent-professional partnerships within local community providers, i.e., Head Start, Early Childhood Intervention, Autism Support Groups. The integration of PM-RBI within local organizations or community partners, particularly across marginalized communities, would facilitate the delivery of more services to families at once. Providing PM-RBI at the local level might strengthen parent-professional relationships and empower caregivers, resulting in a shared responsibility and a trusted relationship (Dunst, 2020).

Moreover, this study specifically focused on parents as primary interventionists for their children, and future research can examine sibling-mediated RBI. Siblings of individuals with ASD fit naturally into the peer-mediated intervention literature, as they provide immediate social support (Mortimer et al., 2014). Siblings are generally the longest-lasting relationships (Gilligan, et al., 2020), providing a familiar and consistent partner for language learning and socializing opportunities.

Linguistic diversity across the nation has grown significantly over the past three decades. Consequently, US families with children with ASD who speak languages other than English are on the rise (Trelles & Castro, 2019). Further research should examine the adaptability and customization of PM-RBI through the use of online platforms to various cultural and linguistic contexts and communities, ensuring that the training is relevant and effective for diverse populations, e.g., learners that use speech generating devices, multilingual learners.

Implications for Practice

There are several implications for practice suggested by the results of this study. Further and more comprehensive research on effective and practical parent-mediated language interventions for young learners with ASD might substantially bridge the gap between research and practice for caregivers of young children with ASD, feasibly placing parents as the primary interventionists for their children. In addition to reducing program costs, PM-RBI allows caregivers to conveniently integrate practices into their routines while increasing access to evidence-based services for those who would otherwise be unable to find trained professionals. Previous studies indicate that despite the growing body of literature on autism and evidence-based practice, families nationwide continue to face barriers to service delivery, such as access to healthcare providers to support language, behavior, and social communication development, negatively impacting their children's long-term health and quality of life outcomes. (Antezana et al., 2017; Malik-Soni et al., 2022; Rivard et al., 2015; Vogan et al., 2017). Fortunately, these current findings suggest that parents can successfully enhance their children's language acquisition in their home environments with RBI, while supporting the socially acceptability and validity of this intervention. Given the naturalistic model of the intervention and the few resources needed, the model offers potential for rural, underserved populations that do not have access to specialized treatment.

As previously mentioned, much of verbal behavior is under the control of multiple stimuli, and nearly all intraverbal interactions are multiply controlled (Skinner, 1957). The RBI approach is premised upon recognizing that verbal operants are typically under multiple stimulus control. Once a balanced verbal repertoire is achieved, interventions can focus on the expansion of intraverbals. The results of this study confirm the importance of having caregivers teach the

verbal operants interdependently for fluency during preferred family routines. Research indicates that conditioning intraverbal responses requires explicit instruction for learners with ASD and related language deficits to develop social interactional skills. Kisamore and colleagues (2016) demonstrated that learners with ASD attain complex intraverbal repertoires under highly structured conditions. This study supports the practice of parents teaching multiple responses throughout teaching sessions and employing different methods to develop a variety of responses, thus enhancing complex verbal behavior (Stauch et al., 2017).

Summary

In the current study, I examined the effects of a naturalistic caregiver training package on the accuracy of parents' implementation of a verbal behavior training intervention, Referent-Based Instruction (RBI). Moreover, following the intervention, child participants' verbal behavior repertoires were assessed, i.e., functional proportionality of requesting, labeling, echoing, and replying as indicated by the Stimulus Control Ratio Equation (ScoRE). Finally, I explored caregivers' experiences of learning and participating in the PM-RBI package via Seidman's Three-Part Interview (2013), examining its social validity. Results showed that following the introduction of the coaching package, caregivers improved their fidelity of RBI procedures and improved their implementation post intervention. Both child participants' communicative fluency increased after PM-RBI, as observed by the balancing of verbal operants as represented by pre-/post SCoRE metrics following VOX analyses. Seidman's Three-Part Interview Series, was used to explore caregivers' experiences participating and learning in the caregiver coaching package, revealing consistently positive outcomes by participants addressing mothers' initial goals, resulting in socially meaningful effects beyond the intervention.

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APPENDIX A: CENTER LETTER OF SUPPORT

November 28, 2022

To the University of North Carolina Charlotte Institutional Review Board (IRB):

My name is Mariana de los Santos, and I am the founder and Clinical Director of Bloom Children's Center in Monterrey, Nuevo León, Mexico. Bloom Children's Center is an independently owned Applied Behavior Analysis Center for Children with Developmental, Learning and/or Behavioral Disabilities.

I am writing this letter to confirm that we support their research project, "*Effects of Parent- Mediated Referent-Based Instruction (PM-RBI): A Verbal Behavior Training Package for Young Children with Autism".*

I am aware that the project involves using a naturalistic parent training package via Zoom to assess the accuracy of parents' implementation of a communication intervention, i.e., Referent- Based Instruction and researcher-developed interview to examine their experiences participating in the study.

Bloom Children's Center will conduct a language assessment for each child participant before baseline sessions begin and will conduct a language assessment after intervention for each child as customarily done by our clinical staff.

I have been provided with the study information and the Bloom Children's Center principal Clinical Team will review, evaluate, and ensure that it aligns with Bloom Children's Center regulatory requirements, client confidentiality, privacy protections, and our center mission.

We support the project under the proposed guidelines put forth in the IRB application. If any unanticipated problems or adverse events are to occur, it is up to Janet Sanchez Enriquez, PI to report these events to the IRB as promptly as possible. This research will be a valuable contribution to families of children with autism, and we are excited to support this endeavor.

Bloom
Children´s
Center Clinical
Director

APPENDIX B: STUDY RECRUITMENT LETTER

UNIVERSITY OF NORTH CAROLINA
CHARLOTTE
CATO College of Education
Department of Special Education and Child Development
9201 University City Boulevard, Charlotte, NC 28223-0001

To Whom It May Concern:

My name is Janet Sanchez Enriquez. I am third year doctoral candidate in special education at the University of North Carolina at Charlotte. For my dissertation project, I would like to request permission to conduct research in your district. Below you will find information about my research project. If you consent, I will send a formal consent to research document. If you have any questions, please feel free to reach out at 210-837-9888 or jenriqu1@uncc.edu
Title of the Project: *Effects of Parent-Mediated Referent-Based Instruction (PM-RBI): A Verbal Behavior Training Package for Young Children with Autism*
Principal Investigator: Janet Sanchez Enriquez, MS, BCBA
Co-investigators: Robert Pennington, Ph.D., BCBA-D, University of North Carolina at Charlotte; Mariana de los Santos, MS, BCBA

You are invited to participate in a research study. Your participation in this research study is voluntary. The information provided is to help you decide whether or not to consent to participate. If you have any questions, please feel free to ask.

Important information:
The purpose of this study is to examine the effects of a naturalistic caregiver training package on the accuracy of parent's implementation of a verbal behavior, i.e., requesting, labeling, echoing, replying, training intervention, i.e., Referent-Based Instruction (RBI).
Extensive research detailing evidenced-based practices for autism treatment provides caregivers and practitioners the means to positively impact behavior and developmental outcomes for individuals with ASD. However, research is needed to further examine individually tailored, feasible and accessible family-focused interventions for caregivers and their children.
This study will involve multiple sessions with families across up to 25 weeks with a duration of up to 1 hour. All sessions will be scheduled during preferred family activities.
The study will involve at least 1-hour Zoom training session where caregivers will be introduced to RBI and be provided with implementation materials.

Caregiver Requirements:
- Provide consent and complete caregiver and child information forms.
- Participate in a Zoom training session (up to 1-hr) introducing RBI and steps for implementation.
- Conduct weekly RBI implementation within typical family routines (minimum of twice weekly).

- Demonstrate RBI implementation within typical family routine of up to 15 m during baseline twice a week via Zoom.
- Participate in Zoom caregiver coaching sessions of up to 13 weeks (up to 60 min) for intervention.
- Implement RBI within preferred family routines during intervention.
- Meet with researcher twice a week for caregiver coaching session.
- Share your experience implementing RBI with your child and receiving caregiver coaching at the conclusion of the study.

What will my child do in this study? What is my role?

Child participants will receive RBI intervention (i.e., verbal behavior language training). This will include participating in naturally occurring family routines with caregivers via Zoom to increase verbal behavior, i.e., requesting, labeling, echoing, replying.

What benefits might child participants experience?

While there are no guaranteed direct benefits to caregivers or child participants, caregivers may experience increased levels of support through caregiver coaching sessions and note an increase in their child's verbal behavior. Child participants may experience increased levels of verbal behavior as well

I look forward from hearing back from you!

Very Sincerely,

Janet Sanchez Enriquez, MS, BCBA
Doctoral Candidate | Special Education
Department of Special Education and Child Development
University of North Carolina at Charlotte
9201 University City Blvd
Charlotte, NC 28223
jenriqu1@uncc.edu
210-837-9888

APPENDIX C: CAREGIVER RECRUITMENT LETTER

UNIVERSITY OF NORTH CAROLINA
CHARLOTTE
CATO College of Education
Department of Special Education and Child Development
9201 University City Boulevard, Charlotte, NC 28223-0001

Dear Legal Guardian,

Researchers at the University of North Carolina at Charlotte are seeking participants for a research study. Among the research team members are doctoral student Janet Sanchez Enriquez, Mariana de los Santos, and her advisor, Dr. Robert Pennington. The study examines the effects of a naturalistic caregiver training package on parents' ability to implement language intervention.

The intervention, Referent-Based Instruction (RBI), will be introduced as a natural-environment training program for increasing the language abilities of young learners. All sessions will be held via Zoom and are scheduled at a time most convenient to you in your home. First, they will begin by providing you with a 1-hr Zoom training on the basic information regarding RBI and how to implement this in your home.

You will be provided with a Parent Guide and asked to implement the intervention within your preferred family routines and activities of up to 15-min daily. Next, you will demonstrate how to implement your selected routines via Zoom with the research team. Then, researchers will discuss with you your family's typical family routines, activities, family goals, and priorities. They will use this information to customize your child's intervention to meet your family's needs. In the following sessions, you will receive coaching support for the intervention through various supports, including a detailed checklist that outlines the required steps, role-play opportunities, video tutorials, real-time feedback, and time for reflection. The sessions will occur twice a week for up to 13 weeks and last up to 60 minutes. All Zoom sessions will be recorded.

If you are interested in participating in this research study, please contact Janet Sanchez Enriquez by email (jenriqu1@uncc.edu) or cell phone (210-837-9888) further to discuss you and your child's role and participation. You may also contact Dr. Robert Pennington (responsible faculty) either by email (rpennin7@uncc.edu) or to discuss further your potential role and participation.

Alternatively, if you would prefer this form printed and mailed to you, or should you have any questions about the study, please do not hesitate to contact the research team:

Janet Sanchez Enriquez
Jenriqu1@uncc.edu
210-837-9888

Thank you for your time.

Sincerely,

Bloom Children's Center Director

APPENDIX D: PARENT CONSENT

UNIVERSITY OF NORTH CAROLINA
CHARLOTTE
CATO College of Education
Department of Special Education and Child Development
9201 University City Boulevard, Charlotte, NC 28223-0001

Parent Consent for Participation in Research

Title of the Project: *Effects of Parent-Mediated Referent-Based Instruction (PM-RBI): A Verbal Behavior Training Package for Young Children with Autism*

Principal Investigator: Janet Sanchez Enriquez, MS, BCBA

Co-Investigator: Mariana de los Santos, MS, BCBA, Bloom Children's Center

Faculty Advisor: Robert Pennington, Ph.D., BCBA-D, University of North Carolina at Charlotte

You are invited to participate in a research study. Your participation and your child's participation in this research study is voluntary. The information provided is to help you decide whether or not to consent to participate. If you have any questions, please feel free to ask.

Important information you need to know

- The purpose of this study is to examine the effects of a naturalistic caregiver training package on the accuracy of parent's implementation of a verbal behavior, i.e., requesting, labeling, echoing, replying, training intervention, i.e., Referent-Based Instruction (RBI).
- Extensive research detailing evidenced-based practices for autism treatment provides caregivers and practitioners the means to positively impact behavior and developmental outcomes for individuals with ASD. However, research is needed to further examine individually tailored, feasible and accessible family-focused interventions for caregivers and their children.
- This study will involve 26-28 Zoom sessions with families for up to 13 weeks with a duration of up to 1 hour. All sessions will be scheduled during preferred naturally occurring family activities.
- Data already collected from Bloom Children's Center will be used to develop a treatment plan to increase your child's vocabulary through Referent-Based Instruction (RBI) Intervention.
- RBI Training Intervention: RBI intervention will be introduced as a natural-environment training program to increase your child's language abilities. All sessions will be held via

Zoom and scheduled at a convenient time in your home. First, they will begin by providing you with a 1-hr Zoom training on the basic information regarding RBI and how to implement this in your home.

- You will be provided with a Parent Guide and asked to implement the intervention within your preferred family routines and activities of up to 15-min daily. Next, you will demonstrate how to implement your selected routines via Zoom with the research team. Then, researchers will discuss your family's typical routines, activities, goals, and priorities with you individually. They will use this information to customize your child's intervention to meet your family's needs. In the following sessions, you will receive coaching support for the intervention through various supports, including a detailed checklist that outlines the required steps, role-play opportunities, video tutorials, real-time feedback, and time for reflection. The sessions will occur twice a week for up to 13 weeks and last up to 60 minutes. All Zoom sessions will be recorded.

- Interviews: At the conclusion of the study, interviews will be conducted to learn more about your experiences during this and its' acceptability. This interview process will consist of a series of questions that are based first on your child's diagnosis, their developmental history, your experiences in accessing services and resources as a family, and any other programming options you considered (e.g., Tell me about your child's developmental history; When did you first notice a language delay? At what point did you feel that your child needed language support or intervention?) [Interview 1], detailed experiences regarding parents' perceptions of the intervention (RBI) (e.g., How would you describe referent-based instruction? What do you see happening during RBI? What do you see your child doing during RBI?) [Interview 2], and parents' reflections on their experiences of participating in RBI, (e.g., What were you hoping to get out of RBI? Tell me if and how these expectations were met or might have changed as you and your family participated in RBI; Tell me a few words about your understanding of the intervention.) [Interview 3]. Each interview can potentially last up to 35 minutes.

- While there are no guaranteed direct benefits to parent or child participants, data gathered from this study may be used to inform practices for effective interventions to support language training for caregivers.

- The research team does not anticipate any risks associated with the specific intervention supporting your child in increasing language.

Why am I being asked to be in this research study?

You are being asked to participate because you are a parent/caregiver or legal guardian of a child between the ages of 3 to 6 years old with an autism diagnosis and have expressed interest in participating in language training.

What will my child do in this study? What is my role?

Child participants will receive RBI intervention (i.e., verbal behavior language training). This will include participating in naturally occurring family routines with caregivers via Zoom to increase verbal behavior, i.e., requesting, labeling, echoing, replying.

If you agree to participate, your role will include:

1. Provide consent and complete caregiver and child information forms.
2. Participate in a Zoom training session (up to 1-hr) introducing RBI and steps for implementation.
3. Conduct weekly RBI implementation within typical family routines (minimum of twice weekly).
4. Demonstrate RBI implementation within a typical family routine of up to 15 m during baseline twice a week via Zoom.
5. Participate in Zoom caregiver coaching sessions across 13 weeks (up to 60 min) for intervention.
6. Implement RBI within preferred family routines during intervention.
7. Meet with researcher twice a week for caregiver coaching sessions.
8. Share your experience implementing RBI with your child and receiving caregiver coaching at the conclusion of the study.

The sessions will be recorded so the research team can collect and analyze the data. Sessions will be video recorded. Videos may be used for training purposes following the conclusion of the study.

What benefits might child participants experience?

While there are no guaranteed direct benefits to caregivers or child participants, caregivers may experience increased levels of support through caregiver coaching sessions and note an increase in their child's verbal behavior. Child participants may experience increased levels of verbal behavior as well.

What risks might I experience?

We perceive there to be minimal risks associated with the specific intervention, however, some learners with a history of challenging behavior may engage in disruptive behavior when presented with a request. If caregiver participants decide it is in their and their child's best interest to withdraw consent due to challenging behavior, participation information and/or data will no longer be collected. We will consider their assent withdrawn and discontinue participation.

How will information be protected?

Electronic materials will be stored in a university password-protected Dropbox folder that the research team can access. Only the research team will have routine access to the study information. Other people with approval from the Investigator, may need to see the information we collect, including people who work for UNC Charlotte and other agencies as required by law or allowed by federal regulations.

How will information be used after the study is over?
These data may be shared through the publication of our results. The data shared for publication will NOT include information that could identify you and your children. Videos may be used for training purposes with consenting participants' faces blurred and will be stored indefinitely on a secure UNC Charlotte Dropbox folder and is optional. Caregivers participating will be required to sign consent forms providing consent for themselves and their children to participate in the study. Additionally, caregivers signing consent will include their child's participation in the language assessment conducted by Bloom Children's Center before beginning baseline and intervention sessions of the study.

Will I receive an incentive for taking part in this study?
No. You will not receive an incentive to take part in this study. Your participation is entirely voluntary.

What other choices are there if I do not to take part in this study?
If you decline participation or choose to stop, you and your child will not be penalized, and you will not lose any benefits to which you are otherwise entitled. All data collected will be destroyed, deleted, or shredded should you decide to withdraw from the study after starting. Withdrawal from the study will not impact participants' treatment at Bloom Children's Center.

What are rights I take part in this study?
Participating in this study is voluntary. Even if you decide to be part of the study now, you may change your mind and stop your participation at any time. You and your child will not lose any benefits to which you are entitled.

Who can answer my questions about this study and participant rights?
For questions about this research, you may contact Janet Sanchez Enriquez at 210-837-9888 or jenriqu1@uncc.edu or Dr. Robert Pennington (responsible faculty) at rpennin7@uncc.edu.

If you have questions about research participant's rights, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Office of Research Protections and Integrity at 704-687-1871 or uncc-irb@uncc.edu.

Consent to Participate

By signing this document, you are agreeing for you and your child to participate in this study. Make sure you understand what the study is about before you sign. You will receive a copy of this document for your records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

I understand what the study is about, and my questions so far have been answered.

I consent to my participation as well as my child's participation in:

Effects of Parent-Mediated Referent-Based Instruction (PM-RBI): A Verbal Behavior Training Package for Young Children with Autism ☐ Yes ☐ No

I consent to audio/video recording during sessions in person and via Zoom: ☐ Yes ☐ No

_____

Participant Name (PRINT)

_____

Signature Date

Janet Sanchez Enriquez

Name and Signature of person obtaining consent Date

APPENDIX E: CAREGIVER DEMOGRAPHIC FORM

Name:

Date:

Child participant:

Please respond to the following items about yourself:

1. Age:

2. Relation to child:
3. Occupation:
4. Please describe previous parent training experiences:

APPENDIX F: CHILD PARTICIPANT INFORMATION SHEET

Child participant:

Date:

Please respond to the following items about your child:

1. Age:
2. Gender:
3. Disability diagnosis (select all that apply):
   - ☐ Intellectual disabilities
   - ☐ Hearing impairment
   - ☐ Speech or language impairment
   - ☐ Visual impairment
   - ☐ Emotional disturbance (can include emotional disability)
   - ☐ Orthopedic impairment
   - ☐ Other health impairment
   - ☐ Autism
   - ☐ Specific learning disability
   - ☐ Deaf blindness
   - ☐ Multiple disabilities
   - ☐ Developmental delay
   - ☐ Traumatic brain injury
4. Please describe how your child makes their needs and wants known.

APPENDIX G: GETTING TO KNOW YOU DOCUMENT

Getting to Know You!

Family Goals & Priorities

1. What we want to keep doing as a family:

2. Routines and activities we want to try this week:

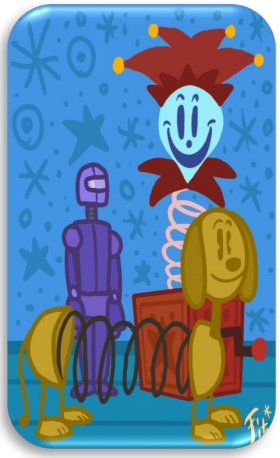
#1s:First targets!

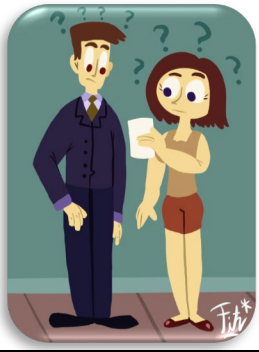
#2s:Maybe Next Time!

APPENDIX H: LEARNER PROFILE

Learner Profile

Toys and Object	Favorites	Least Favorites
		
People and Playmates	**Favorites**	**Least Favorites**
		
Activities and Games	**Favorites**	**Least Favorites**
		

Food and Drinks	Favorites	Least Favorites
		
Places	**Favorites**	**Least Favorites**
		
	**How does your child let you know what they like?**	**How does your child let you know what they don't like?**

	**When is your child most cooperative?**	**When is your child the least cooperative?**
	**What frightens your child?**	**What calms your child?**
	**How does your child participate in daily routines like dressing or feeding?**	**Bathing and Toileting?**
What do you think helps your child learn?		
What would you like to learn about your child?		

APPENDIX I: FAMILY ROUTINES HANDOUT

Family Routines and Activities Handout

Play Routines		**Essential Routines**	
Toys	**Pretend Play**	**Transition, Care, and Safety**	**Getting Dressed**
Physical Activities	**Social Games**	**Toileting and Bathing**	**Meals**
School Ready Skills		**Community and Family Experiences**	
Literacy	**Music and Songs**	**Family Activities and Chores**	**Community Outings and Errands with Family**
Technology/Devices	**Drawing, Painting, Writing**	**Social Activities**	**Family Fun Activities**

APPENDIX J: SAMPLE VERBAL BEHAVIOR TREATMENT PLAN

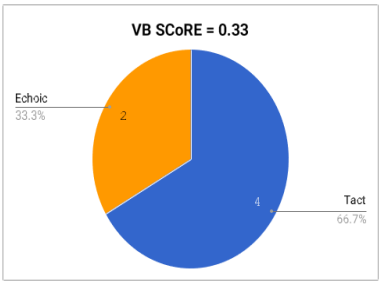
SAMPLE REPORT

Student: Sample Report
Date: April 1, 2019

Interventionist:
Clinic/Location:

Stimulus Control Ratio Equation

The verbal behavior SCoRE was used to assess the relative strength of mand, echoic, tact, and sequelic responses across multiple trials. The results of Roby's SCoRE assessment are displayed below in Figure 1.



Roby's SCoRE of 0.333333333333333 indicates a practical verbal behavior repertoire primarily under Tact (66.7%) control, followed by Echoic (33.3%), Mand (0%), and Sequelic (0%). The disproportionality across verbal operants identified through this assessment indicate that Roby would benefit from, and is able to actively participate in, behavior-analytic language intervention.

Treatment Plan Goals and Objectives:

Goal: To increase the number of items under Tact (66.7%) control.
a. Objective: When presented with a nonverbal stimulus, Roby will label the name of all preferred items.
i. For instance, when playing with a novel stimulus and asked "What's that?", Roby will be able to label the name of the item.
Goal: To transfer stimulus control across environmental variables that control Roby's verbal behavior.
a. Objective: When presented with an imitative stimulus, Roby will echo the name of the item at the same strength with which she tacts the name of the item.
i. For instance, when asked, "Say 'ball'," Roby will repeat "Ball" with strength equivalent to that with which he tacts a ball when present.
b. Objective: When access to reinforcing items is restricted, Roby will mand for the items at the same strength with which she tacts the name of the item.
i. For instance, to obtain a ball, Roby will request "Ball" with strength equivalent to that with which he tacts a ball when present.
c. Objective: When presented with a sequelic fill-in-the-blank frame, Roby will answer with the corresponding response at the same strength with which she tacts the name of the item.
i. For instance, when probed You roll the ____, Roby will reply "Ball" with strength equivalent to that with which she tacts a ball when present.

MAND:

- Converge mands, tacts, echoics, and sequelics (100%)
  - E.g., While engaged with a ball, restrict access to the reinforcer (M) while keeping it in Roby's line of sight
    (T). Provide target response (E) followed by intraverbal frame (S): You roll the ball. You roll the _____.
    - Reinforce correct responding with access to the ball and verbal praise.
- Converge mands, tacts, and echoics (100%)
  - E.g., While engaged with a ball, restrict access to the reinforcer (M) while keeping it in Roby's line of sight
    (T). Provide target response (E): Say, "ball."
    - Reinforce correct responding with access to the ball and verbal praise.
- Converge mands, tacts, and sequelics (66.7)
  - E.g., While engaged with a ball, restrict access to the reinforcer (M) while keeping it in Roby's line of sight
    (T). Provide intraverbal frame (S): You roll the _____.
    - Reinforce correct responding with access to the ball and verbal praise.
- Converge mands and tacts (66.7%)
  - E.g., While engaged with a ball, restrict access to the reinforcer (M) while keeping it in Roby's line of sight (T), and ask Roby to request access: What do you want?
    - Reinforce correct responding with access to the ball and verbal praise.
- Converge mands and sequelics (0%)
  - E.g., While engaged with a ball, hide to the reinforcer (M) and provide intraverbal frame (S): You roll the _____.
    - Reinforce correct responding with access to the ball and verbal praise.
- Isolate mands (0%)
  - E.g., While engaged with the ball, hide it and ask Roby to request it (M): What do you want?
    - Reinforce correct responding with access to the ball.

TACT:

- Converge tacts, mands, echoics, and sequelics (100%)
  - E.g., While engaged with a ball, restrict access to the reinforcer (M) while keeping it in Roby's line of sight
    (T). Provide target response (E) followed by intraverbal frame (S): You roll the ball. You roll the _____.
    - Reinforce correct responding with access to the ball and verbal praise.
- Converge tacts, mands, echoics, and sequelics (100%)
  - E.g., While engaged with a ball, restrict access to the reinforcer (M) while keeping it in Roby's line of sight
    (T). Provide target response (E) followed by intraverbal frame (S): You roll the ball. You roll the _____.
    - Reinforce correct responding with access to the ball and verbal praise.
- Converge tacts, echoics, and sequelics (100%)
  - E.g., While engaged with the ball, point to it (T) and provide target response (E) followed by intraverbal frame (S): You roll the ball. You roll the .
    - Reinforce correct responding with verbal praise.
- Converge tacts and echoics (100%)
  - E.g., While engaged with a ball, point to it (T) and provide target response (E): Say, "ball."
    - Reinforce correct responding with verbal praise.
- Converge tacts, mands, and sequelics (66.7%)
  - E.g., While engaged with a ball, restrict access to the reinforcer (M) while keeping it in Roby's line of sight
    (T). Provide intraverbal frame (S): You roll the .
    - Reinforce correct responding with access to the ball and verbal praise.
- Converge tacts and mands (66.7%)
  - E.g., While engaged with a ball, restrict access to the reinforcer (M) while keeping it in Roby's line of sight (T), and ask Roby to request access: What do you want?
    - Reinforce correct responding with access to the ball and verbal praise.
- Converge tacts and sequelics (66.7%)
  - E.g., While engaged with the ball, point to it (T) and provide intraverbal frame (S): You roll the _____.
    - Reinforce correct responding with verbal praise.
- Isolated tacts (66.7%)
  - E.g., While engaged with the ball, point to it and ask Roby to name it (T): What's that?

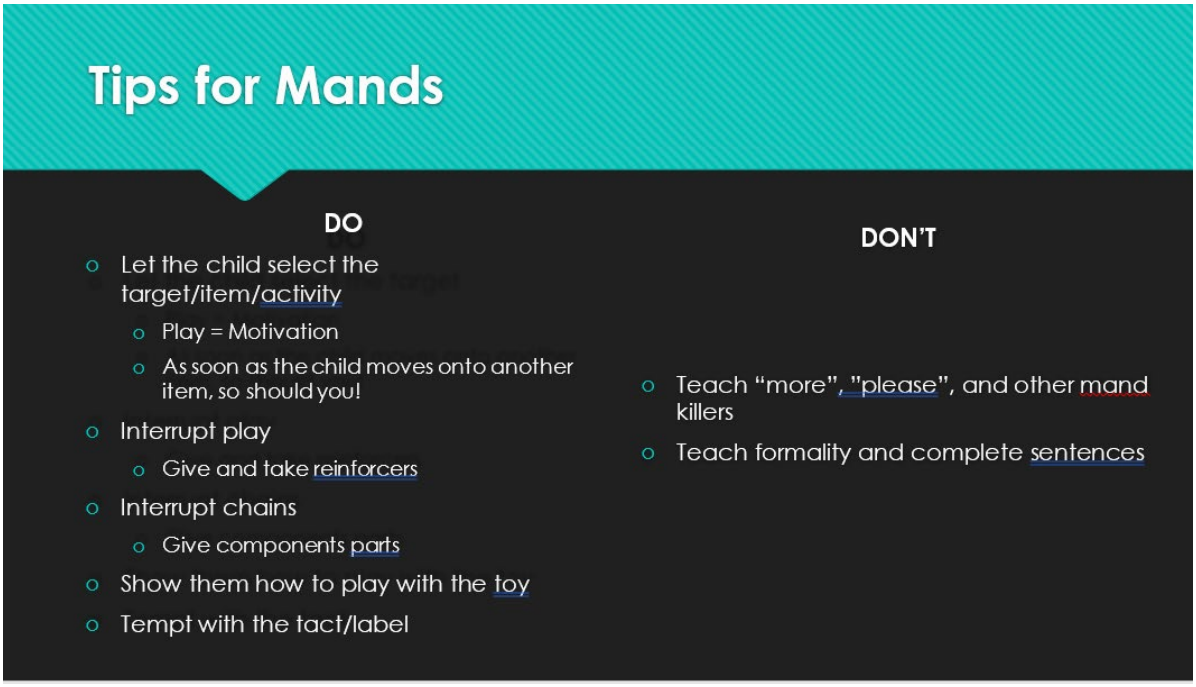
ECHOIC:

- Converge echoics, tacts, mands, and sequelics (100%)
  - E.g., While engaged with a ball, restrict access to the reinforcer (M) while keeping it in Roby's line of sight
    (T). Provide target response (E) followed by intraverbal frame (S): You roll the ball. You roll the _____.
    - Reinforce correct responding with access to the ball and verbal praise.
- Converge echoics, tacts, and mands (100%)
  - E.g., While engaged with a ball, restrict access to the reinforcer (M) while keeping it in Roby's line of sight
    (T). Provide target response (E): Say, "ball."
    - Reinforce correct responding with access to the ball and verbal praise.
- Converge echoics, tacts, and sequelics (100%)
  - E.g., While engaged with the ball, point to it (T) and provide target response (E) followed by intraverbal frame (S): You roll the ___.
    - Reinforce correct responding with verbal praise.
- Converge echoics and tacts (100%)
  - E.g., While engaged with a ball, point to it (T) and provide target response (E): Say, "ball."
    - Reinforce correct responding with verbal praise.
- Converge echoics, mands, and sequelics (33.3%)
  - E.g., While engaged with a ball, hide the reinforcer (M), and provide target response (E) followed by intraverbal frame (S): You roll the ball. You roll the ____.
    - Reinforce correct responding with access to the ball and verbal praise.
- Converge echoics and mands (33.3%)
  - E.g., While engaged with a ball, hide the ball (M) and provide target response (E): Say, "ball."
    - Reinforce correct responding with access to the ball and verbal praise.
- Converge echoics and sequelics (33.3%)
  - E.g., While engaged with another reinforcer, hide the ball and provide target response (E) followed by intraverbal frame (S): You roll the ball. You roll the _____.
    - Reinforce correct responding with verbal praise.
- Isolate echoics (33.3%)
  - E.g., While engaged with another reinforcer, hide the ball and provide target response (E): Say, "ball."

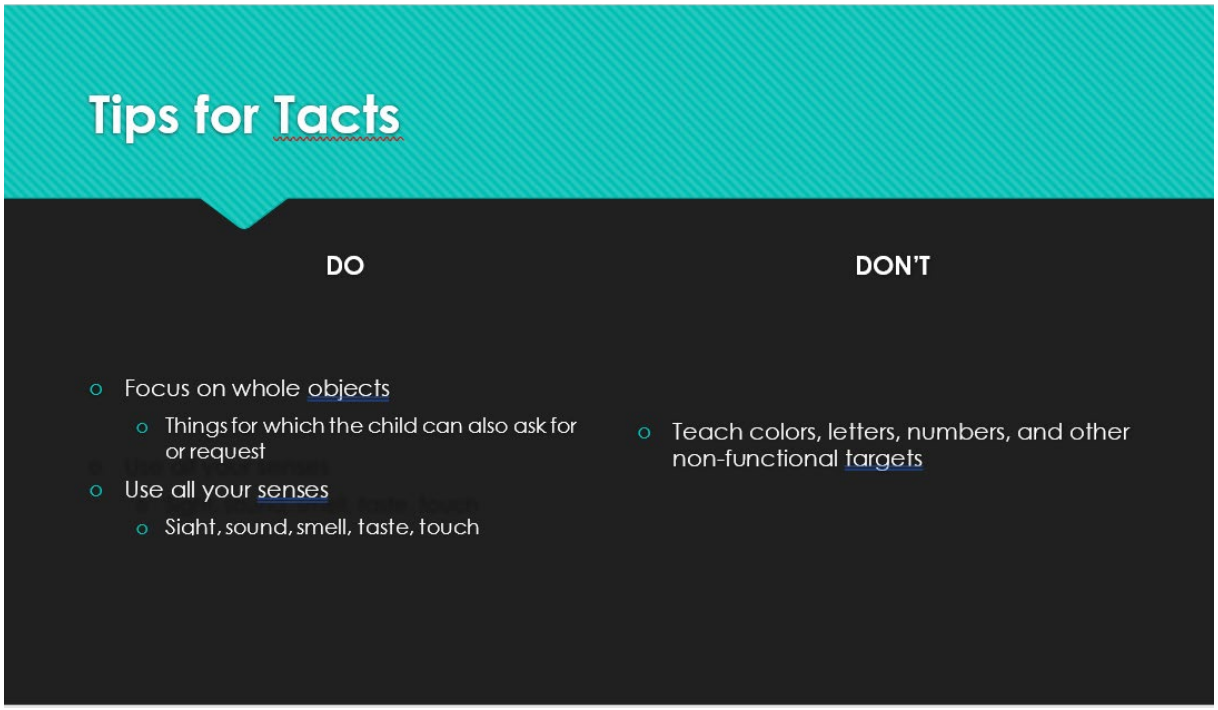
SEQUELIC:

- Converge sequelics, tacts, echoics, and mands (100%)
  - E.g., While engaged with a ball, restrict access to the reinforcer (M) while keeping it in Roby's line of sight
    (T). Provide target response (E) followed by intraverbal frame (S): You roll the ball. You roll the _____.
    - Reinforce correct responding with access to the ball and verbal praise.
- Converge sequelics, echoics, and tacts (100%)
  - E.g., While engaged with the ball, point to it (T) and provide target response (E) followed by intraverbal frame (S): You roll the ball. You roll the .
    - Reinforce correct responding with verbal praise.
- Converge sequelics, tacts, and mands (66.7%)
  - E.g., While engaged with a ball, restrict access to the reinforcer (M) while keeping it in Roby's line of sight
    (T). Provide intraverbal frame (S): You roll the .
    - Reinforce correct responding with access to the ball and verbal praise.
- Converge sequelics and tacts (66.7%)
  - E.g., While engaged with the ball, point to it (T) and provide intraverbal frame (S): You roll the ___.
    - Reinforce correct responding with verbal praise.
- Converge sequelics, echoics, and mands (33.3%)
  - E.g., While engaged with a ball, hide the reinforcer (M), and provide target response (E) followed by intraverbal frame (S): You roll the ball. You roll the _____.
    - Reinforce correct responding with access to the ball and verbal praise.
- Converge sequelics and echoics (33.3%)
  - E.g., While engaged with another reinforcer, hide the ball and provide target response (E) followed by intraverbal frame (S): You roll the ball. You roll the _____.
    - Reinforce correct responding with verbal praise.
- Converge sequelics and mands (0%)

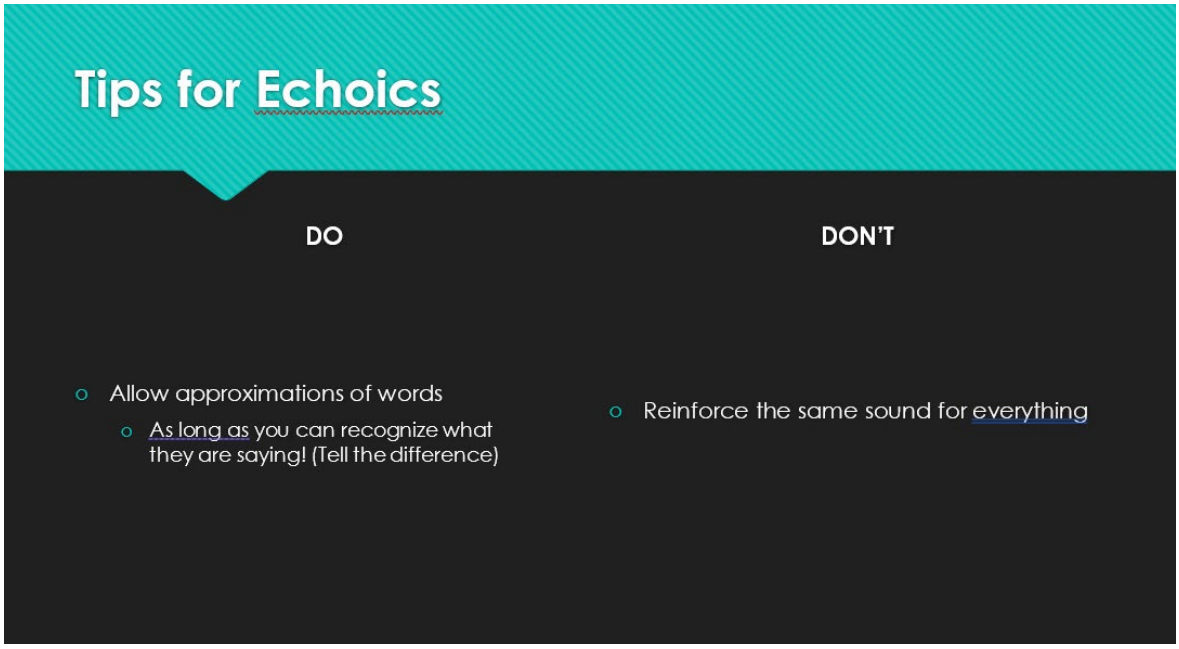
APPENDIX K: CAREGIVER TIP SHEET: MANDS



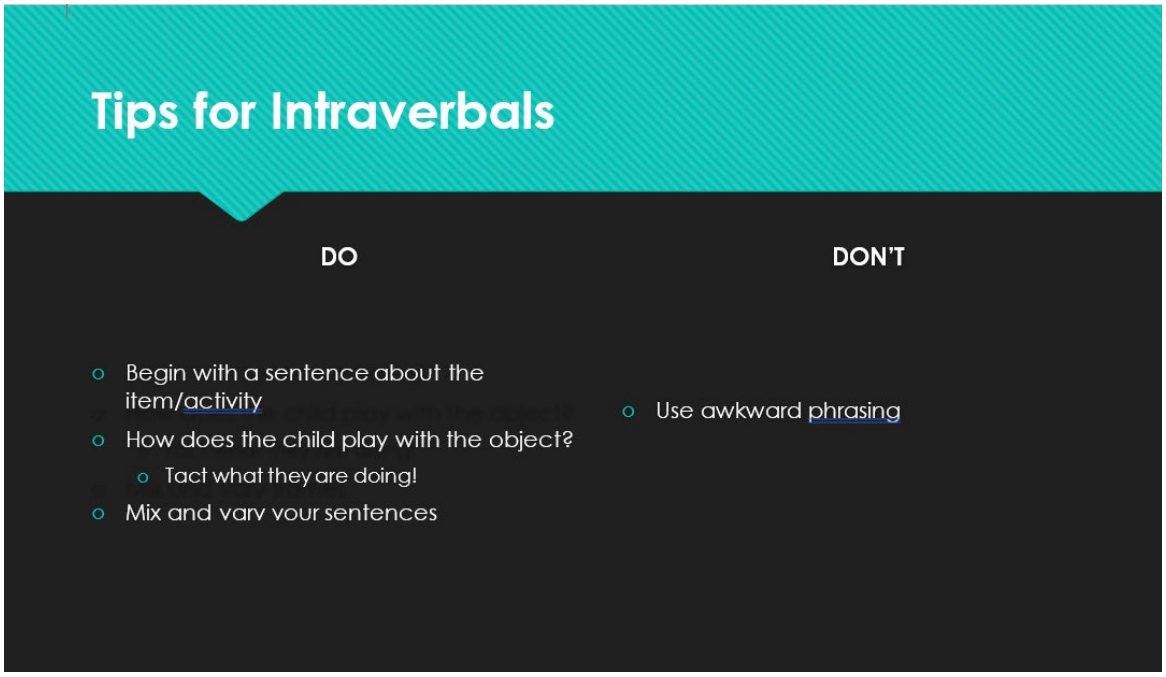
APPENDIX L: CAREGIVER TIP SHEET: TACTS



APPENDIX M: CAREGIVER TIP SHEET: ECHOICS



APPENDIX N: CAREGIVER TIP SHEET: INTRAVERBALS



APPENDIX O: TIP SHEET: CONVERGING THE VERBAL OPERANTS

***All examples use "ball" as the reinforcer and target response. Substitute correct word and intraverbal frame for reinforcing item(s) the student is interested in during the session.**

METS

- While student is engaged with ball, restrict access while keeping it in sight.
- Provide target response followed by intraverbal frame:
  - **"You roll the ball. You roll the _____."**
- Reinforce correct response with access to ball and verbal praise.

MET

- While student is engaged with ball, restrict access while keeping it in sight.
- Provide target response:
  - **"Say ball"**
- Reinforce correct response with access to ball and verbal praise.

MES

- While student is engaged with ball, **hide** ball.
- Provide target response followed by intraverbal frame:
  - **"You roll the ball. You roll the _____".**
- Reinforce correct response with access to ball and verbal praise.

MTS

- While student is engaged with ball, restrict access while keeping it in sight.
- Provide intraverbal frame:
  - **"You roll the _____".**
- Reinforce correct response with access to ball and verbal praise.

ME

- While student is engaged with ball, **hide** ball.
- Provide target response:
  - **"Say ball"**
- Reinforce correct response with access to ball and verbal praise.

MT

- While student is engaged with ball, restrict access while keeping it in sight.
- Ask student to request reinforcer:
  - **"What do you want?"**
- Reinforce correct response with access to ball and verbal praise.

MS

- While student is engaged with ball, **hide** ball.
- Provide intraverbal frame:
  - **"You roll the _____".**
- Reinforce correct response with access to ball and verbal praise.

M

- While student is engaged with ball, **hide** ball.
- Ask student to request reinforcer:
  - **"What do you want?"**
- Reinforce correct response with access to ball.

ETS

- While student is engaged with ball, point to it and …
- Provide target response followed by intraverbal frame:
  - **"You roll the ball. You roll the _____".**
- Reinforce correct with response with **verbal praise only.**

ET

- While student is engaged with ball, point to it and ….
- Provide target response:
  - **"Say ball"**
- Reinforce correct response with verbal praise.

ES

- While student is engaged with **another** item, hide ball and …..
- Provide target response followed by intraverbal frame:
  - **"You roll the ball. You roll the _____."**
- Reinforce correct response with verbal praise.

E

- While student is engaged with **another** item, hide ball and ….
- Provide target response:
  - **"Say ball".**
- Reinforce correct response with verbal praise.

TS

- While student is engaged with the ball, point to it and …
- Provide intraverbal frame:
  - **"You roll the _____".**
- Reinforce correct response with verbal praise.

T

- While student is engaged with the ball, point to it and ….
- Ask student to name it (i.e.
  - **"What's that?" or similar**
- Reinforce correct response with verbal praise

S

- While student is engaged with **another** item, hide the ball.
- Provide the intraverbal frame for the ball:
  - **"You roll the _____".**
- Reinforce correct response with verbal praise.

Remember:

- If the **mand** condition is present, the student is reinforced for correct responses with access to the item. If the mand condition is NOT present, the student is reinforced with verbal praise **only.**
- When the **tact** condition is present, the **student sees the reinforcer** after they have been engaged with it and you begin a "session". **In all other sequences that do <u>not</u> contain the tact, you hide the item** after the student has engaged with it and you know it is a desired item.

APPENDIX P: RBI FIDELITY CHECKLIST

Referent-Based Instruction Fidelity Checklist

Referent-Based Instruction Implementation Steps	Mand	Tact	Echoic	Intraverbal
1. Allow your child to select the referent.				
2. Restrict access to the referent.				
3. Present target level of antecedent (e.g., referent, question).				
4. Wait 5 s for verbal response.				
5. If the child makes an error or doesn't respond within 5 s, provide a prompt.				
6. Reinforce verbal behavior with access to the referent and/or generalized praise.				
Percent Correct:				**/6**
NOTES:				

APPENDIX Q: CAREGIVER COACHING PROCEDURAL FIDELITY CHECKLIST

Making Connections and Creating Opportunities	
1. Establish rapport with caregivers, sharing comments and information to enhance the caregiver and coaching connection?	Yes No N/A
2. Ask caregivers to provide any updates on family, recent events, challenges if any.	Yes No N/A
3. Share any information relevant to family needs.	Yes No N/A
4. Use Family Routines Handout to review family selected routine and referents (materials) used for session.	Yes No N/A
Teaching and Practice	
5. Review RBI implementation steps with caregivers using RBI fidelity checklist and model each step,	Yes No N/A
6. Ask caregiver if they would like to view 5-minute video tutorial for RBI steps (first session; optional for families after).	Yes No N/A
7. Review family selected routine again and discuss rational for use.	Yes No N/A
8. Provide role-play opportunities.	Yes No N/A
9. Answer caregiver questions.	Yes No N/A
Observation and Feedback	
10. Provide coaching while caregiver practices RBI steps with their child during family routine of up to 15 minutes.	
11. Deliver real-time performance feedback throughout observation.	Yes No N/A
12. Feedback may be specific (something observed) or general (encouraging or affirming) on procedures.	Yes No N/A
Session Review and Reflection	
13. Provide general feedback on overall caregiver and child behavior and interactions.	Yes No N/A
14. Facilitate the identification of additional family routines and activities throughout the week to embed RBI.	Yes No N/A
15. Support caregiver to reflect on RBI procedures and plan for implementation within one family routine before next session.	Yes No N/A
Total Yes_____/15x100=	**_____%**
NOTES:	

APPENDIX R: RBI PARENT GUIDE

RBI Parent Guide
Family Handbook

Index

THE ROLE OF PARENTS AND FAMILIES

The experience of a family that includes an individual (or individuals) living with autism should be appreciated and respected. Having a child diagnosed with autism means having to plan and adapt in ways that can be quite different from other families. Those who know people with autism understand the unique ways in which the behaviors associated with autism affect day-to-day life. Children with autism show the same need for social interaction and affection as any other person. However, the way social interest and affection is demonstrated may not be as easily recognized by those who have not lived with a child with autism. A "lack of interest in social interaction" is just, as most parents of children with autism will say, an "apparent" lack of interest. Children with autism need loving interactions like any other child. Likewise, parents of children with autism are keenly aware of how their children communicate; their child may not communicate as much and the style of communication may not be effective with the larger world of listeners, but the children do indeed communicate. Families of children with autism have the same basic needs as others families; however, the specifics are often very different.

We recognize that our families of children with an autism diagnosis are unique and that we serve are a diverse group. Such diversity means that families and parents have a great deal to offer. The role of parents and guardians is highly respected and we are committed to helping families by them become more prepared to support the unique needs of their children. The development and implementation of effective programming require a cooperative approach with families, educational providers, and professionals.

What are the educational treatments for autism with strong scientific support?

Applied Behavior Analysis (ABA): "The best available evidence suggests that using interventions from the field of applied behavior analysis, or ABA, will produce the best outcomes. In ABA, scientifically established principles of learning and behavior are combined to address the primary areas of concern in autism: communication, social development, learning, and behavior problems". In 2020 the National Standards Report was released, giving administrators and educators a guide for the development of intervention programs that are evidenced-based. The "report covers a broad range of applied treatments and identifies the level of scientific evidence available for each. It includes the largest number of studies ever reviewed" (National Standards Report Overview, 2009). The authors of the report conclude that one common element for most of the successful intervention programs, identified as "established treatments," was that they were based on behavior analysis (e.g., Cooper et al., 2019 Skinner, 1953) (National Autism Center, National Autism Standards 2009). This report is consistent with previous research and recommendations (National Research Council (2001); NY State Dept. of Health (1999); Maine Administrators of Services for Children with Disabilities (MADSEC) (1999). Report of the MADSEC Autism Task Force. Manchester, Maine)

What is ABA?

ABA stands for Applied Behavior Analysis. It is the science of studying behavior and applying *data supported techniques*
to increasing or decreasing *behaviors that are meaningful* to the individual and their social environment.

Basic Principles of ABA

Analyzes socially significant behavior in need of improvement. This means that behavior analysts collect, examine, and interpret data as part of the teaching process.

Behavior is defined in objective and measurable terms.

Examines the functional relationship between behavior (what a person does) and its controlling variables (what happens in the environment).

Analyzes behavior through a three-term contingency:
- *What happens before the behavior*
- *What does the behavior look like*
- *What happens after the behavior*

What is Verbal Behavior?

Verbal Behavior is behavior that is mediated by the behavior of another person. This means it is what we do in most of our interactions with other people. Verbal behavior is communication.

It focuses attention on the functional analysis of language: looking at the conditions under which a person will use language. In other words, looking at why things are said.

Verbal behavior can include speaking, using sign language, writing, gesturing, using picture exchange systems, and various augmentative communication devices.

Verbal Behavior is best understood by learning the verbal operants. The verbal operants are a way of classifying what is said by why it is said.

Mand = request (you say it because you want it)

Tact = label (you say it because you see, hear, smell, taste, or feel something)

Intraverbal = conversation, answering a question, responding when someone else talks (you say it because someone else asked you a question or made a comment)

Echoic = repeating what someone else says (you say it because someone else said it)

Imitation= repeating someone else's motor movements (you move because someone else moved the same way)

Listener Responding/Receptive = following directions (you do what someone else asks you to do)

It is critical to consider this analysis when developing language programs for individuals with autism. This allows teaching "what to say" as well as "when to say it". For example, it is important for children to learn to use language under the right conditions such as saying "water" when they are thirsty and want water vs. saying "water" because they are shown a picture of water and asked "what is it?"

This is what it would like to teach all of the meanings of a word like "Cookie"

In verbal behavior programs we focus on teaching all the meanings of a word.
So one word, such as cookie, may be used for a variety of purposes – to label, to request, to answer a question, to repeat what someone else has said, and so forth. The same word will have to be taught as a mand, a tact, an echoic, an intraverbal/sequelic, or as a receptive response so that the student can use the word for a full range of purposes.

What is Cookie?

Is it a…..

Mand
(when you want cookie)

Echoic
(when someone asks a question or makes a comment about a cookie)

Tact
(when you see, taste, smell a cookie)

(when you hear cookie)

Mand?
Tact?
Intraverbal?
Echoic?

Intraverbal/sequelic

Listener Responding (Receptive)
(when you respond to someone giving you an instruction about a cookie)

Mimetic (Motor Imitation) (make the sign for cookie because someone else signed cookie)

This chart summarizes the verbal operants:

Verbal Operant	Antecedent	Behavior	Consequence
Mand	Motivative Operation (MO, want or desire for cookie)	Verbal behavior (says 'cookie', signs cookie or exchanges a picture of cookie)	Direct reinforcement (gets a cookie)
Tact	Sensory stimuli (sees a cookie, smells cookies, tastes a cookie, hears someone eating a cookie, touches a cookie)	Verbal behavior (says 'cookie'; may also sign cookie)	Non-specific reinforcement (example: praise; 'you're right!', "great job!" high five, pat on back, etc.)
Intraverbal	Verbal stimulus (example: "What do you like to eat?")	Verbal behavior (says 'cookies', signs cookie)	Non-specific reinforcement (example: praise; 'you're right!', "great job!" high five, pat on back, etc.)
Echoic	Verbal stimulus (someone says 'cookie')	Verbal behavior (says 'cookie)	Non-specific reinforcement (example: praise; 'you're right!', "great job!" high five, pat on back, etc.)

How do we implement Behavior Analysis and Verbal Behavior?

First we teach the child to cooperate and want to be with us. We do this through pairing ourselves with reinforcement. Pairing is the process by which we correlate the teaching environment and staff with the child's reinforcers (their favorite items or activities) in order to eventually get them to want to approach us.

Then we teach the child:
- How to ask for what they want (MAND)
- How to say what things are (TACT)
- How to answer questions (INTRAVERBAL)
- How to follow instructions (RECEPTIVE)
- How to imitate others:

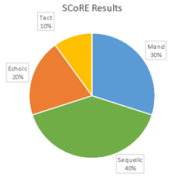
What others say (ECHOIC)
What others do or how others move (MOTOR IMITATION)
- And other skills relevant to communication and social development

Note: The specific skills taught depend on individual student needs.

Before we start teaching the children, we need to assess their skills. This is done by assessing their verbal skills as well as other skills relevant to learning.

Stimulus Control Ratio Equation (SCoRE)

What is SCoRE?
SCoRE stands for Stimulus Control Ratio Equation. The Stimulus Control Ratio Equation uses B.F. Skinner's verbal operants as the basis for the assessment. Verbal operants are categories of verbal behavior (i.e. verbal language) that are necessary for language and communication. The four verbal operants assessed by SCoRE are the mand, tact, echoic, and intraverbal. Specifically, SCoRE assesses the strength of each of the verbal operants in the child's verbal repertoire. At the end of the assessment, a pie chart depicting the relative strength of each verbal operant in the child's verbal repertoire is produced (see below chart for an example SCoRE pie chart).



How does SCoRE work?
To administer SCoRE, practitioners follow a specific assessment protocol for the mand, tact, echoic, and intraverbal operants. Below is an expanded explanation of each verbal operant.

Tact
A tact occurs when a child labels items in their environment. A child could tact items that they see or are interacting with, sounds that they hear, things that they taste, or items they smell. In this condition, therapists will allow students free access to items in the laboratory environment. Once items have been selected, therapists will ask the child, "What is this?" to probe if they are able to label the item. For example, if a child begins playing with a ball, the therapist would hold up the ball and say, "What is this?", the child would respond with "ball" to produce a tact.

Mand
The mand is a request or demand for something. A child could mand for objects they prefer such as toys, activities, and preferred foods or the mand could be for things such as more information or the cessation of unpleasant activities. In this condition, therapists will use the items identified as potential reinforcers in the tact condition to probe if the child will ask for the item when it is removed from sight by asking "What do you want?" once the item has been removed. For example, if a child is playing with a ball, the therapist would remove the ball from sight and ask "What do you want?" and the child would respond "ball" to produce a mand.

Echoic
An echoic is a repetition of a response from someone else. A child produces an echoic when they repeat something that is said by another person. For example, if you were to say, "Say ball" and the child responds "ball", they have produced an echoic. In this condition, practitioners use the items from the tact and mand conditions and ask the child to repeat the name of the object to probe if they can repeat the names or sounds.

Intraverbal
An intraverbal is a response to another person's verbal behavior but it is not a repetition of their behavior. An intraverbal could be answering a question or responding to a fill-in-the-blank response (ex. "twinkle, twinkle little ____ _____" and the child fills in "star"). In this condition, therapists observe how the child interacts with the objects identified in the mand and tact conditions. After seeing how they play or interact with the objects, the caregiver will craft an intraverbal for the child to respond to. For example, if the child is bouncing a ball the caregiver might ask, "You bounce the _____?" and the child would be expected to respond with "Ball".

What information does SCoRE tell me about my child?
Once the assessment is completed, SCoRE tells us the relative strength of each verbal operant in the child's language repertoire. A child without a diagnosis of autism would display a proportional language repertoire where the mands, tacts, echoics, and intraverbals in their language repertoire are balanced. A child with an autism spectrum disorder or other language disorder might have a disproportionate language repertoire. For example, a child with autism may be able to label items and repeat words with a high degree of accuracy but may not be able to request those same items when they want them. SCoRE will tell us if the child's language is proportionate or disproportionate and if it is disproportionate, the assessment will tell us which verbal operants we need to focus on to ensure they have a balanced language repertoire.

In addition to assessment, consultants train the teachers and classroom staff in program development, and provide on-site guided practice of effective teaching procedures. This may include modeling for the staff how to implement certain programs or manage behavior problems, data-based decision-making, and research-supported teaching techniques.

Effective Teaching Procedures:
- Use of appropriate schedule of reinforcement
- Errorless teaching
- Error correction/transfer techniques
- Mixing and varying instruction
- Interspersing easy and difficult tasks
- Discrete trials
- Prompting/fading
- Shaping/differential reinforcement
- Chaining techniques (backward, forward, total task)
- Task analysis
- Extinction
- Skinner's analysis of verbal behavior to teach language

What is Positive Reinforcement?

Reinforcement is a change in the environment following a behavior that increases the future probability of that behavior occurring under similar circumstances

Reinforcement ALWAYS INCREASES the probability of behavior (it does not matter if the reinforcement is positive or negative)

Positive Reinforcement - something is added or gained that *increases* the probability of the behavior occurring again.

Negative Reinforcement - something is removed or taken away that *increases* the probability of the behavior occurring again.

Remember that reinforcement can consist of almost any event; do not think of reinforcement as being just something that is given to the child. Any event that follows a behavior and makes that behavior more likely to occur in the future is reinforcement.

What does it mean to pair with reinforcers?

We offer reinforcers (valuable items/activities) to the child before working on any instructional demands. This means that staff deliver the reinforcers when the child is approaching them and/or remaining in their proximity without demanding anything of the child other than to not engage in problem behavior.

When pairing is done properly, kids want to be around us! They don't mind working with us when the time comes, because a history of positive reinforcement has been established. The adults are seen as "givers", a source of good things.

The result of pairing should be ***approach behavior!!***

What is approach behavior?

Approach behavior refers to any behavior (movement and/or vocalization) of the child that indicates they want to be with you.

If we're having fun, children will be having fun and will want to be with us. It is easier to teach someone who wants to be with us rather than someone who wants to run away from us.
Though no demands are placed at first, reinforcers are contingent (dependent) on approach behavior. The child has to look at us, or walk by us, or allow us to walk by him/her to get the reinforcer. We do not chase… that would reinforce "walking away" behaviors!

When we start assessing and working with children we need to assess their preferences. Things the child prefers may serve as reinforcers. You will be asked to fill out a Reinforcer Assessment to help you reliably identify these items. We will also discuss this together. There are many different reinforcer assessments available. For an example of a reinforcer assessment please see APPENDIX 3.

Referent-Based Instruction (RBI)

RBI is natural environment training method for verbal behavior based on the principles of behavior analysis. This treatment package combines natural language teaching (NLT) and frequency building to strengthen verbal behavior. A *referent* is an identified item, activity, or event which is the basis of the verbal behavior training, the hub around which the four elementary verbal operants are taught. RBI begins by identifying the child's source of interest as

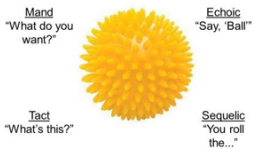
determined by the length of time they spend attending to that object/event or activity. Following an evaluation of the child's language which is measured by SCoRE, the resulting treatment plan outlines how best to teach the child the verbal operants through a combination of most-to-least prompts until the child can produce each operant response independently. During RBI, the referent produces the opportunities for requesting, labeling, naming, and replying, incorporating milieu and discrete-trial training.

You will engage in naturally occurring activities and routines with your child; the identified referents function as reinforcers for teaching language. RBI is conducted within the contexts of family routines and play-based activities, e.g., swinging, piling blocks, completing puzzles, drawing pictures, and playing. The goal is to teach corresponding mands, tacts, echoics, and intraverbals for each item or activity your child is interested in. During teaching sessions, access to the referent is restricted, prompting your child to request. When the learner is engaged with the referent, you will (a) present the referent to produce the tact function (label), (b) model the target response for an echoic (copy), (c) restrict access to promote the mand function (request) and (d) provide a fill-in-the-blank frame to produce an intraverbal (reply).

For instance, when your child plays with a toy truck, the echoic is evoked by you saying to the child, "Say truck". Referencing the toy truck, you say "what's this?", for a tact response. Restricting access to the truck, you say, "what do you want?" for the mand condition. For the intraverbal, you provide the fill-in, "Vroom goes the

". During RBI your child's preferences are continuously being assessed; allowing your children to play as they choose, not requiring engagement in any particular activity. RBI involves following your child's lead.

Referent: Ball



Resources

Websites

www.verbalbehavior.org

https://www.marybarbera.com/

www.asatonline.org

www.autism-society.org

www.autismshop.com

www.autismtrainingsolutions.com

www.behavior.org

www.christinaburkaba.com/AVB.htm

www.difflearn.com (This is an on-line catalog specializing in learning materials and playthings for children with developmental delays and challenges)

www.drcarbone.net

www.marksundberg.com

www.tiu11.org

www.vbteachingtools.com

Other

Educating Children with Autism. National Academy Press: Washington, D.C.

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