COACHING VIA TELEHEALTH: CAREGIVER-MEDIATED INTERVENTION FOR YOUNG CHILDREN ON THE WAITLIST FOR AN AUTISM DIAGNOSIS

by

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DISSERTATION ABSTRACT

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Title: Coaching via Telehealth: Caregiver-mediated Interventions for Young Children on the Waitlist for an Autism Diagnosis

The average age for an autism diagnosis in the U.S. is 4-years-old (Hine et al., 2018), which is devastatingly late as caregivers often report initial concerns in their child's development around 12-months-old and reliable autism diagnosis can be made by 18-months (Pierce et al., 2019). For children from under-resourced families in rural communities, the age of diagnosis is even later, around 5-years-old (Martinez et al., 2018). Early diagnosis of ASD provides toddlers access to medically necessary interventions beyond federally funded early intervention (Individuals with Disabilities Education Act, Part C, 2004) during a vital window of developmental opportunity (Warren et al., 2011). Late diagnosis often leads to under-served families despite economic status or geographic location.

This study targeted ASD symptomology (i.e., higher-order restrictive and repetitive behaviors and interests; HO-RRBIs) in toddlers by pairing caregivers with an early interventionist via telehealth. Six mother-child dyads (four girls and two boys) whose child was (a) between 18 and 42-months-old, (b) demonstrated difficult levels of inflexible behaviors (i.e., HO- RRBIs), and (c) were on an ASD diagnostic waitlist were recruited from pediatrician offices and service districts throughout the Pacific Northwest

and Texas. All families were considered under-served, under-resourced, or living in rural locations.

In a concurrent multiple baseline design across participants, caregivers were coached to mediate early intervention to decrease inflexible and increase flexible child behaviors during play sessions through the use of four evidence-based applied behavior analytic strategies: modeling, prompting, differential reinforcement of appropriate behaviors, and response interruption and redirection. A visual analysis of the data combined with Tau-U revealed a strong basic effect between the intervention package and parent strategy use and child flexible and inflexible behavior. These findings were consistent except for one child participant whose results were a medium effect for flexible behaviors, yet a strong effect for inflexible behaviors. Standardized mean difference was beyond zero for all participants. All mothers rated their participation in the study as favorable. Results of distal and non-experimental outcomes are addressed. Implications for science and practice in early intervention for families whose children are at-risk for ASD are discussed.

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~ unsteadiness of waiting,

~ uncertainty of your child's future,

~ and your joys of parenting.

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CHAPTER I

INTRODUCTION AND LITERATURE REVIEW

This chapter presents the purpose of this study and a review of research literature on early diagnosis and intervention for toddlers with red flags for autism spectrum disorder (ASD). This literature review describes five broad topics: (a) the core deficits of ASD, (b) autism diagnosis, (c) impact of delayed diagnosis, (d) interventions specific to ASD symptomology, and (e) intervention considerations for this population. This chapter's conclusion includes the study's aims and research questions.

The increase in children at risk for autism has caused a surge in wait times for an educational or medical diagnosis, often required to access intensive early intervention or early educational opportunities for this population (Hine et al., 2018). The timing of the diagnostic pipeline, from parental concern to the actual diagnosis, can take multiple years. Diagnosis is the gate-keeper to effective, individualized interventions (e.g., applied behavior analysis), which at an early age can reduce the severity of ASD symptomology and, for some, make a child indistinguishable from typically developing peers (Warren et al., 2011). Long waitlists and inaccessible services negatively impact caregivers' well-being by increasing their stress and anxiety while decreasing sense of efficacy as a parent due to limited information regarding diagnosis (Connolly & Gersch, 2013), inadequate skills to respond to challenging behaviors (Denman et al., 2016), and limited intervention resources (Rivard et al., 2017). Cyclically, extreme caregiver stress leads to intensified child behavior; and this intense, challenging behavior then contributes to higher caregiver stress (Baker-Ericzen et al., 2005).

Interventions for children with ASD commonly target their core deficits: social communication and restricted and repetitive behaviors and interests (RRBIs). Specifically, RRBIs include lower-order (e.g., stereotyped motor movements, repetitive or limited object use, and ritualized patterns of action) and higher-order RRBIs (HO-RRBIs; e.g., insistence on sameness, inflexible adherence to routines, and highly restricted, fixated interests including intense focus; APA, 2013). HO-RRBIs have a strong association with extreme levels of caregiver stress and anxiety, yet they continue to be understudied (Boyd et al., 2012). HO-RRBIs can be particularly difficult for families of young children, due to insistence on precise routines or interactions. Requests for a child to be more flexible (e.g., variation in play materials, partners, or scenarios) can trigger challenging behaviors. These behaviors may escalate, potentially beginning with tantrums and increasing to the harm of self and others (e.g., head banging, biting, or property destruction; Rispoli et al., 2014). The presence of inflexible behaviors can prevent children from exploring play activities beyond their fixated interests, often rejecting a caregiver's bids for interaction, resulting in isolation rather than social play (Lin & Koegel, 2018). While rigidity in play and limited social responsivity are core characteristics of ASD, these behaviors may be present in toddlers and young children with various developmental delays. The commonality and difficulty caused by HO-RRBIs make them plausible targets for early intervention across diagnostic labels. With intervention, HO-RRBIs can be decreased (Lin & Koegel, 2018). This study will expand the research base by focusing on a population of children at risk for ASD who are waiting for a diagnostic evaluation. Despite the possibility of an ASD diagnosis, most families only receive general, non-autism-specific early intervention while waiting to receive an

assessment. Families may benefit from specific interventions that target HO-RRBIs and ASD symptomology while they are on lengthy waitlists.

Literature Review

Core Deficits of Autism

ASD, an early emerging neurodevelopmental disorder defined by social communication delays and restricted and repetitive behavior and interests (APA, 2013), has steadily risen to the current rate of 1 in 54 children in the US (Maenner et al., 2020). The APA released the fifth edition of its Diagnostic and Statistical Manual of Mental Disorders (DSM-V) in 2013, which defines autism as a spectrum disorder based on specific criteria. Within the social communication domain, a person must have delays in the following three areas: (a) social-emotional reciprocity, (b) nonverbal communicative behaviors used for social interaction, and (c) developing, maintaining, and understanding relationships. Social communication for children with ASD covers both the ability to interact in a socially acceptable manner and doing so while following social cues of how to navigate an interaction with others based on the context in which the social exchange is taking place. A second domain includes the restricted, repetitive patterns of behaviors, interests, and activities, to be diagnosed as autistic, the child must have two of the following characteristics: (a) stereotyped or repetitive motor movements, use of objects, or speech, (b) insistence on sameness, inflexible adherence to routines, or ritualized patterns or verbal nonverbal behavior, (c) highly restricted, fixated interests that are abnormal in intensity or focus, or (d) hyper- or hypo-reactivity to sensory input or unusual interests in sensory aspects of the environment (APA, 2013).

The presence of autism symptomology as recognized by a parent, caregiver, or professional is apparent from early-onset and considered part of one's early childhood development to be considered a part of the autism spectrum (APA, 2013). As children age, characteristics of ASD may become easier to identify. For example, as children enter school, an increase in social demands (e.g., making friends, following rules on the playground) may highlight difficulties accentuating developmental differences that were overlooked earlier in the child's life. The diagnostic symptoms also cause a clinically significant impairment for the child's ability to function in their daily lives. For example, a fixated interest in toy vehicles may prevent a child from exploring other activities (e.g., puzzles, building blocks). This fixated interest hinders developmental gains by making transitions to different routines extremely difficult throughout a child's day (e.g., mealtime, tooth brushing, bedtime), and thereby delaying progress in adaptive functioning. Developmental concerns (intellectual disability or language impairment) along with consideration for neurological, medical, or genetic conditions should occur together at the time of diagnosis as comorbidity is common for individuals with ASD. Additionally, individuals who have apparent delays in social communication, but do not fully meet the criteria for autism spectrum disorder, may be assessed for social-(pragmatic) communication disorder. Unlike people with ASD, this population does not demonstrate restricted and repetitive behaviors, yet have other similar characteristics to someone on the autism spectrum (APA, 2013).

Autism Diagnosis and Services: Increased Demand and Increased Wait

As the number of children diagnosed with autism is increasing, there is debate over explanations for this upsurge, referred to by some as the "autism epidemic"

(Leonard et al., 2010). Possible reasons for this increase in diagnosis include, (a) the broadened range of symptoms (transition from DSM-IV to DSM V; APA, 2013), (b) a broader use of assessments and screenings (e.g., pediatric screeners recommended at 9, 12, and 18 months; Hyman et al. 2020), and (c) public awareness campaigns (e.g., Autism Awareness Month; Autism Society). With heightened awareness, more parents are seeking access to accurate and timely evaluations. The result is lengthy waitlists for diagnostic appointments. This lag time between parental suspicion of a developmental delay and a diagnostic assessment can take years, ultimately delaying access to medically necessary, autism-specific intervention. Although ASD diagnostic statistics vary by country, the issue of the waitlists specific to an autism diagnosis is not unique to the US (e.g., in Ireland, Connolly & Gersch, 2013; in the UK, Denman et al., 2016; in Australia, Gibbs et al., 2019; in Canada, Rivard et al., 2017). The wait time for which families are in-limbo often creates a barrier to access necessary intervention to address the core deficits impacting children at risk for ASD. Referrals often occur before age two, and national statistics demonstrate that children can receive a reliable diagnosis by 18 months (e.g., Autism Diagnostic Observational Schedule [ADOS-2] Toddler Module; Lord, Luyster, et al., 2012; Pierce et al., 2019). Yet, the average age for diagnosis in the United States is age 4. For children of color who live in rural locations, the average age is even later: five-years-old and beyond (Hine et al., 2018; Jo et al., 2015; Martinez, 2018). This delay raises the question: *why do families have to wait so long to determine a diagnosis of autism for their child?*

Delays in Diagnosis. Practitioners and researchers have various explanations for the prolonged waiting period around autism diagnosing. Possible reasons include

variation in child development, differing levels of severity, professional competency, and lag time between screening and diagnostic appointment.

Variation in Developmental Trajectory. One argument in favor of delayed diagnosis is the variability of developmental trajectory overtime. Leonard and colleagues (2010) present the difficulty of objectively diagnosing autism. Due to the variability of symptoms, the physician must have a broad understanding of different manifestations of behavior associated with ASD. The problem is that general practitioners may have minimal knowledge of autism, and they only see a child patient for a finite amount of time. These appointments may be as short as 15 minutes, making it impossible to observe variability in behaviors. While a parent interview is always a pertinent part of a child's medical appointment, to infer conclusions from the second-hand, parent-reports of child conduct is problematic. While a parent often knows their child best, depending on the parent's knowledge of typical child development, their observations at home may be biased to see higher or lower levels of performance. The combination of limited time, physician competency, and parent bias can lead to an under- and over-diagnosis of ASD (Beaudoin et al., 2019; Harrop, Gulsrud et al., 2016; Leonard et al., 2010).

Difficulty in Determining Autism Severity. The autism severity level is an additional component in diagnosis under DSM-V and often plays a part in uncertainty and variability. Directly linked to the intensity of service, severity level defines whether a child will receive minimal, moderate, or high levels of intervention based on the diagnostician's determination of autism severity. Some diagnostic tools provide the severity level (e.g., Autism Diagnostic Observation Scale-2 (Lord, Rutter et al., 2012), but ultimately, the level of severity comes from brief observation and parent report. The

link between diagnosis and severity is problematic. Diagnosing professionals should consider that the severity level will change with the age and developmental of the child. However, there are no tools to assess severity *beyond* diagnosis; thus, it is up to the professional working with the person at any given time to determine if the severity level is accurate or should be adjusted to meet support needs better. Establishing intervention intensity at an initial assessment can result in too little (e.g., ineffective) or too much (e.g., unnecessary and costly) therapeutic intervention (Mazurek et al., 2019).

There are three levels of severity corresponding to suggested levels of support for individuals diagnosed with ASD. The support varies between level 1: requiring support; level 2: requiring substantial support; and level 3: requiring significant support as designated for each diagnostic area independently (i.e., social communication and restricted and repetitive behaviors; DSM-IV). Table 1 describes the severity levels of ASD concerning social communication or restricted and repetitive behaviors.

Autism research has questioned the independence of the defining components of ASD, especially in symptom severity (Whitten et al., 2018). As described in the severity levels, a deficit in one symptom component may be more severe than in others. In turn, impacting another part that otherwise may not be an area identified for intervention, thus suggesting that these diagnostic criteria may be more dependent on one another. For example, severe, obsessive interests may impact one's ability to communicate socially with others because that interest consumes the person's attention to the point of exclusion for most everything and everyone around them. In this example, it is difficult to say which is the causal factor: Is it avoidance of social interaction or restricted interest? Suggesting the highest level of intervention in all areas, however, may be a disservice as

it could increase family stress and result in an unnecessary, costly intervention. The severity level can be a difficult decision, and one should take great care when using this leveled system to determine the amount of intervention one should receive.

Table 1

Descriptions of ASD Severity Levels

	ASD Symptom Category	
Level of Support Required	Social Communication	Restricted, Repetitive Behaviors
Level 1 Some Support	Some difficulty with social communication and initiating interactions; clear examples of atypical or unsuccessful responses to social overtures; uninterested in social interactions; a person can speak in full sentences and engage in communication but awkward back and forth conversation; attempts to make friends are typically unsuccessful.	The inflexibility of behavior causes significant interference with functioning in at least one situation; difficulty transitioning between activities; organization and planning problems obstruct independent performance.
Level 2 Substantial Support	Deficits in verbal and nonverbal social communication skills; social impairments are apparent even with support; limited initiation of social interactions; minimal or unusual responses to social overtures; person speaks in abbreviated sentences, with minimal interaction; narrow special interests; odd nonverbal communication	The inflexibility of behavior, difficulty coping with change, or other restricted and repetitive behaviors often appear enough to be evident to the casual observer. These behaviors interfere with functioning in a variety of contexts. For example, distress and difficulty changing focus or action.
Level 3 Very Substantial Support	Severe deficits in verbal and nonverbal social communication cause significant impairments in functioning, very limited social interaction initiation; minimal response to social overtures, a person with little intelligible speech, rarely initiates communication interactions; unusual social bids.	The inflexibility of behavior, extreme difficulty coping with change, or other restricted/repetitive behaviors markedly interfere with functioning in all aspects of daily and personal life—great distress/difficulty changing focus or action.

Note. Severity levels listed here are from the DSM-V (APA, 2013).

Similar to the difficulty in diagnosing ASD, determining the impact the disability will have on overall function, (i.e., the severity of ASD) can also be challenging. In a study by Mazurek and colleagues (2019), the researchers identify factors that lead clinicians to prescribe particular autism severity levels as defined by the DSM-IV. Outcomes determined that overall high-level severity was associated with children diagnosed at a younger age, had a low intelligence quotient (IQ), and high severity scores on the Autism Diagnostic Observation Scale-2 (Lord, Rutter et al., 2012). Alternatively, the severity of RRBIs is decided primarily by the parent's report. The authors discuss their concern of clinicians considering IQ scores as a critical determinant of ASD severity, and the lack of observation and assessment of all symptomology, to include RRBI severity. Further research is necessary for determining the severity of ASD, proper conditions for doing so, and appropriate measures for making these decisions (Mazurek et al., 2019).

Professional Competency: Preliminary Diagnosis and Referrals. While some diagnostic decisions are apparent, others involve expert insight into nuanced behaviors (e.g., diagnosing high-functioning girls). To avoid waitlists, parents may see a primary care provider in hopes of a quick diagnosis. Yet, in many situations, what were intended to be quick fixes may result in referrals due to a provider's limited knowledge of ASD, requiring the family to be placed on another waitlist for further assessments by a more skilled diagnostic team (Rutherford et al., 2018).

Differing symptom topography and severity due to development and maturation may also result in a preliminary diagnosis and follow-up appointments, substantially prolonging the waiting time for families. A toddler with minimal social opportunities

with peers may be described as a competent play partner with his older sibling. Once the child enters kindergarten, social demands are more constant and variable, possibly resulting in inappropriate social behavior (e.g., aggression toward others, inflexibility, tantrums, or sensitivity to noise in groups). These challenging behaviors that are often overlooked in toddlerhood can become more prominent in kindergarten, demonstrating more social anxiety and more significant play skill deficits. If a child does not receive a diagnosis based on social concerns in toddlerhood, in the preschool years, these social communication difficulties will have become much more evident and ingrained in his interactions (Leonard et al., 2010). Waiting to diagnose until preschool years provides an opportunity for behaviors to become solidified in the child's repertoire. In contrast, early diagnosis allows for necessary early-intensive intervention, which may redirect the developmental trajectory before social difficulties can lead to more significant social issues, such as peer exclusion and isolation.

Lag-time Between Screening and Diagnostic Assessment. Various screening tools are available to identify children at risk for ASD before age two (e.g., The Modified Checklist for Autism in Toddlers, revised with follow-up (M-CHAT-R/F; Robins et al., 2009); Screening Tool for Autism in Toddlers and Young Children (STAT; Stone, Coonrod, & Ousley, 2000). Yet, the US continues to diagnose at a much later age, contributing to disparate access to intensive, autism-specific early intervention (Center for Disease Control and Prevention 2019). In a review by Daniels and colleagues (2014), researchers identified conventional approaches across agencies to efficiently find and screen children at risk for autism at an early age. Results identified important factors towards early identification, (i.e., symptomology awareness, routine screening, and

procedural efficacy during the testing). None of the outcomes impacted the length of time between parent concern and actual diagnosis, even with the numerous studies describing this as a problem (Daniels et al.,2014). In a study by Martinez and colleagues (2018), family experiences leading up to diagnosis were reported. Not surprisingly, results indicated a delay between parental first concern and actual diagnosis. Barriers for families included difficulty finding medical providers, travel distance to providers, and shortages in mental health professionals (Martinez et al. 2018). Early diagnosis of ASD provides toddlers and young children access to medically necessary interventions beyond federally funded early intervention (Individuals with Disabilities Education Act, Part C, 2004). Streamlining procedures to ensure timeliness toward diagnosis seems an obvious next step for the field (Christensen et al., 2016; Daniels et al., 2014; Esler et al., 2015; Fountain et al., 2011; Hertz-Picciotto & Delwiche 2009; Warren et al., 2011).

Solutions to Decrease Wait Times. Despite these barriers, there are solutions. Possible solutions include parent screening, staff training, and support beyond diagnosis. While some solutions have been explored in research, others should be better understood in research.

Parent Screening. One example of the movement toward accessible screening before a diagnosis is the use of mobile applications (apps; e.g., Autism & Beyond, Egger at al., 2018; Autism and Developmental Disorder Screening app, Kim et al., 2018). Most ASD screening apps are new and in early stages of use, with as-yet, limited users. These apps are designed for easy access, enabling a parent to record videos and review signs of autism in their child while still in the familiar surroundings of their home. These apps have received minimal feedback and mixed reviews, including criticism of their limited

recognition of various symptomology and limited usefulness beyond age three (Thabtah, 2019). One application that has received more positive feedback is ASDetect, which is based on the Social Attention and Communication Surveillance Tool (see Barbaro & Dissanayake, 2010). This app claims to have an 81% correlation between screening and diagnostic results (Thabtah, 2019; Barbaro et al., 2011). In their proposed study of ASDetect, Barbaro and Yaari (2020) describe their app as a surveillance tool that enables parents to assess their child's behavior and determine their likelihood of autism. A parent compares their own child's behavior and age (i.e., 12, 18, or 24 months) with the behavior of children with and without ASD, as presented by video on ASDetect. As the authors broaden their reach of the app to more users, more valuable ratings, and parent feedback are anticipated (Barbaro & Yaari, 2020). Empowering parents to identify more accurate signs of ASD in their child may decrease unnecessary referrals, ultimately shortening waitlists.

Adequate Staff Training. As autism awareness continues to rise, the need for skilled assessors to determine a diagnosis has increased. As Rutherford and colleagues (2018) described, interdisciplinary teams meet best practices in diagnosis, but a trained specialist can make an accurate diagnosis. The authors suggest that autism specialists provide training to other community professionals who require a greater understanding of ASD to implement accurate screening assessments. An additional suggestion is to have supports in place for professionals to seek information needed to make an accurate diagnosis (e.g., autism information hotline), thus decreasing the likelihood of further referrals and inaccurate assessment results (Hyman et al., 2020; Rutherford et al. 2018).

Adequate Support Beyond Diagnosis. Early diagnosis permits critical early intervention for this population of children (Guthrie et al., 2013; Hine et al., 2018; Macari et al., 2012; Ozonoff et al., 2010). These interventions focus on specific deficits (e.g., social interaction, communication, and inflexibility). By receiving particular therapies, such as applied behavior analytic interventions and speech support at an early age, a child can make significant improvements in challenged developmental areas (Dawson et al., 2010; Remington et al., 2007; Warren et al., 2011). There are successful early intervention packages for toddlers post-diagnosis; these include the Early Start Denver Model (Dawson et al., 2010), Pivotal Response Treatment (Nefdt et al., 2010); Lovass Method (Lovass et al., 1987); Joint Attention Symbolic Play Engagement and Regulation (JASPER; Stickles Goods et al., 2013), Milieu Teaching (Kaiser & Roberts, 2013). The transition from diagnosis to intervention, however, is not seamless. Smith-Young and colleagues (2020) report that parents find equal frustration in the lag time between the identification of developmental delay and diagnosis as they do in the wait between diagnosis and intervention services. Key factors toward family support that could lead to an ease in these transition times include (a) increase of information about diagnosis processes, (b) empowering parents to be advocates for their child, and (c) instructions to access insurance and external funding (Smith-Young et al., 2020).

The long road toward diagnosis and intervention suggests the need for widely-available early intervention packages that target ASD symptomology well before diagnosis. Children demonstrating symptoms of ASD can benefit from individualized intervention at the first recognition of a developmental delay. Specifically, an intervention that targets an increase in behavior flexibility and responsivity may increase

social communication and decrease restrictive and repetitive behaviors (Boyd et al., 2011). In contrast, waiting to intervene allows dysfunctional behavior patterns to develop a more extensive learning history in a child's repertoire. Parents inadvertently become supporters of these inappropriate behaviors, making behavior change much less likely to occur under natural circumstances. The result is the need for additional services and higher expenses later in childhood or into adulthood (Jacobson et al., 1998).

Cost-Benefit Analysis of Autism Intervention

Service availability and cost of intervention is mainly dependent on the state the family lives. Early intervention may be paid for in part or whole by government-funded agencies. Families often pay for additional services (e.g., applied behavior analysis) through insurance or private funding. A cost-benefit analysis calculates the cost and benefit of intervention compared to a similar group who did not receive the intervention (Levin et al., 2018; Marcus et al., 2000).

A cost-benefit analysis by Jacobson and colleagues (1998) analyzed the impact of receiving the early intensive behavioral intervention (EIBI) for three years before school entry for children at risk of ASD. Using the state of Pennsylvania's cost estimates for special education at the time of the study, outcomes suggested significant savings in educational spending by providing EIBI during these early years, (i.e., a cost range of ~ $230,000-650,000 during years in school). Unique to children with ASD, response to intervention varies depending on the severity of ASD symptomology and its impact on daily functioning; therefore, the cost of future educational needs also varies (e.g., higher severity, more support, and higher price). Jacobson and colleagues attempted to account for this variation by considering the range of response to EIBI (i.e., high response leading

to general education, partial response leading to special education, and minimal response leading to special education requiring more intensive supports). Thus, the range in cost is relative to the response to intervention and severity. Overall, the authors estimate the number of students in the minimal response range who require more intensive special education services (i.e., the group with the highest cost) is the smallest group. Thus, they conclude that the price of EIBI in the early years is worth spending. These children will, in turn, require less money spent throughout their educational careers, as even more severe symptomology can be addressed and potentially changed, resulting in long-term savings overtime (Jacobson et al.,1998).

Chasson and colleagues (2007) conducted a similar analysis comparing long term educational costs for children with ASD who did and did not receive EIBI in the state of Texas. By implementing an equation that considers the price of special education, costs of EIBI, and the number of years of schooling (both publicly funded education and EIBI), the authors estimated the cost savings per child and for all children with ASD served in the state. Findings suggest a savings of over $2 billion if all children with ASD received EIBI based on the 10,000 students diagnosed with ASD in the Texas school system and cost of service at the time of the study.

Despite the positive outcomes suggested, projections are not without conjecture. One assumption is that the number of non-responders requiring significant support in school will remain the smallest group of students with ASD. A second is that the cost of EIBI will remain relatively stable over time, which is unlikely due to demand for services and a limited number of available behavior analysts to provide services. Finally, the authors assume that the number of students with autism will remain relatively stable,

which is an inaccurate assumption based on the consistent rise in numbers over the last several years. As these assumptions are not reliable across time, cost-benefit analyses should continue to be conducted to assess the ever-changing needs of the autistic community (Chasson et al., 2007).

More recent cost-benefit analyses have compared delivery of the Early Start Denver Model by a therapeutic agent (i.e., clinician- or parent-led intervention; Penner at al., 2015) as well as the mode of intervention delivery and coaching of ABA procedures (i.e., in-home face to face, clinic-based telehealth, and home-based telehealth; Lindgren et al., 2016). Penner and colleagues (2015) found the parent-led intervention to be less effective than clinician-based therapy. Lindgren and co-authors (2016) found this not to be the case. Specifically, the authors concluded that coaching sessions for parents of children with ASD via telehealth had positive outcomes (Lindgren et al., 2016). A reduction in the child's challenging behavior, high treatment acceptability as reported by parents, and the lowest costs for intervention compared to telehealth in clinics or face-to-face in-home therapy were all reported (Lindgren et al., 2016). These findings speak to the need for continued research in delivery mode, intervention agent, and intervention package used. These three components should align with evidence-based practice as well as contextual fit for each family to measure effectiveness as well as cost-benefit results.

Cost-benefit analysis for this study could assist stakeholders (i.e., caregivers, early interventionists, diagnosing professionals, and policymakers) in making intervention delivery decisions. First, compare the cost of telehealth versus face-to-face delivery. Second, measure the intervention's benefits by child behavior change (e.g., ASD symptomology, play flexibility) and caregiver outcomes (e.g., responsivity, level of

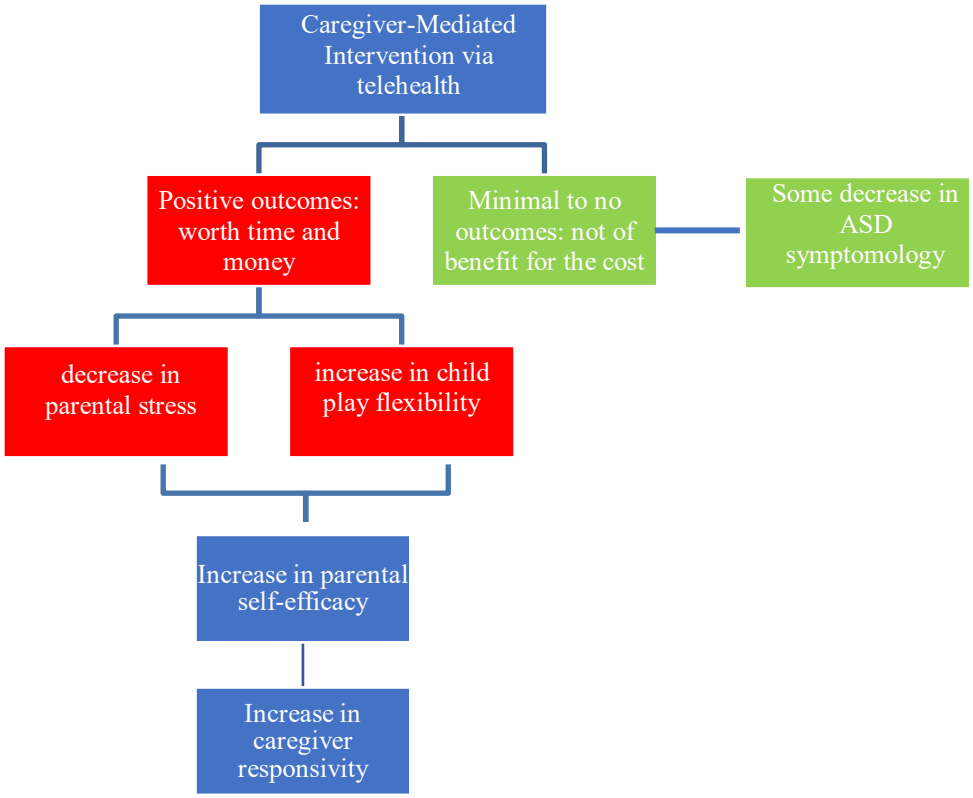
stress, self-efficacy). Third, assess the child and parent outcomes gained via telehealth in comparison to the results of the same intervention package implemented face-to-face. Figure 1 depicts a hypothetical benefit graphic specific to this study. If results from this caregiver-mediated intervention via telehealth are widely positive, the benefit to cost analysis may be worthwhile and in favor of the intervention package presented here. In this hypothetical example, the outcomes for the study demonstrate a positive proximal outcome for one dependent variable and some distal outcomes, as seen in red. In green, the distal outcomes were minimally affected by the intervention, thus may not be of benefit for this standalone variable. It is important to note that cost-benefit analysis can help assess particular aspects of the intervention in addition to the overall intervention package. A cost-benefit analysis can evaluate the effectiveness of a caregiver-mediated intervention versus intervention by an early interventionist. It can also assess the mode of delivery: telehealth versus face to face. Similar to previously discussed analyses (e.g., Chasson et al., 2007; Jacobson et al., 1998; Lindgren et al., 2016) calculating the costs of special education, costs of early intervention in-person versus telehealth, and the number of years of schooling may result in the current analysis of the benefits of this type of intervention package.

Caregiver Stress and Self-efficacy

Research suggests that parents of children with ASD have higher levels of stress and lower levels of self-efficacy than the parents of children with most other developmental disabilities. (Harrop, McBee, & Boyd, 2016; Wong et al., 2017). Emerging research to understand the needs of this population of families includes anecdotes of parents' feelings

Figure 1

Hypothetical Benefit Matrix



Note. This hypothetical benefit matrix exemplifies caregiver-mediated intervention via telehealth to inform cost-benefit analysis to calculate the investment rate of return.

of stress and anxiety in association with limited information regarding diagnosis (Connolly & Gersch, 2013), reports of inadequate skill sets necessary to respond to challenging behaviors (Denman et al., 2016), and stories of frustration around the limited resources available during the wait time for diagnosis and there-after (Rivard et al., 2017). Heightened caregiver stress in parents of children with ASD negatively affects treatment efficacy (Osborne et al., 2008; Shalev et al., 2020). Research tells us parental stress varies with ASD symptomology and severity. RRBIs interfere with various aspects

of daily life (i.e., adaptive skills and interactions with others), resulting in parents reporting that RRBIs are more challenging to manage than social communication differences in their child's daily behavior (Harrop, Gulsrud et al., 2016). A meta-analysis by Hayes and Watson (2015) highlights that the severity of ASD symptomology (i.e., RRBI severity, social-communication severity, or combined severity) is more influential on high caregiver stress than any other child behaviors.

Parental self-efficacy is a parent's perception of one's competence to be a parent to their child (Coleman & Hildebrandt Karraker, 2003; van Rijen et al., 2014; Wittkowskil et al., 2017). Research suggests a link between parent's self-efficacy and child behavior and functioning. A parent's responsivity and discipline style impact a child's behavior and development (van Rijen et al., 2014). In turn, a child's challenging behavior and developmental differences can negatively affect a parent's belief in their ability to parent.

In a study by Coleman and Hildebrandt Karraker (2003), the researchers examined the relationship between a mother's self-efficacy and their toddler's behavior. Results indicated that lower maternal self-efficacy was present in dyads whose toddler exhibited avoidance toward the mom, limited enthusiasm, and negative responses. Although the participants in this study had no autism diagnosis per se, similar behaviors (e.g., social avoidance and aloofness) from toddlers with ASD are common. It is possible that without specific early intervention to address these behaviors, dyadic-engagement exchanged between a mother and child with ASD could be minimal, as seen in the Coleman and Hildebrandt Karraker (2003) study, and low self-efficacy may emerge. The limited engagement is of concern as high levels of parental self-efficacy has been linked

to positive parental influence, high competence, and better child outcomes (Jones & Prinz, 2004; Wittkowskil et al., 2017).

A review by Jones and Prinz (2004) points to studies that suggest a relationship between these two factors regarding parental self-efficacy and intervention outcomes. Studies indicated that intervention outcomes for parent-child dyad demonstrated a significant increase in parent efficacy and a decrease in child challenging behavior (Sanders et al., 2000; Sofronoff & Farbotko, 2002 as cited in Jones & Prinz, 2004). Interventions that target a decrease in challenging child behavior may likely help a caregiver feel better about themselves.

Interventions and ASD Symptomology

Early intervention packages (i.e., one or more intervention techniques used simultaneously or in tandem) that focus on social communication are not uncommon. (e.g., Early Start Denver Model [ESDM], Dawson et al., 2010; Milieu Training, Kaiser & Roberts, 2013; Joint Attention Symbolic Play, Engagement, and Regulation [JASPER], Kasari et al., 2006; More Than Words - Hanen Model, Weitzman, 2013). Although some packages have demonstrated mixed results (i.e., Hanen Model and ESDM), others are considered evidence-based practices with more promising outcomes (i.e., JASPER; Milieu Training) in areas of child development (Steinbrenner et al., 2020). Many early intervention packages, such as those mentioned, focus on social-communication deficits rather than RRBIs despite the prevalence of both deficits in children with ASD.

There are several justifications for this recurring focus on social communication, over RRBIs in early intervention. One reason is that social communication deficits are shared across people on the spectrum, while RRBIs tend to be heterogeneous and linked

to the severity level of ASD. Defining RRBIs in isolation of social communication milestones can be a challenge. Addressing flexibility during play can be labeled as targeting restrictive and repetitive behavior. However, an increase in play diversity and interactions with peers may be a bi-product of such an intervention; therefore, the intervention works to impact change in both RRBIs and social communication goals.

Another reason for focused intervention is that the developmental trajectory of social communication usually does not change without intervention for children with ASD (Chang et al., 2016), while research suggests that RRBIs may vary for some children over time without targeted intervention. Justification for RRBIs improving over time is two-fold: (a) these behaviors are impacted by a child's maturity and (b) intervention effects of other ASD symptoms may affect RRBIs without direct intervention. Yet, while some RRBIs may decrease, others remain at similar levels across childhood and, in some instances, others increase in intensity and frequency (Elison et al., 2014). Despite previous intervention trends, research is highlighting the need to include RRBIs as a focus area for early intervention (e.g., Bishop et al., 2007; Boyd et al., 2012; Lin & Koegel, 2018).

Intervention for RRBIs. Research has demonstrated the negative impact of RRBIs on meeting developmental milestones, making social connections, and school achievement for children with ASD (Boyd et al., 2012). There is growing evidence that RRBIs not only impact the child's developmental trajectory but significantly affect the functioning of a family. These behaviors have been associated with higher parent stress, more negative parenting, lower self-efficacy, and perceived lesser quality of life (Bishop et al. 2007; Boyd et al., 2012; Harrop, McBee, & Boyd, 016).

RRBIs fall into two categories: low and high order. Lower order RRBIs (LO-RRBISs) are repetitive motor movements, which include stereotypies, movement of objects in a repetitive, non-functional manner, and self-injurious movements, which are conducted in a repeated sequence (Boyd et al., 2012). HO-RRBIs are cognitive behaviors such as inflexibility in routines and actions, the adherence to ritualistic series of events, and often include rigid, rule-bound actions (Boyd et al., 2012; Lin & Koegel, 2018). While research has grown in focus on interventions for these behaviors and recognizes the high levels of caregiver stress associated with RRBIs, interventions focusing on this specific sub-set of behaviors are limited in number compared to interventions which target social communication deficits for individuals with ASD (Boyd et al., 2012; Harrop et al. 2014). Research suggests HO-RRBIs are associated with higher parent stress and more problem behavior than LO-RRBIs (Lin & Koegel, 2018; Klin et al., 2007; Lecavalier et al., 2006 South et al., 2005).

An additional literature review by Harrop (2015) included 29 articles that used parent-mediated intervention with toddlers with ASD to identify how interventions targeted and measured RRBIs. Seventeen studies discussed specific strategies for addressing RRBIs. Thirteen of these studies identified applied behavior analysis as their intervention method. Treatments for HO-RRBIs include cognitive behavioral therapy, differential reinforcement, and consequence/antecedent–based approaches. Two studies did not mention RRBIs but used behavior management as part of their methods to address behaviors with matched descriptions for RRBIs; two used Qigong sensory massage to address behaviors within the RRBI category. The remaining studies did not mention RRBIs as a focus or moderator of their research, and none of the studies targeted RRBIs

in the intervention. These findings point to limited attention to such a vital area of research.

Intervention focusing on RRBIs does exist despite the comparatively fewer interventions than those for social communication deficits. For example, interventions specific to LO-RRBIs include such strategies as exercise (Kern et al., 1984; Lang et al., 2010) and environmental arrangement (Piazza et al., 2000). There is extensive research on self-injurious behaviors (e.g., Erturk et al., 2018), which include functional communication training (e.g., Durand & Carr, 1991), differential reinforcement (e.g., Tucker et al., 1998) and response cost procedures (e.g., Sidener et al., 2005). Interventions for HO-RRBIs, often using applied behavior analytic techniques, include differential reinforcement, antecedent and consequence interventions (Raulston et al., 2019), visual schedules (Zimmerman et al., 2017) and video modeling (Dupere et al., 2013).

In a study by Harrop, Gulsrud et al. (2016), the authors targeted caregiver responses to their toddler's RRBIs during play scenarios. In their study of 83 toddlers, almost all of them displayed RRBIs during the parent-child play period, with the most common RRBI being repetitive object use, thus highlighting the frequent occurrence of HO-RRBIs even at a young age. Results showed that once children began their repetitive behavior, caregivers were unsure how to respond. They showed difficulty in behavior interruption and had minimal success in re-engagement of the child in a more appropriate interaction once the repetitive behavior was allowed to occur, signifying that disruption can be uncomfortable for some automatically reinforcing behaviors. Findings also identified that while some caregivers have instincts to interrupt RRBIs, their responding

was inconsistent and that some responses may undermine the caregiver-child relationship (e.g., toy removal) rather than allow for a more significant interactive opportunity.

Overall, social communication interventions are more common than interventions for RRBIs for caregiver-child dyadic interventions. At the same time, it has become evident that RRBIs cause stress in the family and should be a target in early intervention. Some behavior strategies have proven successful in RRBI intervention. Yet, more research on the impact of a caregiver-mediated intervention on both LO- and HO-RRBIs and overall ASD symptomology is necessary to determine efficacy, feasibility, and variability in the delivery of these interventions for very young children.

Intervention Considerations

Child Play. In considering the growth and development of young children, play is a significant component. The six stages of social play developed by Parten (1932) have laid a foundation for social play in early childhood education to describe the types of play behaviors in which typical toddlers engage. Although the sequence may be differently ordered depending on a child's developmental level, the stages described by Parten (1932), provide a clear description of child play for toddler- and young preschool-aged children (Xu, 2008). According to Parten (1932), three stages of play may involve children between the ages of 18 and 42 months. Children under age two, most frequently engage in the stage of solitary play. In this stage, children play alone with or without toys with minimal interaction with other people. Although they play without much social interaction, a variation of object play may occur. For example, cause and effect toy play may be the main action. At approximately 24 months, children engage in onlooker play. This observational learning is a combination of social engagement and watching

another's work during play scenarios. A toddler may watch others and engage verbally; however, playing with or near another person may not occur right away. Around 30 months, toddlers begin parallel play. While solo play continues, children start to play next to others and exchange materials, through cooperation and collaborative play usually do not occur until later preschool years.

For children at risk for ASD, these stages of social play may be missing essential components. Language delays may decrease verbal exchanges during play, which reduces interaction during parallel play exchanges. Limited observational skills may decrease interactions during onlooker play. Restrictive behaviors that promote holding onto certain toys for a length of time may decrease exchanges during parallel play. Without intervention targeting flexibility and reciprocity during play, young children at risk for ASD miss vital opportunities to learn cognitive, social, and language skills through playing with caregivers and peers (Frey & Kaiser, 2011).

In a study by Frey and Kaiser (2011), researchers used strategies to expand diversity and complexity of play with objects. Their participants ranged in age from 25 to 32 months with language delays. Outcomes demonstrated that the children were able to expand their play and show more complex play actions with interventionist modeling of play behaviors. Therefore, the researchers concluded that to teach new play expansions, starting with the least intrusive teaching (i.e., a model), eliminated the likelihood of prompt dependency (Frey & Kaiser, 2011). Additional studies are also supporting the use of modeling while teaching new behaviors in the context of the play. Quigley and colleagues (2018) used a component analysis to test modeling, prompting, and edible reinforcement in tandem and independently. Outcomes identified behavior change in all

components, with modeling being the least effective of the three (i.e., modeling independently, prompting independently, and a combination of modeling and prompting). Ulke-Kurkcuoglu (2015) conducted a comparison between least to most prompting and video modeling to teach pretend play skills to children with ASD. The findings here were similar, with prompting being more effective than video modeling to teach these skills. These studies were all conducted by a skilled interventionist in a classroom environment.

While past literature helps choose effective technologies, this research study offers different contributions to the field. The parent is the interventionist who will utilize a hierarchy of least to most intrusive teaching techniques to increase flexible behaviors during play. There are two categories of behaviors that occur during play to describe here: inflexible (e.g., restrictive and repetitive behaviors) and flexible (e.g., cooperative and easy-going behaviors). During instances when a child is exhibiting inflexible behavior, they may demonstrate an undesirable response (e.g., whining, screaming, hitting) to the parent's attempt to interact. Another example of inflexible behavior is when the child engages with an object using a repetitive movement (e.g., flipping, visually inspecting, mouthing items) that prevents or interferes with play interactions.

Further, if the caregiver has great difficulty interrupting the child's intense interest (e.g., the interruption is brief, and the child quickly returns to a repetitive movement), this is considered inflexible behavior as well. Flexible behaviors include positive interactions with people in the environment during play. The child can vary their focus from their interests, engage verbally, and watch others' actions. The child may incorporate a newly demonstrated action by the other person into their play, for example, imitation. Determining between inflexible and flexible behaviors during play can provide a clearer

picture of intervention goals for a child with a developmental delay. In the case of children with ASD, it is unlikely that a child will gain functional, flexible skills in the context of play without intervention (Kok et al., 2002).

Natural Contingencies. For toddler-aged children, interventions are most effective when they are individualized and designed to meet the unique characteristics of the child and family in their natural environment (Division for Early Childhood, 2014). Caregiver-implemented intervention sessions in natural environments (e.g., in the home) allow for learning opportunities to continue beyond scheduled intervention sessions. Environmental influences (e.g., parent as an interventionist, available learning materials, the familiarity of the home setting) remain present even when the interventionist is not present (Tomeny et al., 2019). Predictable natural contingencies in secure, natural environments allow for meaningful and frequent learning opportunities to be offered by the caregiver (Dunst et al., 2006). When considering natural contingencies, it is essential to consider both physical and emotional contingencies in the environment.

Environmental Arrangement. The environmental arrangement is a common component of naturalistic teaching in which the environment is prepared to support a child's exploration (Wong et al., 2015). Environmental arrangement in an antecedent intervention in which the caregiver can set up the environment to best communicate expectations for a social exchange during play. Because these arrangements are unique to each child's needs and can vary from day to day, the arrangement of the environment is a way to encourage communication between child and caregiver and provide interactive opportunities to expand a child's play exploration (Schreibman et al., 2015). The environmental arrangement can be a means to prepare the play environment for

fruitful social exchanges and play. Additional intervention techniques are often required in combination with this component to produce behavior change in development (e.g., flexibility, responsivity, and sharing).

In the current context, the environmental arrangement is the space set up for the play interaction as a means for communication with the child. The area in which the play encounter will take place, the materials offered, and people are all part of the environment. The arrangement of items can communicate boundaries and expectations for the play encounter. The parent is a critical factor in the environmental arrangement here. The parent should be emotionally and physically present to engage with their child. The parent should position themselves within the play space in a way that communicates to the child, "I am here for you! Let's be together." The arrangement of the environment is going to be unique for each family. However, the commonality lies in the components encompassed in the environmental arrangement. The three components (i.e., materials, surrounding space, and parent) should communicate intention by suggesting a playful time for the dyad. The physical and emotional availability of the parent is a crucial factor in each dyad's environment.

Applied Behavior Analytic Strategies

The science of applied behavior analysis (ABA) examines changing socially significant behaviors by using the principles and technologies of behavior analysis (Fisher et al., 2011). The use of ABA strategies in early intervention has led to developmental progress in various domains and across diagnoses, especially for children diagnosed with autism (Wong et al., 2015). ABA technologies specific to this population to address RRBIs have been identified in the research as approaches to increase

flexibility during play. A discussion of (a) modeling and prompting, (b) differential reinforcement, and (c) response interruption and redirection is included here.

Modeling and Prompting. Two strategies to teach new skills are modeling and prompting. These strategies can occur independently and in tandem. Modeling is when someone demonstrates how to perform a skill or behavior to the learner (Sam & AFIRM Team, 2016). When modeling a play behavior, the parent might show how to use a toy in a new way through demonstration. In the current context, modeling is considered the least intrusive strategy in teaching a new play behavior. Prompting is a graduated, more directive model. That is, if modeling does not promote imitation or expansion from the child, a prompt should follow as a more directive nudge. A prompt includes more direct language and physical support for completing a task or play expansion. This least-directive to most-directive sequence to new skills is encouraged during play interactions to minimize the likelihood of prompt-dependency (Cooper et al., 2007). Prompting is intended to reduce low-frequency or incorrect responding and is a commonly used behavioral technique to change behavior (Titus Dieringer et al., 2017). In the context of teaching play skills, modeling (i.e., caregiver enacted actions with materials and turn-taking) is used first. Next, is prompting (i.e., physical encouragement by the caregiver via hand over hand, suggestive pointing, and child positioning). These can be combined to provide guidance and suggestion to a child to practice new play skills.

Research supports the use of modeling when teaching imitation, to include the combination of modeling and time delay (pre-prompt interval of 5 seconds allowing for child response; Francis et al., 2020). Adding in a time delay after a model provides time for the child to respond, especially if receptive or expressive skills are underdeveloped.

Differential Reinforcement of Appropriate Behaviors. Differential reinforcement of appropriate behaviors (DRA) can increase the occurrence of the newly taught or more desired behavior while reducing the occurrence of the undesirable behavior (Hanley and Tiger, in Fisher, Piazza, & Roane 2011; Savage & AFIRM Team, 2017). In the context of intervening on play behaviors, intervention packages (e.g., PRT; Nefdt et al., 2010), can increase target behaviors by pairing intervention components with reinforcement. DRA is a common component in intervention packages, but as a standalone intervention, results of such research in support of DRA is mixed (Stahmer et al., 2003). To increase intervention efficacy, parents should be coached to implement DRA in combination with modeling and prompting.

Response Interruption and Redirection. Response interruption and redirection (RIRD) is a way to eliminate or decrease behaviors that interfere or compete with other more productive or appropriate behaviors (Tomaszewski et al., 2017). RIRD is most common in the treatment of stereotypic behavior. These behaviors can compete so intensely with other behaviors that a person is unable to meaningfully participate in an activity because they become too distracted by their intense interest. These restrictive behaviors, often maintained through automatic reinforcement, compete with many intervention strategies used to replace these problematic behaviors. Identifying reinforcement equivalence (i.e., a reinforcer that is as strongly desired as self-stimulation) is often extremely difficult to identify (Piazza et al., 2000). The approach and dosage of intervention should vary depending on the type and intensity of stereotypic behavior. Yet, the intervention with the most success in decreasing the interference of restrictive, repetitive, or stereotypic behaviors is RIRD (Martinez & Betz, 2013). For some

individuals, these repetitive behaviors can be quickly interrupted or can occur in tandem with appropriate actions. In these instances, repetitive behaviors do not qualify as competing or interfering behaviors and, therefore, may not need to be directly targeted in an intervention.

In this study, RIRD is the most directive intervention strategy introduced to play situations between caregiver and child. This strategy targets restrictive and repetitive behaviors that interfere with a child's ability to change focus to what the caregiver is modeling as an expansion of play. As the exchange between caregiver and child is during play, this interruption is implemented to be minimally intrusive. For example, it can be an instance of the caregiver resting a hand on the child or playfully tickling the child to break their focus on their action or toy inspection. The redirection offered by the parent may include a different, highly reinforcing toy or model of new actions to make the repetitive play more flexible.

Intervention via Telehealth

Telehealth is the use of technology (e.g., smartphone, computer, or tablet) to communicate, coach, or teach intervention techniques while being able to see and hear the other person. Coaching via telehealth is the interaction between an early interventionist (i.e., coach) and caregiver using technology to communicate. The coach observes interactions between caregiver and child and provides support and feedback during this interaction (Simacek et al., 2017). This method of intervention delivery from a distance can address shortages of professionals due to client geographical location and the cost-effectiveness of provider or family travel (Delaigue et al., 2014; Simacek et al., 2017). Furthermore, the shelter-at-home mandates during the time of the novel

Coronavirus (COVID-19) forced services to move online. Telehealth enabled a continuation of intervention services to be carried out from a distance (Rodriguez, 2020).

Many studies about using telehealth with caregivers whose children have a diagnosis of ASD demonstrate positive child outcomes as well as parent satisfaction. Such studies have shown the technology to be user-friendly, success in coaching caregivers to conduct in-home interventions, and maintenance of parent-led interventions over time (Baharav & Reiser, 2010; Jang et al., 2012; Nefdt et al., 2010; Vismara et al., 2012). Varying disciplines have reported successful implementation of telehealth practices to young clients and their families (e.g., speech-language pathologists, Ekberg et al., 2019; board-certified behavior analysts, Ferguson et al., 2019; and occupational therapists, Renda & Lape, 2018).

Coaching caregivers and teachers via telehealth have grown in popularity in part due to successful research advocating for such a platform (Ashburner et al., 2016). Telehealth has proven to be a successful means of training educators in schools and early intervention settings to conduct functional assessments, create individualized behavior plans and implement innovative classroom management techniques (Boivert et al., 2010). Neely and colleagues (2016) investigated interventionist training via telehealth to implement behavioral interventions with preschool-aged children with ASD. Outcomes demonstrated high fidelity toward procedures after a relatively short training period (i.e., six sessions), and maintenance of these teaching procedures when assessed approximately one month later. An increase in child target behavior (i.e., requesting) was also an outcome (Neely et al., 2016). These findings are supported by other literature in

the use of telehealth for coaching and training of practitioners and parents, resulting in the child's developmental gains (e.g., Machalicek et al., 2009; McDuffie et al., 2013).

Vismara and colleagues (2012) used telehealth to train parents to implement early intervention strategies with their young children in their homes. Barriers such as costly, time-intensive interventions and stressful over-scheduled family life often prevent a parent from attempting to acquire the necessary skills needed to improve their child's developmental outcomes adequately. Results from the study by Vismara and colleagues (2012) are in favor of telehealth as an effective means of training parents as interventionists. Findings also demonstrated that parents gained significant capacity to promote early language acquisition and play skills with their young children with ASD. Overall, parents reported positivity toward the use of technology and telehealth (Vismara et al., 2012).

In a study by McDuffie and colleagues (2016), the researchers used telehealth and in-person parent coaching on communication intervention strategies for young boys with Fragile-X syndrome. Outcomes were similar for both in-person and distance coaching, suggesting that telehealth coaching may be an equitable response to a family's limited access to professional support due to rural location. An additional finding from this study is that for some strategies, the consistency (i.e., fidelity) of parent strategy use was higher during telehealth than in-person sessions, echoing the success of this mode of service delivery. High rates of satisfaction of both in-person and distance sessions were reported by the parents, suggesting that telehealth may be a viable option for caregiver-led interventions (McDuffie et al., 2016).

Reviews (e.g., Machalicek et al., 2016; Unholz-Bowden et al., 2020) and studies (e.g., Suess et al., 2016) have found that parents could be coached via telehealth to assess and intervene on their child's challenging behavior with fruitful outcomes of decreasing the unwanted behavior. Behavioral interventions (e.g., functional communication training) have also successfully resulted in desired behavior change by parent-implemented interventions when coached by behavior analysts via telehealth (Boivert et al., 2010; Unholz-Bowden et al., 2020 Wacker et al., 2013; Wainer & Ingersoll, 2015). Research shows that coaching caregivers via telehealth to implement interventions is cost-effective and assists with the inequity of service delivery (e.g., access to more professions, a broader reach, and greater scheduling flexibility; Ashburner et al., 2016; Lindgren et al., 2016).

With the supportive literature for telehealth practices, this intervention mode is not without difficulties. For example, parents report problems with internet access or issues around family emergencies that cannot be adequately addressed from afar (Lerman et al., 2020; Tsami, Lerman, & Toper-Korkmaz, 2019). Technical issues are also a problem for clinicians, being that the professional does not always receive training on technology, implementation coaching strategies via web-cam, or means of rapport building from a distance (Lee et al., 2015; Lerman et al., 2020). Ethical considerations include the clinician's environment when conducting intervention sessions (e.g., sound-proof office space) and security of technology (e.g., HIPPA compliant platform and secure cloud storage; Lerman et al. 2020). Lerman and colleagues (2020) discuss the means of troubleshooting many of these obstacles. Solutions include supervision and training in distance-coaching by a more skilled clinician who reviews sessions and tracks

fidelity for interventionists new to telehealth practices. Increasing privacy through the use of sound-proof offices, headphones, and secure platforms (e.g., VSee) are also good practices. Access to technical assistance throughout the intervention series and initial technology checks to solve problems early are additional determinants of success (Lerman et al., 2020).

Caregiver Mediated Interventions

For intervention strategies to be useful for children with ASD, caregivers need to know how to promote their child's active engagement in daily routines and activities. Barriers (e.g., inflexible behaviors, limited responsivity, and interference of highly preferred items) delay or prevent play skills and social connections, even with a child's familiarity with their primary caregivers. Unaddressed in intervention, these inflexible child behaviors can lead to isolating play and unresponsive parenting as a result of a child's desire to be left alone, resulting in potential detached emotional connections, parental stress, and the parent's sense of low self-efficacy (Fettig & Ostrosky, 2011; Jang et al., 2012 Sigafoos et al., 2003). Including parents in choosing goals to address these isolated and inappropriate behaviors provides the opportunity for caregiver empowerment and individualized interventions for the family's social and cultural context (Fettig et al., 2015). Training and coaching parents on early intervention implementation have mixed results in the research literature (Fettig & Barton, 2014; Oono et al., 2013).

Some early intervention studies specific to coaching caregivers in behavior change strategies with their young child report negligible effects, low levels of maintenance, and minimal generalization (Barton & Fettig, 2013; Beaudolin et al., 2014). Studies such as Vaughn and colleagues (1997) and Galensky and colleagues (2001)

reported the unlikelihood of maintained intervention fidelity by parents due to the limited parent input and buy-in of these clinician-created interventions (Fettig & Ostrosky, 2011). Such findings strongly suggest the importance of caregivers in decision making and the choice of family-friendly, evidence-based intervention strategies.

In contrast, Beaudoin and colleagues (2014) measured the effectiveness of a parent-mediated intervention on parent outcome and parent-child dyadic engagement. Findings demonstrated that parent-mediated intervention progressed the child participants‘ (toddler-aged children at risk for ASD) social skills as well as improved the responsivity between the members of the dyad. This study used an at-risk group who received the intervention, a control group of at-risk toddlers who did not receive any intervention, and a typically developing group for comparison. The gains made by the control group, who did not receive any intervention, were far less than the developmental gains made by a typical peer group or the at-risk group who did receive the intervention. Early intervention is of vital importance for children at-risk for ASD.

Therapist engagement is a critical component of telehealth, which makes it different from self-directed computer-based resources. A pilot project by Ingersoll and colleagues (2016), compared the success of parent-mediated interventions for two groups: one with therapist assistance via telehealth and the other who participated in self-directed computer modules. All child participants made developmental gains. Those in the group that engaged in therapist-assistance, however, performed better in language and made more social gains. Thus, concluding interaction with a therapist, even though telehealth, provides significant benefits to child development and parental success.

On the topic of coaching caregivers via telehealth to act as interventionists for their child with ASD, Tomeny and colleagues (2019) reviewed 26 studies. Each study was evaluated for its alignment with four coaching components: (a) collaborative planning, (b) building on caregiver's competence, (c) guided practice, and (d) collaborative reflection and decision making. While all 26 studies focused on building caregiver's expertise, only six of the studies addressed all four suggested coaching components. Of those studies, two take place via telehealth: Vismara and colleagues (2012), described previously, and Meadan and colleagues (2016), described here.

Meadan and colleagues (2016) worked to understand the effects of parent-implemented interventions under natural contingencies on children's communication skills. Specifically, measuring changes in child and parent behavior when clinicians coached these parents via telehealth. Parents used three strategies (model, mand-model, and time-delay) to further communicative attempts from their child. Despite mixed results for child behavior and maintenance of some strategies, the change between the frequency and fidelity of parental strategy use in baseline and after coaching was significant. The coaches' consistent inclusion of the parent in intervention decisions was concluded as a likely factor in the success of the parent as interventionist (Meadan et al., 2016).

Although the effectiveness of caregiver-mediated intervention research is mixed, there is evidence that it can make a difference in the developmental trajectory of toddler-aged children at risk for ASD. Such components as caregiver input to target behaviors, intervention planning, and tracking of treatment fidelity should be analyzed as variables impacting intervention outcomes. At this time, there is limited research addressing the

use of caregiver-mediated early intervention via telehealth for toddlers at risk for ASD. Additionally, intervention focus on HO-RRBIs, precisely the flexibility of behaviors during play, is less studied.

Study Purpose and Research Questions

The purpose of this study is to examine the effects of this intervention package as means to (a) increase child flexibility, (b) decrease child inflexibility (i.e., HO-RRBIs), and (c) increase caregiver's use of evidence-based strategies during play as proximal outcomes. Distal outcomes for both the child and caregiver include an increase in shared joy during play interactions. Specific to the child, distal outcomes may consist of an increase in directed vocalizations and accepting or giving toys during play. For the caregiver, distal outcomes may include an expansion of self-efficacy and quality of life and a decrease in stress. This study targets autism symptomology in toddlers and young children by pairing caregivers with an early interventionist via telehealth. The early interventionist will coach caregivers to mediate a treatment package of evidence-based strategies, namely environmental arrangement, modeling, prompting, differential reinforcement of appropriate behaviors, and response interruption and redirection. The environmental arrangement, modeling, and prompting may be simple strategies for parents. Differential reinforcement of appropriate behavior will likely be a new approach to supporting their child's play. For children demonstrating greater difficulty in play because of a fixated interest or behavior, caregivers are coached to use a response interruption and redirection strategy to improve caregiver and child relationships. A hypothesis is that coaching parents to use and thoughtfully sequence the order of these strategies will result in the desired change in their child's flexibility during play.

This study aims to determine (a) if this intervention package impacts child RRBIs during play and if so to what extent, (b) if the child and parent characteristics and experiences were associated with the extent of behavior change for each participating dyad, (c) if participation in the study impacts caregiver stress, sense of efficacy, and quality of life, (d) what strategies were most and least acceptable to caregivers, and (e) if intervention via telehealth was an acceptable mode of delivery for the parents.

Figure 2 shows a logic model for the study. The context of the study describes why an intervention package is necessary for this population. Contextual variables may influence the intervention's effectiveness and a family's readiness to include child, parent, and family characteristics. The independent variables listed are the intervention components. Both proximal and distal outcomes are measured. Proximal outcomes are defined as behavior change directly targeted by the intervention. Distal outcomes are defined as behavior change that is affected indirectly by the intervention. All experimental dependent variables are tracked during playtime between parent and child at both baseline and intervention to account for behavior change. Parent questionnaires and assessments measure all non-experimental dependent variables.

Similarly, the context variable can impact outcomes. For example, a job loss due to the COVID-19 pandemic outbreak may increase parent stress despite a decrease in child inflexibility, which, under other circumstances, would have decreased stress. Figure 3 is a change model that shows the hypothesized impact of the independent variables on the dependent variables for both proximal and distal outcomes.

Figure 2

Logic Model for Caregiver-Mediated Intervention Package via Telehealth

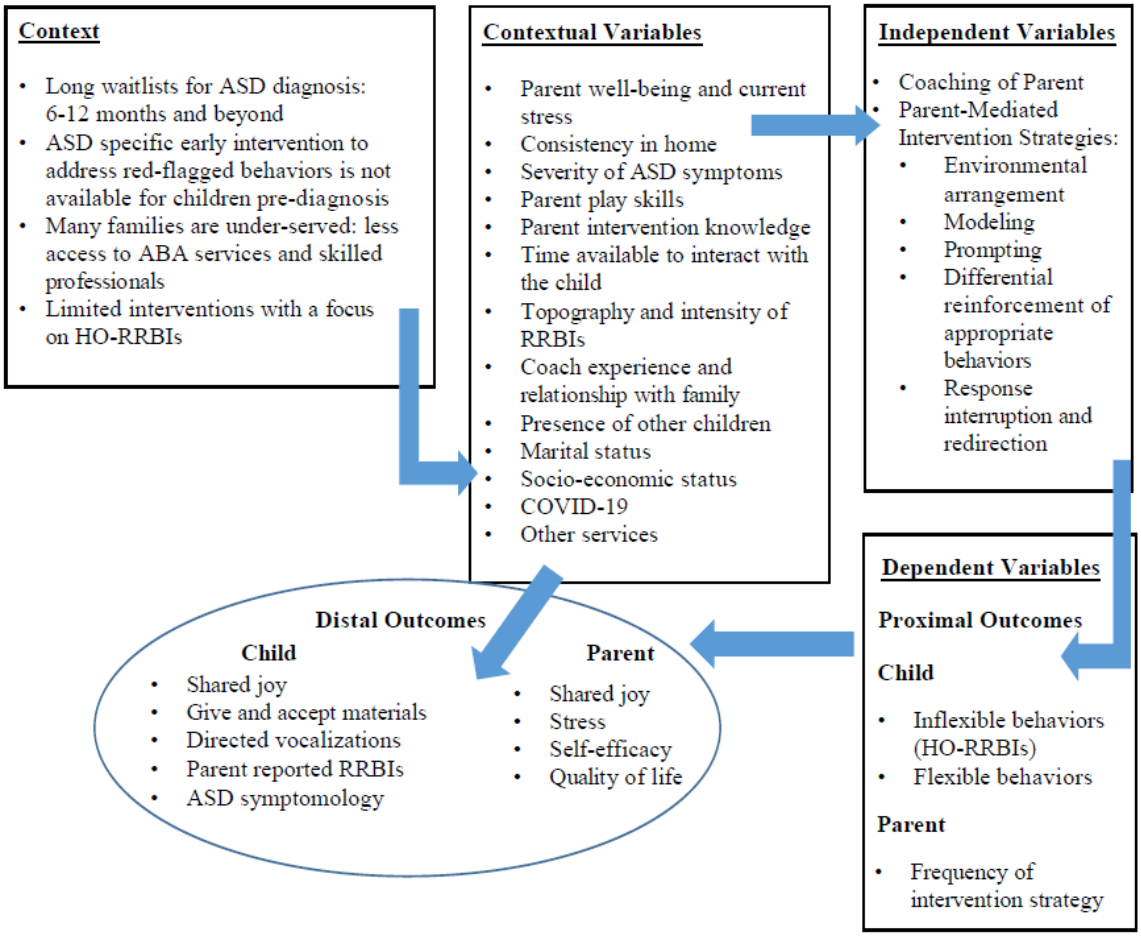
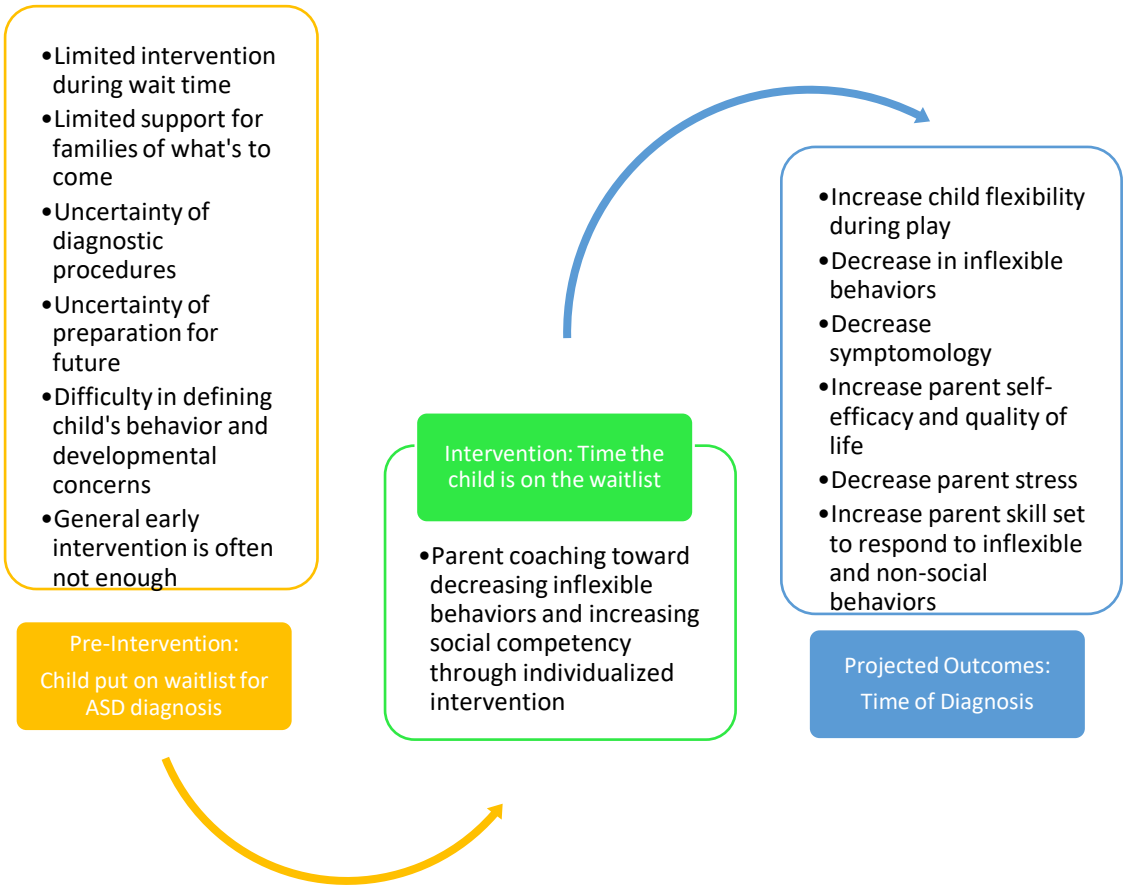


Figure 3

Waitlist Intervention Process Change Model



Note. This figure demonstrates the change model of the three phases of the waitlist intervention process.

The current study will address the following research questions:

Experimental Research Questions

1. Is there a functional relation between the caregiver-implemented treatment package and an increase in the caregiver's strategy use (i.e., modeling, prompting, differential reinforcement of appropriate behavior, and response interruption and redirection)?

2. Is there a functional relation between the caregiver-implemented treatment package and the child's flexible and inflexible behavior during play?

3. Is there a functional relation between parent strategy use and the child's flexible and inflexible behaviors during play?

4. Is there a functional relation between the caregiver-implemented treatment package and the following non-targeted outcomes (a) an increase in directed vocalizations by the child, (b) an increase in accepting and giving of toys by the child, and (c) an increase in child, parent, and shared joy?

Non-Experimental Research Questions

5. Following the treatment package, is there a decrease in the caregiver's level of stress?

6. Following the treatment package, is there an increase in self-efficacy and quality of life as a caregiver?

7. Following the treatment package, is there a change in parent-reported autism symptomology and restricted and repetitive behaviors?

8. Do caregivers perceive this intervention as

(a) worth the time and effort,

(b) positively affecting their child's development and their family life,

(c) strategies to be used over time within their family, and

(d) something that they would suggest to other families?

Research Design

The study design will use a combination of single-case research, multiple baseline design, and non-experimental pre-post measures. A multiple baseline design requires three or more participants, with staggering baseline lengths of at least five data points before the beginning of intervention (Gast et al., 2014).

CHAPTER II

METHODS

This chapter includes a description of the methodology used in this study consisting of inclusion criteria, procedures for recruitment, and response to attrition. This chapter also provides participant information, setting for intervention, and researcher information. Also presented here are details of the materials necessary to carry out the study, including measures for pre- and post-assessments, telehealth, and intervention materials. This chapter describes the procedures used to implement all phases of the study in detail. Finally, a summary of data analysis, including pre- and post-statistical analysis and visual analysis for intervention outcomes, are presented.

Inclusion Criteria, Recruitment Procedures, Attrition

Inclusion Criteria

Qualifying children (a) were between 18 and 42 months old at the time of consent, (b) demonstrated challenging levels of RRBIs as reported by the parent during intake and assessments, and (c) were on ASD diagnostic or eligibility waitlists. Parents needed to (a) have guardianship or legal decision-making powers for the participating child, (b) live in the same household as the participating child, (c) have access to an Internet-capable device with Bluetooth™ connectivity, (d) have Wi-Fi access, and (e) be willing to participate in 5 to 12 video recorded baseline sessions (i.e., no intervention), complete pre- and post-assessments, and participate in 15 video-recorded intervention sessions two times a week (up to 50 minutes each). All participating families were considered underserved; that is, their child received minimal intervention specific to ASD at the time of recruitment. Minimal intervention is (a) equal to or less than two hours of

one-on-one early intervention with per week, (b) equal to or less than two hours of early intervention group child care per week, or (c) attending a child care or preschool that is not specific to early intervention. Rural and under-resourced families were encouraged to participate. To be a rural family, the family must live in a geographic area that is at least 30 miles by road from an urban community of fewer than 50,000 people (U.S. Census Bureau, Urban and Rural Classifications**,** 2019). To be an under-resourced family, as part of intake assessments, the parents reported *not having enough money* and *never or rarely able to buy nice things*. Sexual orientation, race, national origin, religion, creed, education, or socioeconomic status were not factors for consideration in recruitment or selection of parents or children. Single parents and fathers were encouraged to participate as they are underrepresented in the literature.

Recruitment Procedures

In the states of Oregon, Washington, Texas, and Northern California, recruitment began with providers serving families with young children (e.g., pediatricians, local disability organizations, and education service districts). The primary investigator (PI) sent emails with flyers, held face-to-face meetings with early intervention providers and office administrators, and uploaded postings on social media pages specific to autism. The flyers included a website for the study, which allowed interested parents to submit their names, email addresses, and telephone numbers for contact. The PI contacted the interested families by phone for a conversation lasting approximately 15 minutes, depending on parent questions, during which the PI read a recruitment script. Recruitment took two months.

Sixteen families communicated interest in participating. Twelve potential participants were from a doctor's office in Oregon. Of these 12 families, five met criteria for inclusion, five did not meet criteria, and two were unable to be reached. The five that did not meet inclusion criteria was due to (a) child age (three children were above 42 months); (b) child diagnosis (one child already had a medical diagnosis and educational eligibility for autism); and (c) high levels of support (one child attended full-day school in a specialized classroom receiving speech, occupational and behavioral therapy). Of the five remaining, four agreed to participate and submitted consent forms via mail, with one of those four later withdrawing due to conflicts with the needed time commitment. The remaining three participants enrolled in the study as dyad 1, dyad 2, and dyad 3.

Two potential participants were from an early intervention group in Oregon. Both families met the criteria and consented to participate in the study as dyad 4 and dyad 5. The final two potential participants were from a community-based disability network in Texas and made contact through the website on the flyer. Of these two families, one did not respond to email, text, or phone while the other met criteria and enrolled in the study as dyad 6.

Attrition

Some attrition was anticipated, due to the expected stress associated with waiting for a diagnosis and parenting a young child with a disability. Six dyads agreed to participate in the study, and five completed the study, with four as the minimum number of participants. Dyad 1 was lost to attrition due to scheduling difficulty resulting from new employment post-baseline that required on-call availability, yet completed pre-measures and five baseline data points. Dyad 2 had two breaks in the intervention

sequence. The first break, between intervention sessions one and two, was due to a move to a new home. The other break between intervention sessions two and three was due to notice of furloughed employment as a result of COVID-19.

Participants

Table 2 provides a summary of child participant characteristics, including details of child age at recruitment, gender, and diagnosis. The focus behaviors listed are behaviors agreed on by the PI and parent as ranked on the RBS-EC with scores of either three or four at pre-assessment. Table 3 describes the parent characteristics.

Dyad 1: Bree (mom) and Jax (child). Bree was a 25-year-old, white mother, who was never married and identified as female. Bree had an associate's degree and described her financial situation as having *not enough* and *rarely able to buy nice things*. Bree was in between employment positions and actively interviewing for a job during recruitment and baseline. She received a permanent position resulting in her withdrawal from the study due to difficulty with scheduling.

Jax was a 21-month-old male on the waitlist for an autism diagnosis. He did not have a current diagnosis and qualified for early intervention based on a developmental delay. Jax received no in-home services. Bree, Jax's biological mother, had two other children living in the home in addition to Jax. Bree described Jax's behavior as difficulty with transitions and showing frustration when interrupted. She said Jax sometimes demonstrated difficulty giving up toys and, at times, preferred to play alone. Jax's diagnostic appointment was on March 23, 2020, and was postponed without a rescheduled date due to COVID-19. Jax’s referral for an ASD assessment occurred in January 2020, which equates to a wait time of six months.

Table 2

Child Participant Characteristics

Child name (dyad #)	Age in Months	Gender	Race	Alternative Diagnosis	Focus Behaviors
Jax (dyad 1)	21	M	White	Developmental Delay	1, 2, 3, 4, 5
Maude (dyad 2)	33	F	White	Developmental Delay	4, 5, 7
Daisy (dyad 3)	30	F	White	Hydrocephalus Epilepsy Hearing Impairment Developmental Delay Motor Impairment (Clubfoot)	2, 5, 8
Lucia (dyad 4)	36	F	Hispanic/ Latina	Developmental Delay	1, 6
Derek (dyad 5)	36	M	Indigenous North America/ Alaskan Native	None	1, 2, 3, 4, 5
Allie (dyad 6)	31	F	Hispanic/Latina	Developmental Delay	1, 3, 4, 5, 9

Note. Focus behaviors were from the RBS-EC pre-intervention measure completed by the parent. Although each child had target behaviors to inform their level of HO-RRBI, the measurement for all children was more broadly categorized as inflexible and flexible behaviors. Focus behaviors: 1: upset if interrupted; 2: inflexible routine; 3: limited and intense interests; 4: fixation with parts of objects; 5: sensory seeking behaviors; 6: lines up or arranges toys and other objects; 7: narrow pre-occupation or repetitive interest with one type of toy, 8: attachment to object, 9: mouthing and carrying objects

Table 3

Parent Participant Characteristics

Parent Name (dyad #)	Age in Years	Gender	Race	Marital Status	Qualifying Category
Bree (dyad 1)	25	F	White	Single	UR, US
Vicki (dyad 2)	30	F	White	Single	US
Liz (dyad 3)	25	F	White	Single	R, UR, US
Gigi (dyad 4)	43	F	Hispanic/Latina	Married	US
Kay (dyad 5)	42	F	Indigenous North America/ Alaskan Native	Married	UR, US
Maria (dyad 6)	42	F	Hispanic/Latina	Married	US

Note. Qualifying Category: R = rural; UR = under-resourced; US = under-served.

Dyad 2: Vicki (mom) and Maude (child). Vicki was a 30-year-old white mother who never married and identified as female. Vicki had a high school degree and described her financial situation as having *just enough* and *sometimes able to buy nice things*. Vicki had a full-time position and worked 40 plus hours per week. Due to COVID-19, for the last month of the study, Vicki was temporarily furloughed from her position.

Maude, a 33-month-old female, was on the waitlist for an autism diagnosis. She did not have a non-ASD diagnosis. Maude qualified for speech therapy due to limited verbal communication; however, she did not receive any therapy during the months enrolled in this study. At recruitment, Maude attended in-home child care; however, the

care provider suspended services based on Maude's challenging behavior (e.g., unable to share or give up toys, aggression, and tantrums). At the start of baseline, Maude was cared for by her maternal grandmother during the day.

Vicki, Maude's biological mother, and had one other child living in the home (Maude's biological older brother). Vicki described Maude's behavior as difficulty with transitions and frustration when interrupted. Maude was said to have minimal difficulty giving up toys, limited functional play, a preference to play alone, and she enjoyed playing fetch with her dog. Maude's diagnostic appointment was scheduled for March 2020 but was rescheduled for May 20, 2020, resulting in a diagnosis of autism. Maude's total time on the waitlist for diagnosis was nine months.

Dyad 3: Liz (mom) and Daisy (child). Liz was a 25-year-old divorced, white, full-time working mother who identified as female. At the time of recruitment, Liz was on home leave due to a recent surgery. Partially through the intervention phase of the study, Liz returned to work as a caregiver in a nursing home. Liz had an associate's degree and described her financial situation as having *just enough* yet, *rarely able to buy nice things*. Daisy was a 30-month-old female on the waitlist for an autism diagnosis. Her non-ASD diagnoses included hydrocephalus, epilepsy, hearing impairment, global developmental delay, low motor function, and a club foot. Daisy attended a general childcare program without a focus on early intervention for 10 hours per week. In-home services were provided twice a month for one hour each. She received physical therapy in a physical therapy clinic two times per month for 30 minutes. The COVID-19 shelter at home orders resulted in the suspension of Daisy's therapies.

Liz, Daisy's biological mother, had two other children living in the home in addition to Daisy. Liz described Daisy's behavior as becoming easily upset and frustrated by transitions. Daisy was reported to have difficulty sharing and giving up toys. She preferred to play alone and demonstrated frustration at interruptions. Daisy's diagnostic appointment was initially scheduled for March 31 and then rescheduled as a virtual appointment for May 7, 2020, due to COVID-19. Daisy did not receive an autism diagnosis, but was said to demonstrate autism traits and was scheduled for a follow up in three months. The initial referral for an ASD assessment was on October 1, 2019, resulting in a wait time of seven months.

Dyad 4: Gigi (mom) and Lucia (child). Gigi was a 43-year-old, married, Hispanic mother who identified as female. Gigi had an associate's degree and described her financial situation as having *a little extra* and *often able to buy nice things*. Gigi was a stay-at-home mom and previously worked as a special education teaching assistant in a high school classroom. Lucia was a 36-month-old female on the waitlist for an autism diagnosis. She was eligible for services due to a developmental delay. Lucia attended an early intervention group for 2 hours per week. Gigi, Lucia's biological mother, had one other child living in the home (Lucia's biological older brother). Gigi described Lucia as having difficulty with transition and giving up toys, showing frustration when interrupted, limited functional play, and a preference for playing alone. The initial referral for an ASD assessment was made in February 2019, but due to paperwork issues, the appointment date was still pending. Gigi had been waiting for Lucia's appointment for 15 months.

Dyad 5: Kay (mom) and Derek (child). Kay was a 42-year-old married indigenous to North America/Alaskan Native mother who identified as female. Kay had a bachelor's degree and described her financial situation as *not having enough* and *rarely able to buy nice things*. Kay worked in a classroom for preschool-aged children with disabilities. Derek was a 36-month-old male on the waitlist for an autism diagnosis. Derek attended a preschool with no early intervention focus for 20 hours per week. He received no in-home services. Kay sought private-pay occupational therapy (OT) via telehealth, which occurred two times per month during the study. The OT did not include direct intervention with Derek and used consulting through Kay to intervene on Derek's daily routine. Kay, Derek's biological mother, had one other child (younger female) living in the home in addition to Derek. Kay described Derek's behavior as being easily upset and frustrated by transitions. Derek was said to have difficulty giving up toys, a hard time sharing, a preference to play alone, and demonstrated frustration when interrupted. Derek was waiting for educational eligibility for ASD with a pending assessment date. Kay began pursuing the eligibility in February 2020, making her wait time four months thus far.

Dyad 6: Maria (mom) and Allie (child). Maria was a 42-year-old married, Hispanic mother who identified as female. Maria had a Bachelor's degree and described her financial situation as having *a little extra* and *sometimes able to buy nice things*. Maria was a stay-at-home mother. Allie was a 31-month-old female on a waitlist for an autism diagnosis. She did not have any diagnosis but qualified for early intervention due to a speech delay. Allie received services from a local early intervention provider one time per week for 1 hour. She was not receiving additional speech therapy during the

study. Maria, Allie's biological mother, had one other child living in the home (Allie's biological twin sister). Maria described Allie's behavior as having difficulty with transitions and frustration when interrupted. Allie was said to have difficulty giving up toys and limited functional play. She showed a preference for playing alone. Allie did not have a scheduled diagnostic appointment as Maria had been waiting to be scheduled for four months with the delay due to COVID-19.

Setting

All meetings occurred through telehealth using distance communication. The parent and child were in their home for all baseline and intervention sessions. If possible, families used a room with minimal distractions. In the event other family members or children enter the room during video-taping, the interventionist asked for their consent to be part of the video. All siblings and additional parents consented under these circumstances. During all sessions, the interventionist used a private office.

Researcher Roles

The primary interventionist/principal investigator was a white, female, Board Certified Behavior Analyst and doctoral candidate in special education at the University of Oregon. Her experience of working with children and families spanned over 25 years and included serving as the primary investigator in previous intervention studies. The principal investigator fulfilled the role of primary interventionist and met with each family. Specifically, the primary interventionist was responsible for: (a) consent of each family in person; (b) ensuring pre- and post-assessments were complete; (c) ensuring social validity was complete at the endpoint of the study; (d) managing the schedule; (e) conducting all baseline and intervention sessions; and (f) reviewing intervention session

videos daily to check for progress and fidelity of child data, and parent data, and determining coaching issues to address in the next visit.

Research assistants reviewed videos, input data from videos, and conducted procedural fidelity and fidelity checks across sessions and data collection. Two doctoral students from the University of Oregon Special Education Department trained as research assistants. Each research assistant received training on how to use the datasheets, checklists, and the iPhone application *Insight: Observation Timer Tool for School Psychologists,* and on the specifics of behavior definitions for this study (see Appendix A for datasheet and Insight app sample). Each research assistant reached at least 90% agreement with the PI using a practice video. Retraining for research assistants occurred if agreement fell below 80% for data collected on a target behavior for two consecutive sessions.

Materials

Telehealth Equipment

Hardware. The interventionist used a university-issued 13-inch Dell™ laptop with an internal video camera and speakers, 2.7 GHz Intel Core i5, and 8GB of DDR3 memory. The parent used their tablet, laptop, or smartphone equipped with a web camera and an internal speaker. Each device used encrypted communication through VSee using wireless access. Each iPad or tablet could connect to wireless networks. A Yamay M98 Bluetooth™ headset provided wireless audio communication, allowing the parent to hear the interventionist more clearly from afar. It also enabled the interventionist to listen to the parent and child more clearly from various ranges. The PI trained participants to use this equipment during the pre-baseline phone meeting. Two types of tripods were offered

to the parent to use during the study: a small flexible tripod for smartphones or a larger tripod for iPads.

Software. Using the free version of VSee software downloaded from http://vsee.com, the interventionist scheduled telehealth sessions using video conferencing with the participating parent. VSee software has federal approval in the Health Insurance Portability and Accountability Act of 1996 (HIPPA), Pub. L. 104-191, 42 USC. §§ 1320d et seq. as this software protects the privacy of its users. Communication was secured through 128-bit encryption via password-protected VSee accounts for both audio and video between interventionist and parent so that the transmission was not identifiable even to the VSee software system. In addition to privacy, VSee uses a lower bandwidth Internet connection than other systems (e.g., Skype) and has screen share options to improve communication during meeting times.

As a result of COVID-19, VSee suspended services outside of medical appointments part-way through the study. The University of Oregon's purchase of the HIPPA approved secure platform, Zoom™, allowed for a seamless move to this new platform. The PI recorded sessions using ApowerREC™, a computer installed screen recorder. Cloud-based hosting websites (Box™ or Office365™), which are HIPPA compliant, stored recorded materials making it easy for transfer to participants. Recorded sessions allowed for the tracking of behavior change during intervention sessions and the inter-rater reliability of these data.

Intervention Materials

Toys. Each participating family was given a tote bag filled with toys to use during baseline and intervention sessions. These toys were delivered to the family during the

pre-intervention phase. Play materials consisted of toys in the *Short Play and Communication Evaluation* (SPACE; Shire et al., 2018). The purpose of SPACE was to help determine appropriate play skill targets for children with autism.

Similarly, the goal of this study was to decrease restrictive and repetitive behaviors by expanding play skills and increasing parent strategy use to support their child's play. Therefore, it was appropriate for this study to utilize a similar set of toys as recommended by the authors of the SPACE project to assess current play level and further children's play skills. The chosen toys covered differing levels of play and developmental skills. Providing items specific to each level of play allows children to perform independently based on their developmental skill set. For example, those at the lowest level had the opportunity to be successful with items targeting early development (e.g., cause and effect play or a combination of materials). The chosen toy set also allowed the parent to expand their child's play behaviors to more complex interactions during intervention sessions throughout the study. See Appendix B: Toy List for the specific toys sent to participants. Because the materials listed sometimes included multiple pieces (e.g., set of Duplo blocks, wooden inset-puzzle), if pieces got lost during the study, the toy was still usable, preventing compromised fidelity due to materials loss. The play materials cost $125.68 per child. The dyads kept the toys after the study providing an additional incentive.

The families were encouraged to use the new toys in combination with toys the child already had at home. The interventionist encouraged parents to allow their child to access the bag of toys anytime, but with parent participation as often as possible. In the

event, additional toys were necessary due to the child's unique developmental needs; these were mailed to the family.

Parent binder. Parents were provided educational materials and instructions in a parent binder. Materials in the binder were labeled "pre-baseline," "baseline," and "intervention," designating when they were to be accessed by the parent. Materials that could not be viewed by the parent before particular time points in the study (e.g., intervention strategies at baseline) were marked and clipped with a binder clip. Pre-baseline materials included: (a) consent and assent information, (b) contact information for interventionist, (c) telehealth instructions, and (d) list of toys included in the tote. Baseline materials included: (a) written instructions for baseline, (b) worksheets to identify target behaviors, and (c) replacement behavior worksheets. Intervention materials included: (a) four strategy overviews, (b) instructions for strategy videos, (c) ideas for play activities to engage their child, and (d) instructional tables (e.g., coaching format, session timeline). See Appendix C: Parent Binder for a complete list.

Strategy videos. There are three videos demonstrating intervention strategies: (a) video 1: environmental arrangement, modeling, and prompting; (b) video 2: differential reinforcement of appropriate behaviors; and (d) video 3: response and redirection to introduce each concept to parents. These videos were made available on Box.com© for each family when the interventionist was ready to introduce the particular intervention strategy. Once a strategy was introduced and the video presented to the parent, it remained available for repeated viewing.

Response Measurement and Data Collection

Proximal Outcomes

Child Target Behaviors. The dependent variables that are the proximal outcomes measured for each child participant were (a) inflexible and (b) flexible behaviors (see Table 4). Both inflexible and flexible behaviors were measured using partial 10-second intervals for each 10-minute play session between parent and child. Measurement occurred in baseline and intervention sessions 2-15.

Table 4

Child Dependent Variables and Proximal Outcomes

Behavior	Definition	Example during play
Inflexible	Behaviors identified by parent and interventionist as interests that ***occur more frequently than others and interfere*** with social opportunities. Target behaviors to decrease during the intervention: • negative response (whining, screaming, hitting) toward parent attempt to interact • a repetitive movement that cannot be interrupted • interest interferes with or prevents interactions • must have it done a certain way • flipping, mouthing, throwing toy • parent models a new idea and the child continues the same action with the item • non-play related actions • actions that repeatedly occur with no expansion to play	Includes any inflexible behaviors and will be individual for each child. May consist of tapping, wiggling, and visually peering at toys, in which case the actions prevent the child from becoming socially involved with the parent's play. Playing only with stick-like toys and trains. The child is stirring in a pot (functional); after 5 seconds of mixing, child speeds up and begins to shake head quickly while stirring in pot and continues for the next minute (non-flexible or repetitive)
Flexible	Behaviors identified by parent and interventionist as interests that occur infrequently but would be beneficial if they happened more often in the child's play; these behaviors are considered social opportunities and are targets to increase during the intervention.	The child plays with a toy, then moves to a different toy and uses it for a different purpose. The child gives up the chosen toy and plays with the toy offered by the parent.

Identifying Child Targets. To better target individual changes, specific RRBIs for each child participant were determined using the four sections of the Repetitive Behavior Scale - Early Childhood (RBS-EC; Wolff et al., 2016). There are four sub-groups within the RBS-EC rating scale, including (a) *repetitive motor*: continuous, non-social movements or actions repeated similarly; (b) *ritual and routine*: resistant to change, engage in fixed patterns of behavior, strongly prefers that daily activity occur in the same way regularly; (c) *restricted interests and behavior*: behaviors with a limited or inflexible range of focus; intense or unusual interests or activities; (d) *self-directed behavior*: repeated movements or actions directed toward the body that have a potential to cause redness, bruising or other injuries.

Sections II and III were used to identify target behaviors most closely related to HO-RRBIs, while Sections I and IV were more closely associated with LO-RRBIs. Overall, behaviors rated as *3*s and *4*s were considered the most challenging behaviors per parent reports. In the event a parent ranked several behaviors as *3*s and *4*s across all sections, the interventionist reviewed the list with the parent to determine the two most difficult in Sections II and III to encourage HO-RRBIs as targets for this study. Interfering LO-RRBIs (highly ranked behaviors from Sections I and IV) were addressed on an individual basis as needed during intervention sessions. The ranked scores on the RBS-EC were compared at pre- and post-intervention to mark changed rankings of behaviors. Table 2 lists target behaviors identified by parent and interventionist along with child characteristics. A behavior intervention plan, based on the top-ranked behaviors for each child, guides intervention sessions. Appendix D shows each Behavior Intervention Plan per dyad.

Parent Target Behaviors. The dependent variables measured for each parent participant was the use of strategies (modeling, prompting, reinforcement, and response interruption and redirection) in a sequence during play sessions. More details of the strategies are described in the *General Procedures* section of this chapter.

Sequences of Strategy Use. Figure 4 provides a flow chart that exemplifies the sequence of strategies taught to the parent, depending on the child's behavioral repertoire. After the introduction of all strategies, the remaining sessions focused on areas for parent improvement using the strategies in a sequence to maximize child and parent progress. The figure shows the strategies in a sequence of *least to the most* amount of support for their child. Response interruption was used after all other approaches deemed unsuccessful, and the child was unable or unwilling to respond to the parent's models and prompts. The circles around the sequences denote that a dyad may stay within one circle (e.g., the red circle) for the entire play session or may only need to use graduated assistance once (e.g., the green circle). The interventionist reminded the parent to "start again" with the first model after each reinforcement to allow independence in the child's play to emerge and decrease the risk of prompt dependence.

A frequency count over the 10-minute play sequence measured parent strategy use. Measurement occurred in all baseline sessions and intervention sessions 2-15. There were four possible sequence strategies:

Sequence A: model; time delay (wait 5 seconds); reinforce or move sequence B.

Sequence B: sequence A; model; time delay (wait 5 seconds); reinforce or move to sequence C.

Sequence C: sequence A; sequence B; prompt; reinforce or move to sequence D.

Sequence D: sequence A; sequence B; sequence C; RIRD with prompt; time delay (wait 5 seconds); reinforce any approximation.

Twenty strategy sequences were the ceiling per session. Thus, a rate of two strategies per minute was identified as an ample number of interactive models and prompts during the 10-minute play session. Although the *environmental arrangement* was taught as an initial strategy, it was not measured during the intervention. The environmental arrangement was independently performed by parent pre-session once it was introduced. Feedback about the environmental arrangement was offered at each session with the parent.

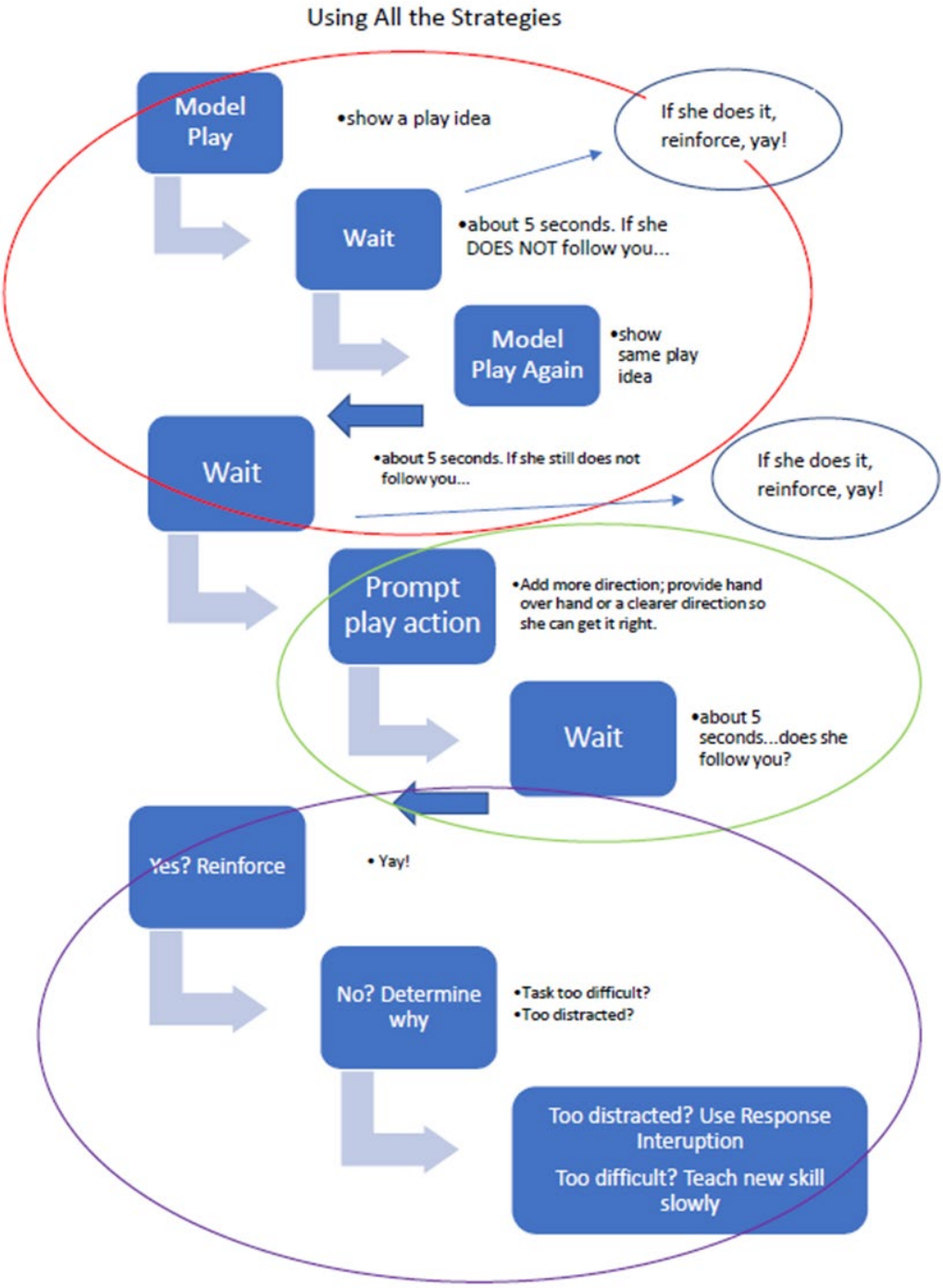
Distal Outcomes

Distal outcomes were the behaviors that were not directly targeted but may change as a result of the intervention strategies targeting the dependent variables. The distal outcomes were measured by direct observation or by pre- and post-measures.

Distal Outcomes by Direct Observation. Distal outcomes by direct observation for the study were (a) joy and shared joy (child and parent); (b) accepting and giving materials (child only); and (c) directed vocalizations or gestures (pointing, hand out, reaching; child only). These distal outcomes were similar to targets scored on the ADOS assessment Toddler Module and Module 1 (Lord, Luyster, et al., 2012; Lord, Rutter, et al., 2012). Distal outcomes were in the social affect category rather than RRBIs, offering a potentially broader measure for the intervention's impact. These distal outcomes (i.e., joy, materials, and vocalization/gestures) were tracked by frequency during partial 10-second intervals during each play session for data collection in baseline and intervention.

Figure 4

Strategy Sequence Flow Chart



Note. Sequences A and B are included in the top circle, followed by sequence C in the mid-page circle and then sequence D in bottom circle.

Table 5 further defines these distal outcomes measured by direct observation throughout the study.

Distal Outcomes by Pre- and Post-Measures. Distal outcomes were measured using pre- and post-measures and post-only-measures to identify change throughout the study for child and parent. The child assessments attempted to determine changes in parent perception of the child's signs of ASD. The parent assessments measured changes in parent stress, quality of life, and self-efficacy since the start of the study. The PI did not share the scores from these measures with parents, other agencies, or physicians.

Table 5

Distal Outcomes by Direct Observation

Behavior	Definition	Example and non-example
Individual and shared joy *(parent and child)*	Show of behavior, which suggests the continuation of activity. Laughter, smiling, a surprised look of excitement. These are scored individually for the parent and child. Intervals, where parent and child joy both occur, is considered shared joy.	**Example:** Child laughs when a parent pretends to call the child on the phone; the parent smiles at the child **Non-example:** No response, flat facial affect when a parent plays peek-a-boo; child ignores or moves away; parent engages with pretend phone without including child; child laughs, and the parent does not respond or moves to another activity with no smile, laughter or inclination of happiness.
Give and accept materials	Offers a toy to or receives a toy from another person to share or expand play, demonstrating some flexibility in play. Not as a request for help or assistance	**Example:** The parent hands the child a shape for the shape sorter, the child takes the shape and reaches toward the parent for another. The parent shows and gives a different toy to the child, and the child puts the current toy down or releases it to the parent, choosing the toy provided by the parent. **Non-example:** Child hands parent toy after trying to get it to work without success (i.e., request for help)
Directed vocal utterances / gestures	Vocalization in the context of the play situation which may include eye-contact or gesture	**Example:** The child and parent play with the truck; the child says "vroom" without eye contact OR child makes squeal noise when the parent pretends to dump a load of blocks from the truck. **Non-example:** The child makes high-pitched sing-song noises while building with blocks, and there is no evidence that the child knows the parent is near.

Child Pre- and Post-Measures. For the child, the distal outcomes measured were ASD symptomology, including RRBIs and other signs a child may be at-risk for ASD. The scales used were: (a) M-CHAT-R/F (Robins et al., 2009), (b) RBS-EC (Wolff et al., 2016), and (c) The Behavior Inflexibility Scale (BIS; Boyd et al., 2018). The BIS was used as a post-measure only with permission from the first author. The parent completed all measures.

Change in the child's signs of ASD was measured by pre- and post- data collection using two different scales: M-CHA-T-R/F (Robins et al., 2009) and RBS-EC (Wolff et al., 2016). The BIS (Boyd et al., 2018) as a post-test measure further compared the occurrence of restrictive and inflexible behaviors. The M-CHA-T-R/F (Robins et al., 2009) was a screening tool for children between the ages of 16 and 30 months that requests the parent complete a short assessment form to identify child behavior, and signifies if they are at-risk for autism. This pre- and post-measure assisted in understanding unique intervention needs. The scores from this measure were not disclosed to the parents.

The RBS-EC (Wolff et al., 2016) evaluated a child's RRBIs. This scale took approximately ten minutes to complete and is a standardized measure to more accurately discriminate between RRBs, which are considered typical for the developmental age versus those which act more as barriers to development (Wolff et al., 2016). This scale can be used for children from toddlerhood to early school-age. It asks the parent to circle the frequency of behavior on a Likert-type scale between 0 (does not occur) and 4 (occurs many times per day). The scores from this measure were disclosed to the parents to

determine intervention focus. This measure was given at the start and completion of the study.

The BIS (Boyd et al., 2018) evaluated similar behaviors to the RBS-EC, with a more specific focus on HO-RRBIs (i.e., inflexible behaviors) in young children (Lecavalier et al., 2020). As the BIS was normed on children aged three and older, it was used cautiously here to determine the goodness of fit for behavior measurement of toddler-aged children. Parents completed this 38-item scale. It used a six-point Likert-type scale with 5-rating to indicate a *severe problem* and 0-rating to indicate *not a problem at all* and resulted in an overall inflexibility factor (Lecavalier et al., 2020). It took less than 15 minutes for most participants to complete.

Parent Pre- and Post-Measures. For parents, the distal outcomes measured were: (a) parent stress, (b) quality of life, and (c) parent self-efficacy. To measure parent stress over time, the Parent Stress Index - Short Form, 4th Edition (PSI-4; Abidin, 2012), and COVID-19 Questionnaire. The COVID-19 Questionnaire was post-measure only as the impact of the pandemic was minimal to the United States until after the start of this study. The Family Quality of Life Questionnaire (FQOL; Hu et al., 2011) was used to measure parent quality of life. Parent self-efficacy was measured using Self-Efficacy for Parenting Tasks Index – Toddler Scale (Coleman & Hildebrandt Karraker, 2003). All measures were self-reported and completed by the parent.

Parent stress was measured using the PSI-4 short form (Abidin, 2012. The PSI-4, a self-report measure, can identify levels of stress in a parent-child relationship and took approximately ten minutes to complete. Additionally, parents completed a COVID-19 questionnaire to identify the impact the pandemic had individually on each family. This

document took less than ten minutes to complete with additional time if families chose to write information about the impact of COVID-19 beyond the questions provided. As a measure of the quality of life, parents completed the Family Quality of Life Scale (FQOL; Hu et al., 2011). Also, a brief instrument, the FQOL asked the parent to respond to 25 statements using a five-point Likert-type scale to assess their quality of life and general well-being. The Self-Efficacy for Parenting Tasks Index – Toddler Scale (Coleman & Hildebrandt Karraker, 2003) evaluated parent self-efficacy. This assessment measured efficacy by parent self-report across seven domains of parenting: emotional availability, nurturance, protection, discipline, play, teaching, and instrumental care. Analyses and the internal reliability for the overall scale was $a = 0.92$ (Coleman & Hildebrandt Karraker, 2003).

General Procedures

The overall study lasted approximately seven months. The sessions' temporal frequency was dependent on early interventionist and family availability, ideally entailing two sessions per week. Each participant received a different number of baseline sessions and 15 intervention sessions. Following the recruitment of participants, there were four phases of the study. Phase 1 included consent, intake, and assessments, which included assessments and measures, an overview of telehealth, and a brief introduction to the study. Phase 2: baseline, which included (a) pre-baseline: identifying target behaviors; (b) baseline: parent/child independent play sessions, and (c) post-baseline: identifying replacement behaviors, action plan, and an in-depth overview of the study. Phase 3: fifteen intervention sessions with a parent/child independent play session used for data collection during sessions two through 15. Phase 4: an optional post-intervention meeting

to discuss outcomes, meet with the early interventionist, or discuss any questions pending about the study or their child's diagnosis. Table 6 is a study timeline and an overview of the phases.

The family's overall active time requirement was 10 to 18 weeks, depending on the number of baseline sessions, family availability, cancellations, and rescheduling. The ideal schedule was twice weekly; however, this could be increased to three times per week to accommodate the rescheduling of missed sessions. Each family received at least 20 sessions (a minimum of five sessions in baseline and 15 intervention sessions).

Phase 1: Consent, Intake, Overview

The primary investigator (PI) served as the early interventionist (EI) in the study and will be referred to as the EI hereafter. The EI screened each parent during the initial phone call to assess the fit for the study (see Appendix E: Basic Information Sheet). If the parent and EI agreed the study was a good fit, the EI mailed an intake and assessment packet to the family. A phone meeting was scheduled between the EI and parent to review the intake and assessment packet, offering help as necessary. The EI read the consent forms to the parent and answered questions. This phone call also included an overview of telehealth procedures and an inquiry of telehealth equipment needed by the parent. Once complete, the parent returned all paperwork in the pre-stamped envelope to the EI.

Upon receiving the consent and assessments from the parent, the EI mailed the technology equipment, parent binder, and toys to that participating family. The phase 2 meeting was scheduled by email within one week of shipping the package to each family. An invitation for VSee and Box.com was sent to the participating family at this time

Table 6

Study Timeline

Study phase	Focus	Time	Participants
Phase 1			
Consent, Intake, & Overview	Consent, intake, overview of telehealth, overview of assessments	1 hour	EI & Parent
Phase 2			
Pre-baseline	Review RBS-EC; Identify target behaviors	30 min	EI & Parent
Baseline	Parent/child play session (data collection) 5-12 sessions	10 min	EI, Parent & Child
Post-baseline	Study Overview; In-depth target behaviors Action plan for HO-RRBIs	30 min	EI & Parent
Phase 3			
Intervention	Parent/child play session (data collection) Parent education with coaching Reflection and feedback Summarize overall session Plan for practice and next meeting 15 Sessions	20-50 min	EI, Parent & Child
Phase 4			
Post-Intervention	Optional follow-up session; assessment questions; diagnostic results; provider meeting	30 min	EI & Parent
	Total Duration of Parent Commitment	4 to 5 months	
	Total Duration of Study (Recruitment through last assessment)	7 months	

Phase 2. Baseline: Pre-baseline, Baseline, and Post-baseline

Pre-baseline. This meeting included the parent and EI setting up the VSee and Box.com accounts. In most cases, the parent was able to set them up independently using the emailed prompts. Once the account was functional, the phone meeting was ended and

reconvened using the telehealth format. During this virtual, face-to-face meeting, the EI reviewed the RBS-EC assessment with the parent by pointing out the top areas rated as *4*s (see RBS-EC description in pre- and post-measures). Together, the EI and parent identified and defined two behaviors from the RBS-EC that fit into the HO-RRBI description. A brief overview of the study, baseline expectations, and deciding on a schedule for meetings marked the end of the pre-baseline session.

Baseline. Baseline sessions were approximately 14 minutes: a two-minute check-in, 10- minute child/parent video, a two-minute confirmation of the next meeting, and appreciation for the parent's time. The baseline included a series of five to 12 sessions, depending on the participating family. The EI did not offer coaching during the baseline sessions. Each parent was encouraged to play as they usually would with their child. All baseline sessions were recorded using ApowerRec and stored in the Cloud in a password-protected file, which was accessible only to the EI.

The interventionist began each baseline session by saying, “For 10 minutes, play as you usually play with (child name). Do and say what you think will help (child) play with you. I have provided you with toys to use. Please add in toys as you wish and use the toys I have provided for you. I will not be able to talk to you about your child’s behavior or play during baseline. This session will be video-taped. Please stay in the space designated for playtime that can be seen and heard by the recording device. If (child’s name) runs off, please bring him/her back in a way you think will help him/her stay and play with you. I will tell you when to stop. Do you have any questions before we begin?”

Post-baseline. Following the data collection portion in the baseline, the parent and EI met via telehealth for approximately 45 minutes to discuss a more detailed overview of the study and sessions, confirm target behaviors, and identify replacement behaviors to create an action plan to use during intervention sessions. Table 7 shows the session components, description, and minutes dedicated to each area (Rush & Sheldan, 2011).

Table 7

Study Timeline

Intervention Component	Component Description	Time
Check-in	Briefly discuss how the parent is doing, the child's health, and any questions specific to the intervention; EI suggests parent and child play with the toys and one another using some of the recommendations from the last coaching session.	2-7 min
Play without coaching	The interventionist will not coach or correct during this 10-minute segment.	10 min
Parent coaching	After the play session, the parent and EI will discuss the play session. The EI may suggest practicing some strategies with feedback at the time. EI will present new information and review past discussions as necessary to support the parent's progress. Anecdotal notes of suggestions and corrections will be documented by EI to use in the feedback component.	5-20 min
Feedback	The EI will base feedback on observations, suggestions, and corrections made in a parent coaching session and the play session without coaching, the EI will highlight focus areas for the Dyad to practice between sessions. The EI may suggest the parent re-watch the session via video in Box.com to further learning opportunities.	4-8 min
Plan and closing	The EI and parent discuss the practice plan and goals for the upcoming week. Time and day for the next session will be confirmed	2-5 min
Total		23-50 min

Phase 3. Intervention

Phase 3, intervention, comprised 15 sessions. This phase included three components: (a) independent parent/child play session, (b) parent education with coaching, and (c) reflection and feedback. These components occurred in tandem during each session.

Independent Parent/Child Play Session. Following a brief check-in and greeting, each intervention session included a parent/child play session. These sessions began by reminding the parent of the expectations for the baseline play sessions. No coaching occurred during these independent play sessions. However, if the parent became discouraged due to child non-responding or disruptive behavior, the EI may have reminded the parent that they are doing the best they can, to relax, and try to have fun playing with their child. The EI video recorded each session.

Coaching and Parent Education. The coaching model used in this study was an early childhood, research-based model effective with parents and classroom teachers, as described by Rush & Sheldan (2011). In the context of this study, adult learning was the focus of the coaching model. Coaching components included the goal of building capacity within the parent to increase the feeling of efficacy as a parent. A goal for the child/parent dyad was to move the participants toward a better quality of life. There were five prominent components of this coaching model: (a) joint planning, (b) observation, (c) action/practice, (d) reflection, and (e) feedback. These were the five critical components in the planning and implementation of each coaching session. The name of each coaching component, application in the current study, and definitions are in Table 8 (Rush & Sheldan, 2011).

Table 8

Coaching Components

Coaching Component	Component Description
Joint Planning	• Agreement on what actions to take during a session • Understanding what parent will practice between visits • Goal: discussion and agreement on interactions from coach to parent and parent to the child to maximize skill use and comfort for the parent.
Observation	• Observation of the parent as part of the planning by EI • Observation as training for the parent to see themselves interacting with their child
Action/ Practice	• To allow for practice of skills and make corrections and adjustments • Give feedback about the person participating in the action by both parent and EI • The EI will model, discuss or prompt through intervention behaviors as seen in parent videos for the parent to practice • The parent will practice interventions.
Reflection	• Reflection will occur following observation • Reflection allows for an analysis of the actions and observations • The parent can reflect on skills used during the intervention and what might need adaptation for the next intervention.
Feedback	• After reflection to develop a deeper understanding of skills, review the implementation, and improve it. • Refine skills and expectations for intervention and goals for practice between meetings

Note. All coaching components are considered bi-directional, where the EI and parent both taking active roles. (Rush & Sheldan, 2011)

All intervention sessions included both coaching and education. The first several intervention sessions focused on individual intervention strategies. Adaptation of the remaining sessions was conducted with the intent of ideally meeting each dyad's specific needs around the use of strategies during play. For all fifteen sessions, the early

interventionist coached parents using a session lesson plan (see Appendix F for lesson plan 1). During *reflection and feedback*, the EI and parent identified individual practice goals and tailored the lesson to meet the Dyad's needs. Generalization of strategies beyond play sessions was discussed during the last several sessions based on the Dyad's progress and parental capacity. Generalization of strategy use beyond play was not tracked in this study.

In the final session (session 15), the EI summarized the intervention information from the past weeks. The parent completed and returned the post-assessments and loaned technology in the pre-paid mailing box to the EI. The parent identified a merchant of choice for their $50 gift card. Upon receipt of the assessments and, if applicable, the loaned technology, the EI mailed the gift card to the family with a thank you note for participating.

Coaching on intervention strategies. Four strategies were included in the intervention package to be taught to parents during coaching to increase child flexibility and interaction: (a) environmental arrangement, (b) modeling and prompting, (c) differential reinforcement of appropriate behavior (DRA), and (d) RIRD. The parent was instructed to reference the corresponding information sheet for each strategy, which was in their parent binder (see Appendix G: Strategy Sheets). Each information sheet explained (a) the strategy definition, (b) the purpose, (c) an example and non-example, (d) steps to complete the strategy, and (e) "think about" prompts to help parent plan for their play session. The video-specific to each strategy became available via Box.com to the parent after an in-session discussion. Table 9 defines each of the intervention strategies.

Table 9

Intervention Strategies

Intervention Strategy	Definition	Example/Non-Example
Environmental Arrangement	Alters the physical environment and materials available to increase play and engagement with the parent, promotes prosocial behaviors, and reduces challenging behaviors of children (Davis & Fox, 1999)	**Example:** The parent adds three choices of a preferred toy and places them in a clear plastic jar with lid; the child brings jar to the parent for assistance, the parent facilitates the trade of materials and play ideas. **Non-example:** All toys are available at once, so the child does not need the parent to access anything novel OR television is on during playtime, which distracts both child and parent from engaging with one another.
Modeling and Prompting	Modeling: showing a new way to use a toy to play experience and exploration further; decreasing frustration of "unable" toy play Prompting: using a small teachable step or helping hints to demonstrate how to do a new or unfamiliar experience (Sam & AFIRM Team, 2016; 2015)	**Example:** The parent hands the child a shape for the shape sorter, the child takes the shape and begin flipping the toy between their fingers. The parent holds another shape up at the child's eye level and says "look," then puts shape into the sorter. The parent hands another to the child and says, "you try." If the child does not imitate, graduated guidance should prompt the child for success. **Non-Example:** The parent removes the child's current toy, says "you're doing it wrong" and does hand over hand to show the child how to manipulate toy OR parent allows the child to spin toy over and over for 10 minutes without interruption or social interaction.
Differential Reinforcement of Appropriate Behaviors (DRA)	DRA is the means of providing a reinforcing item to reduce repetitive or restrictive behavior (e.g., inflexible, repetitive, isolated play) and increase flexibility, social play, and interaction (Savage & AFIRM, 2017)	**Example:** The child plays with the truck without noticing anything the parent offers to the child. The parent gently removes his hand from the truck and put it on bubbles (another new, but favorable activity). The child looks at bubbles and smiles, the parent blows bubbles, and the child switches attention from truck to bubbles and parent. A parent gives child small pieces of a fruit snack, as this is a pre-determined reinforcement because the child gave up routine toy/action (truck rolling) and came to participate with a new toy (bubbles) and parent. **Non-example:** Child changes attention to new toy with no reinforcement from parent
Response Interruption and Redirection	A way to eliminate or decrease behaviors which interfere and consistently compete with one's overall development (Tomaszewski et al., 2017)	**Example:** Child rolls trucks, the child continues to roll the truck over and over without looking at the parent or other toys offered. Parent models and prompts flexible behaviors, but the child does not remove focus or eye gaze from the repetitive rolling of the truck. The parent gently stops the truck, removes the child's hand from the truck, and puts the child's hand on the pop-up toy. The child changes focus to the pop-up toy, and the parent removed the truck from the play area. **Non-example:** The child continues to roll a truck for the entire play session.

Strategy: Environmental arrangement. During coaching sessions, the early interventionist helped the parent set up the room to initiate interactive play between the parent and child. When setting up the environment, some toys should have been easily accessible and new items for the parent to use in play expansions. The parent and EI discussed what toys from the play tote should be available (e.g., promoting flexible play) and which were more difficult for the child to give up during play (e.g., promoting inflexible play). Preparing the environment, with the intent to communicate clear expectations of play with the child, was a key concept in session discussions. Planning and preparing both the physical (e.g., toys, furniture) and emotional (e.g., parent distractions, directives, responsiveness to play) environment was a parent education theme.

Strategy: Modeling and prompting. A model is when the parent demonstrates a way to play with an item or a social interaction. The EI coached the parent to follow the child's lead and take note of opportunities to model age-appropriate play. Modeling was the first attempt made by the parent to enter into play with their child. The parent made two attempts to model to their child if their child did not respond.

Prompting includes more directive expectations for the child to carry out a play imitation. A prompt may use minimal physical contact or hand-over-hand assistance to demonstrate how the toy works. A prompt followed the two unsuccessful modeling attempts made by the parent to demonstrate a play idea. Differential reinforcement of appropriate play followed any successful model or prompt of play interactions.

Strategy: Differential reinforcement of appropriate play (DRA). The EI coached the parent to reinforce flexible behavior during play. When the child became engaged in

an appropriate activity or a flexible behavior, the parent reinforced the child. Coaching included identifying individual reinforcement, social and tangible reinforcement, play expansions, and a hierarchy of reinforcement. Identification of individual reinforcers was discussed throughout sessions to clarify matching task difficulty with rate and type of reinforcement.

Strategy: Response interruption and redirection (RIRD). RIRD was used to interrupt overly focused behavior, which interferes with social exchanges. The EI and parent planned the best strategy for interruption (i.e., item removal, physical block, or verbal cue). The coaching of RIRD guided how to interrupt and replace the behavior through modeling, prompting, and reinforcement. Not all dyads needed this level of directive intervention.

Reflection and Feedback. After each parent-child independent play session, the parent reflected on the playtime, coaching, and new information. The EI began this portion with questions to assist in the parent's reflection, for example (a) "How did it feel to use that strategy on your own?"; (b) "What would you continue to do next time?"; and (c) "What would you like to work on?" The EI then provided guidance and encouragement to help parents reach the goals answered in questions (b) and (c). The parents committed to a reasonable goal for play practice between intervention sessions, and the next telehealth session was confirmed.

Parent Practice. The EI suggested that the parents practice the strategies during playtime with their child in between coached sessions. A practice log was available in the parent binder to assist with taking notes. Parents could keep track of their playtime, the length of times they played with their child, strategies used, and any additional

information worthwhile sharing. A completed example of this practice log was included in the parent notebook.

Phase 4. Post Intervention

An optional post-intervention telehealth meeting allowed an opportunity for the EI to provide further support. This meeting may have been used to check in with the family's other providers, meet after a diagnosis has been made, or follow up with the parent to check for further progress. The family could opt not to meet and end the interaction with the EI at intervention session 15.

Experimental Design

The study design was a combination of single-case research, multiple baseline design, with non-experimental data collection using pre- and post-measures. A multiple baseline design requires three or more participants, with staggered baseline lengths of at least five data points before the beginning of the intervention, to align with the What Works Clearinghouse standards for single-case research (Kratochwill et al., 2013). Intervention start times for dyads were staggered (i.e., following baseline data point 5, 7, 9, or 11) once variability was stable across baseline data points for both parent and child responding. Extended baseline required participants to continue longer without intervention, which could have been of concern due to potential time constraints of families on the waitlist (e.g., length of wait time) and potentially high attrition with this vulnerable population.

Data Analysis

An analysis of level, trend, overlap, and variability of the dependent measures within and across participants across all tiers of the multiple baseline designs (Gast et al.,

2014; Kratochwill et al., 2013) will be done to demonstrate behavior change. Visual inspection of graphed data provided valuable information related to intervention effects. As results showed clinically significant change based on visual analysis, a non-overlap estimator, Tau-U, was used (Parker et al., 2011; Kratochwill et al., 2013). Tau-U is a method for measuring data non-overlap between two phases (A and B) to determine the within case effect size. It is a "distribution-free" nonparametric technique, with a statistical power of 91% to 95%. Tau-U follows the "S" sampling distribution (as does Mann-Whitney U and Kendall's Rank Correlation), so *p*-values and confidence intervals are available. Tau-U controlled for within phase trend, serial dependence in the data, and consistency in logic with single-case visual analysis. To calculate Tau-U and, the single-case effect size calculator (Version 0.5) web application was used and retrieved from https://jepusto.shinyapps.io/SCD-effect-sizes/ (Pustejovsky & Swan, 2018). The results were interpreted using a score of 0.65 or lower to indicate a weak functional relation; 0.66-0.92 indicated a medium to high relation; and a strong relation of 0.93 or higher.

A calculation of the standard mean difference will determine the between-case effect size for multiple baselines across a smaller number of participants (as in most single-case designs). To calculate the standard mean difference effect size, the single-case effect size calculator web application was used and retrieved from https://jepusto.shinyapps.io/scdhlm/ (Pustejovsky, 2016). The results were interpreted using a score below or above zero to indicate behavior change due to intervention.

Pre- and Post-Measures

All pre- and post-measures report changes over time, comparing raw scores between the pre-baseline and the post-intervention assessments.

Response Measurement, Treatment Fidelity, Interrater Reliability

Asynchronous video review was used for direct observation data collection by research assistants using pen and paper or technology application for behavioral tracking, which was compared with synchronous and asynchronous data collection by the PI. ApowerRec™ screen recorder was used to record each telehealth session for data collection purposes. The trained research assistants collected data on the occurrence and nonoccurrence of target child and parent behaviors for each session using event recording procedures (e.g., 10-second partial interval recording or frequency). Research assistants were trained as data collectors by attending a one-hour face-to-face training with the PI, where they were trained using didactic teaching with a PowerPoint with an overview of the study procedures. Data collectors then watched and coded three model videos from the tutorials on parent strategies. The data collectors then met with the PI via telehealth and coded a session from a participating dyad. Once trained to fidelity, the data collectors independently coded two videos for either child or parent behaviors. Discrepancies were discussed, and videos were re-coded by data collectors until they each reached 100% interobserver agreement for the dependent variable they were responsible for coding. Play sessions occurred via telehealth over 14 weeks, and no more than 10-minutes of play was coded.

Dependent Variables and Response Measurement. Dependent variables, both child and parent behaviors. Child dependent variables are flexible and inflexible (i.e., HO-RRBIs) behaviors during play as measured by 10-second partial intervals of each 10-

minute play session during baseline through intervention sessions. Definitions of inflexible and flexible play are in Table 4. Individual targets within these broader definitions are included in Table 3 with child characteristics. Behavior intervention plans for each child participant are in Appendix D. The parent dependent variable is their use of intervention strategy sequences correctly as measured by frequency of correct sequences during each 10-minute plat session in baseline and intervention. Frequency of use (i.e., model, prompt, and RIRD) as used by parents was also accounted for in this measurement. A strategy sequence flow chart is in Figure 4, and the description of each strategy is in *general procedures*. In addition to the frequency of strategy use, data on parent treatment fidelity (i.e., strategies attempted and correct sequence steps) were also collected. Distal outcomes were measured by pre- and post-assessments. Two additional assessments at post-intervention add to the understanding of child RRBIs (i.e., BIS; Boyd et al., 2018) and parent stress (i.e., COVID-19 Questionnaire). The interventionist took procedural fidelity for each session. Examples of the application used for data collection and datasheets can be found in Appendix A, and procedural fidelity checklist in Appendix H.

Parent Treatment Fidelity. Parent strategies were broken into steps for four sequences (see Figure 4). Partial and completed sequences were tracked during 10-minute play sessions. The number of total steps completed correctly was divided by the number of possible steps if none had been missed in a sequence and multiplied by 100 to obtain a percentage ranging from 0% to100% of steps fully completed. Information on missed steps within a sequence informed the interventionist of areas where parents needed further coaching. Parent treatment fidelity data were collected for 100% of intervention sessions by the PI.

No treatment fidelity was collected for dyad 1 due to attrition prior to intervention. For dyad 2, overall, parent treatment fidelity was 95% (range = 73-100%) for 100% of intervention sessions. For dyad 3, overall parent treatment fidelity was 93% (range = 67-100%). For dyad 4, overall, parent treatment fidelity was 97% (range = 91-100%) for 100% of intervention sessions. For dyad 5, overall, parent treatment fidelity was 97% (range = 81-100%) for 100% of intervention sessions. For dyad 6, overall, parent treatment fidelity was 97% (range = 92-100%) for 100% of intervention sessions.

Reliability. Inter-observer agreement (IOA) data were collected for 37% (range = 35 - 40%) of baseline sessions and 36% (range = 34-36%) of intervention sessions across dyads for child behaviors and parent strategy use. IOA data were collected for 31% (range = 29-36%) of intervention sessions for parent treatment fidelity. Research assistants were provided with behavioral definitions and trained by the PI using sample videos until they could reach a minimum of 90% agreement across three consecutive sessions before beginning formal data collection. The PI randomly selected videos for IOA data.

The research assistants collected data on the dependent variables for child and parent behaviors from recorded videos For child behaviors, IOA was taken by partial 10-second intervals for functional play and inflexible child behaviors. For IOA on parent behaviors, data was collected on the frequency of correct strategy sequences throughout the 10-minute play period with the opportunity for twenty sequences possible in each session. The interventionist collected primary data for all sessions and all dependent and independent variables for child and parent. Secondary independent data collectors retrieved reliability data by watching recorded sessions asynchronously. Point-by-point

IOA was calculated. Specifically, disagreements were subtracted from agreements, divided by possible outcomes, multiplied by 100 to get a percentage for both child behavior and parent strategy use (Gast et al., 2014). Disagreements were reviewed by the PI to identify the reason for the discrepancy. These mistakes in coding were brought to the research assistant's attention and discussed to reach an agreement. If the IOA fell below 80% agreement for any participant's baseline or intervention set for three consecutive calculations, the research assistant was retrained by the PI in a booster session until they met the initial criteria required for data collectors.

For dyad 2, IOA of child behavior in baseline was 87% (range = 83-90%), intervention was 95% (range = 80-100%), and overall agreement was 92%. IOA of parent strategies in a correct sequence for baseline was 98% (range = 95-100%), intervention was 85% (range = 65-95%), and overall agreement was 89%. IOA for parent treatment fidelity was 99% (range = 98-100%).

For dyad 3, IOA of child behavior for baseline was 91% (range = 89-92%), intervention was 88% (range = 81-100%), and overall agreement was 89%. IOA of parent strategies in a correct sequence for baseline was 98% (range = 95-100%), intervention was 98% (range = 95-100%), and overall agreement was 98%. IOA for parent treatment fidelity was 95% (range = 88-100%).

For dyad 4, IOA of child behavior for baseline was 90% (range = 86-94%), intervention was 95% (range = 84-100%), and overall agreement was 94%. IOA of parent strategies in a correct sequence for baseline was 98% (range = 95-100%), intervention was 88% (range = 70-100%), and overall agreement was 91%. IOA for parent treatment fidelity was 93% (range = 87-97%).

For dyad 5, IOA of child behavior for baseline was 90% (range = 85-100%), intervention was 87% (range = 78-100%), and overall agreement was 88%. IOA of parent strategies in a correct sequence for baseline was 97% (range = 90-100%), intervention was 90% (range = 75-100 %), and overall agreement was 93%. IOA for parent treatment fidelity was 99% (range = 96-100%).

For dyad 6, IOA of child behavior for baseline was 88% (range = 79-100%), intervention was 94% (range = 82-100%), and overall agreement was 92%. IOA of parent strategies in a correct sequence for baseline was 97% (range = 90-100%), intervention was 86% (range = 75-95%), and overall agreement was 89%. IOA for parent treatment fidelity was 98% (range = 95–100%).

Intervention Procedural Fidelity. One-hundred percent of coaching sessions were coded for procedural fidelity by the PI using a fidelity checklist. No procedural fidelity was collected for dyad 1. During intervention sessions with dyad 2, the interventionist averaged 98% procedural fidelity (range = 91-100%). For dyad 3, the interventionist averaged 99% procedural fidelity (range = 91-100%). For dyad 4, the interventionist averaged 100% procedural fidelity. For dyad 5, the interventionist averaged 99% procedural fidelity (range = 82-100%). For dyad 6, the interventionist averaged 98% procedural fidelity (range = 91-100%).

The IOA coder used the Fidelity Checklist for Coaching Sessions (Appendix H), to assess the continuity across a comprehensive set of topics and telehealth procedures for 33% of sessions. IOA was calculated using the point-by-point method described above. IOA for procedural fidelity for the coaching dyad 2, the interventionist averaged 91% procedural fidelity (range = 82-100%). For dyad 3, the interventionist averaged 95% procedural fidelity (range = 91-100%). For dyad 4, the

interventionist averaged 98% procedural fidelity (range = 91-100%). For dyad 5, the interventionist averaged 98% procedural fidelity (range = 91-100%). For dyad 6, the interventionist averaged 96% procedural fidelity (range = 91-100%).

Social Validity Measurement. Social validity measures assess the appropriateness of the intervention strategies for each parent in the study. The *Treatment Acceptability Rating Form-Revised* (TARF-R; Reimers & Wacker, 1992) can determine parents' acceptability of an intervention (e.g., time commitment, cost, effectiveness, and understanding). The parent responded with 1 (strongly disagree) to 5 (strongly agree) for each item. Open-ended interview questions allowed for additional feedback, as seen appropriate by each participant. The modified TARF-R to assess the acceptability of the intervention and can be found in Appendix I: Social Validity Questionnaire. Participants completed an evaluation of the social validity of the intervention and telehealth procedures. The form for Social Validity of Telehealth Procedures can be found in Appendix J.

CHAPTER III

RESULTS

Dyad 1: Bree and Jax

Bree's use of behavior strategies was 0 for the five baseline sessions she completed. During baseline, Jax demonstrated flexible behaviors in an average of 42%, (range = 32-62%), of the intervals. Jax demonstrated inflexible behaviors for an average of 46% (range = 30-65%) of the intervals during baseline.

For directed vocalizations in baseline, Jax demonstrated an average of 43% (range = 25-60%) of intervals during the 10-minute play period. For accepting and giving toys, in baseline, Jax demonstrated an average of 18% (range = 12-23%) of intervals.

For joy, in baseline, Bree demonstrated an average of 4% (range = 2-7%), and Daisy demonstrated an average of 4% (range = 0-8%) of intervals. Shared joy averaged 47% (range = 0-100%) of intervals in baseline.

No intervention data was gathered due to attrition.

Dyad 2: Vicki and Maude

Vicki's use of behavior strategies was 0 for all five baseline sessions. During intervention, Vicki used an average of 11 strategy sequences (range = 0-20) per 10-minute play session. In sessions 2-10, Vicki averaged 10 strategy sequences (range = 0-17) and in sessions 11-15, averaged 13 sequences (range = 6-20) for each 10-minute play session. Vicki's overall average rate of sequence use during intervention was 1.0 (range = 0.0-2.0) per minute during the 10-minute intervention session. Vicki used Sequence A (i.e., model – wait - reinforce) most frequently as 71% of her sequences overall. The second most frequently used was Sequence C (i.e., model – wait – model – wait – prompt

–reinforce) at 23% of the strategies used. The most frequently missed sequence component was reinforcement at 77% of missed components. Table 10 shows the sequence used and missed strategy components. During baseline, Maude demonstrated flexible behaviors at an average of 16% (range = 10-20%) of the intervals. Maude demonstrated inflexible behaviors for an average of 62% (range = 53-70%) of the intervals during baseline. During intervention, Maude demonstrated flexible behaviors during an average of 68% (range = 20-90%) of intervals. Maude demonstrated inflexible behaviors for an average of 14% (range = 0-40%) of the intervals.

For directed vocalizations in baseline, Maude demonstrated this behavior on an average of 9% (range = 5-13%) of intervals during the 10-minute play period. In intervention, Maude demonstrated directed vocalizations for an average of 8% (range = 0-18%) of the intervals. For accepting and giving toys, in baseline, Maude demonstrated an average of 22% (range = 7-40%) and in intervention, an average of 7% (range of 0 - 18%) of intervals.

For joy, in baseline, Vicki demonstrated an average of 14% (range = 7-22%), and Maude demonstrated an average of 9% (range = 3 - 17%) of intervals. During intervention, Vicki demonstrated joy an average of 12% (range = 0-28%) and Maude an average of 13% (range = 0 -27%) of intervals. Shared joy averaged 67% (range = 50-83%) of intervals in baseline and 89% (range = 0-100%) during intervention.

No data was collected for dyad 2 for session three due to break in sessions between intervention 1 and 2 as well as intervention sessions 2 and 3.

Dyad 3: Liz and Daisy

Liz's use of behavior strategies was 0 for all seven baseline sessions. During intervention, Liz used an average of 7 strategy sequences (range = 1-17) per 10-minute play session. In sessions 2-10, Liz averaged 4 sequences (range = 1-9) sequences and in sessions 11-15, averaged 15 sequences (range of 13-17) for each 10-minute play session. Liz's overall average rate of sequence use during intervention was 1.3 (range = 0.2-1.8) per minute during the 10 -minute session. Liz used Sequence A (i.e., model – wait - reinforce) most frequently at 84% of her sequences overall. The second most frequently used was Sequence C (i.e., model – wait – model – wait – prompt – reinforce) at 8% of the strategies used. The most frequently missed sequence component was reinforcement at 91% of missed components. Table 10 shows the sequence used and missed strategy components. During baseline, Daisy demonstrated flexible behaviors in an average of 58%, (range = 42-73%), of the intervals. Daisy demonstrated inflexible behaviors for an average of 17% (range = 10-28%) of the intervals during baseline. During intervention, Daisy demonstrated flexible behaviors during an average of 67% (range = 32-100%) of intervals. Daisy demonstrated inflexible behaviors for an average of 5% (range = 0-12%) of the intervals.

For directed vocalizations in baseline, Daisy demonstrated an average of 27% (range = 12-37%) of intervals during the 10-minute play period. In intervention, Daisy demonstrated directed vocalizations for an average of 28% (range = 10-54%) of the intervals. For accepting and giving toys, in baseline, Daisy demonstrated an average of 16% (range = 8-27%) and in intervention, an average of 16% (range = 7-33%) of intervals.

For joy, in baseline, Liz demonstrated an average of 9% (range = 3-12%), and Daisy demonstrated an average of 3% (range = 0-10%) of intervals. During intervention, Liz demonstrated joy an average of 10% (range = 0 23%) and Daisy an average of 9% (range = 0 20%) of intervals. Shared joy averaged 34% (range = 0 - 89%) of intervals in baseline and 84% (range = 0-100%) during intervention.

Dyad 4: Gigi and Lucia

Gigi's use of behavior strategies averaged 0.9 (range = 0-3) for the seven baseline sessions. During intervention, Gigi used an average of 10 strategy sequences (range = 4-19) per 10-minute play session. In sessions 2-10, Gigi averaged 9 strategy sequences (range = 4-19) and in sessions 11-15, averaged 14 sequences (range = 9-17) for each 10-minute play session. Gigi's overall average rate of sequence use during intervention was 1.03 (range = 0.3-1.9) per minute during the 10-minute intervention session. Gigi used Sequence A (i.e., model – wait - reinforce) most frequently as 88% of her sequences overall. The second most frequently used was Sequence C (i.e., model – wait – model – wait – prompt –reinforce) at 7% of the strategies used. The most frequently missed sequence component was reinforcement at 67% of missed components. Gigi was the only participant to use Sequence D (RIRD), which she used one time. Table 10 shows the sequence used and missed strategy components. During baseline, Lucia demonstrated flexible behaviors in an average of 20%, (range = 12-28%), of the intervals. Lucia demonstrated inflexible behaviors for an average of 54% (range = 38-60%) of the intervals during baseline. During intervention, Lucia demonstrated flexible behaviors during an average of 61% (range = 28-88%) of intervals. Lucia demonstrated inflexible behaviors for an average of 29% (range = 5-63%) of the intervals.

For directed vocalizations in baseline, Lucia demonstrated this behavior on an average of 22% (range = 8-38%) of intervals during the 10-minute play period. In intervention, Lucia demonstrated directed vocalizations for an average of 30% (range = 13-52%) of the intervals. For accepting and giving toys, in baseline, Lucia demonstrated an average of 18% (range = 12-23%) and in intervention, an average of 23% (range = 2-47%) of intervals.

For joy, in baseline, Gigi demonstrated an average of 2% (range = 0-5%), and Lucia demonstrated an average of 1% (range = 0-2%) of intervals. During intervention, Gigi demonstrated joy an average of 10% (range = 3-17%) and Lucia an average of 10% (range = 2-17%) of intervals. Shared joy averaged 40% (range = 0-100%) of intervals in baseline and 95% (range = 50-100) during intervention.

Dyad 5: Kay and Derek

Kay's use of behavior strategies averaged 0.6 (range = 0-3) for the nine baseline sessions. During intervention, Kay used an average of 12 strategy sequences (range = 0-20) per 10-minute play session. In sessions 2-10, Kay averaged 8 strategy sequences (range = 0-19) and in sessions 11-15, averaged 17 sequences (range = 11-20) for each 10-minute play session. Kay's overall average rate of sequence use during intervention was 1.2 (range = 0.0 -2.0) per minute during the 10-minute intervention session. Kay used Sequence A (i.e., model – wait - reinforce) most frequently as 95% of her sequences overall. The second most frequently used was Sequence C (i.e., model – wait – model – wait – prompt - reinforce) at 4% of the strategies used. The most frequently missed sequence component was reinforcement at 100% of missed components. Table 10 shows the sequence used and missed strategy components. During baseline, Derek demonstrated

flexible behaviors in an average of 43%, (range = 28-58%), of the intervals. Derek demonstrated inflexible behaviors for an average of 35% (range = 12-55%) of the intervals during baseline. During intervention, Derek demonstrated flexible behaviors during an average of 79% (range = 43-100%) of intervals. Derek demonstrated inflexible behaviors for an average of 7% (range = 0-15%) of the intervals.

For directed vocalizations in baseline, Derek demonstrated this behavior on an average of 57% (range = 50-73%) of intervals during the 10-minute play period. In intervention, Derek demonstrated directed vocalizations for an average of 40% (range= 28-62%) of the intervals. For accepting and giving toys, in baseline, Derek demonstrated an average of 16% (range = 8-28%) and in intervention, an average of 16% (range = 7-28%) of intervals.

For joy, in baseline, Kay demonstrated an average of 7% (range = 0-22%), and Derek demonstrated an average of 6% (range = 1-25%) of intervals. During intervention, Kay demonstrated joy an average of 18% (range = 3-33%) and Derek an average of 18% (range = 3-33%) of intervals. Shared joy averaged 52% (range = 0-100%) of intervals in baseline and 100% during intervention.

Dyad 6: Maria and Allie

Maria's use of behavior strategies averaged 0.3 (range = 0-2) for the 11 baseline sessions. During intervention, Maria used an average of 11 strategy sequences (range = 0-20) per 10-minute play session. In sessions 2-10, Maria averaged 8 strategy sequences (range = 0-18) and in sessions 11-15, averaged 16 sequences (range = 14-20) for each 10-minute play session. Maria's overall average rate of sequence use during intervention was 1.1 (range = 0.0 -2.0) per minute during the 10-minute intervention session. Maria used

Sequence A (i.e., model – wait - reinforce) most frequently as 56% of her sequences overall. The second most frequently used was Sequence C (i.e., model – wait – model – wait – prompt – reinforce) at 35% of the strategies used. The most frequently missed sequence component was reinforcement at 69% of missed components. Table 10 shows the sequence used and missed strategy components. During baseline, Allie demonstrated flexible behaviors in an average of 19%, (range = 2-40%), of the intervals. Allie demonstrated inflexible behaviors for an average of 54% (range = 37-85%) of the intervals during baseline. During intervention, Allie demonstrated flexible behaviors during an average of 59% (range = 5-100%) of intervals. Allie demonstrated inflexible behaviors for an average of 21% (range = 0-57%) of the intervals.

Table 10

Parent Strategy Sequence Frequency of Use and Missed Steps

	Parent				
Descriptions	Vicki	Liz	Gigi	Kay	Maria
Strategy Sequence Use					
Sequence A	81	89	113	155	46
Sequence B	7	8	7	3	7
Sequence C	27	9	8	6	29
Sequence D	0	0	1	0	0
Missed Sequence Step					
Reinforcement	10	29	12	11	9
Model in Sequence B	0	2	4	0	2
Prompt in Sequence C	3	1	2	0	2

Note. Strategy sequences are listed in *General Procedures*.

For directed vocalizations in baseline, Allie demonstrated this behavior on an average of 22% (range = 8-38%) of intervals during the 10-minute play period. In intervention, Allie demonstrated directed vocalizations for an average of 30% (range = 13-52%) of the intervals. For accepting and giving toys, in baseline, Allie demonstrated an average of 18% (range = 12-23%) and in intervention, an average of 23% (range = 2-47%) of intervals.

For joy, in baseline, Maria demonstrated an average of 6% (range = 0-15%), and Allie demonstrated an average of 2% (range = 0-7%) of intervals. During intervention, Maria demonstrated joy an average of 7% (range = 0-37%) and Allie an average of 7% (range = 0-37%) of intervals. Shared joy averaged 30.5% (range = 0-100%) of intervals in baseline and 55% (range = 0-100%) during intervention.

Standard Mean Difference (Between-Case Effect Size)

The between-case effect size shown as standard mean difference for each dependent variable was above zero and for child inflexible behavior below zero as anticipated for a decrease in behavior. For parent strategy use SMD = 0.06, (95% CI [-0.006, 1.21], df = 16.09, SE = 0.29, $p < 0.02$). For child flexible behavior, SMD = 0.27, (95% CI [-0.28, .084], df = 15.73, SE = 0.26, $p < 0.20$). For child inflexible behavior, SMD = -1.21, (95% CI [-2.11, -.0.29], df = 9.37, SE = 0.40, $p < 0.00$). Thus, the probability of participants demonstrating the observed behavior change is not likely without intervention.

Visual Analysis and Tau-U (Within-Case Effect Size): Proximal Outcomes

Figures 5, 6, and 7 depict the data for the dependent variables. Figure 5 shows the number of strategy sequences used by the parent and the rate of sequences per minute

during baseline and intervention. Figure 6 shows the percentage of child flexible and inflexible behavior during play across baseline and intervention. Figure 7 shows the relationship between parent strategy use and child behaviors.

Dyad 1: Bree and Jax

Parent strategy use. Figure 5 displays Bree's count of correct strategy use and rate during 10-minute play sessions. During baseline, Bree exhibited no variability in responding with zero sequences. No intervention data was collected due to attrition.

Child flexible and inflexible behavior during play. Figure 6 displays Jax's percentage of flexible and inflexible behaviors during the 10-minute play sessions. In baseline, Jax exhibited frequent inflexible and flexible behaviors with no trend and variability in responding. No intervention data was collected due to attrition.

Parent strategy use and child behaviors. Figure 7 displays Bree's strategy use and Jax's flexible and inflexible behaviors during play. During baseline, Bree does not use any strategy sequences during the play sessions, and Jax demonstrates variable, medium levels of flexible and inflexible behaviors with variability. No intervention data was collected due to attrition.

Dyad 2: Vicki and Maude

Parent strategy use. Figure 5 displays Vicki's count of correct strategy use and rate during 10-minute play sessions. During baseline, Vicki exhibited no variability in responding with zero sequences completed in sessions. During intervention, Vicki's strategy use shows a slight delay in responding, resulting in an overlap of the first data point with baseline data. Once Vicki began to use the strategy sequences, data showed a

Figure 5

Parent Strategy Use

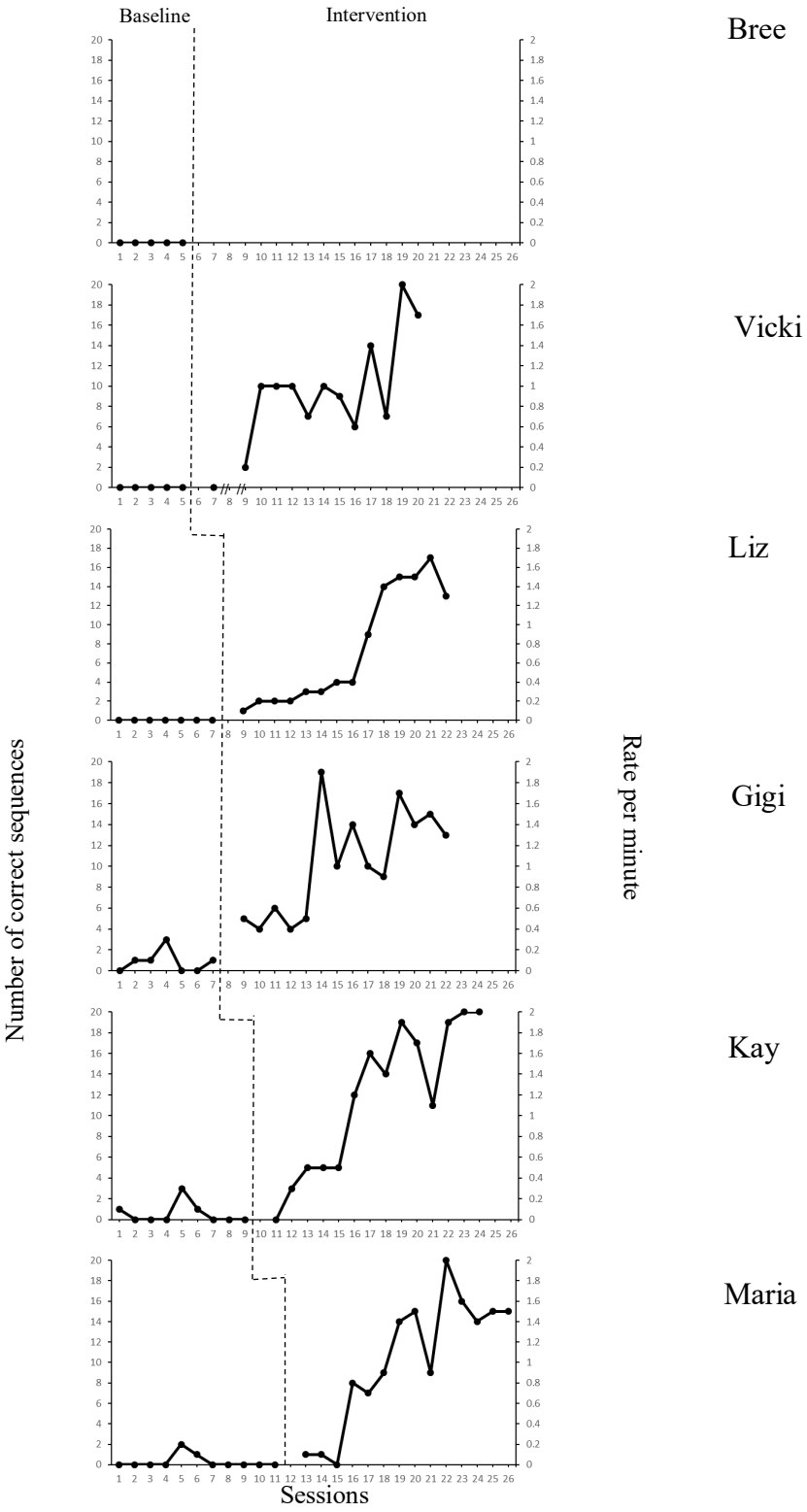


Figure 6

Child Flexible and Inflexible Behaviors During Play

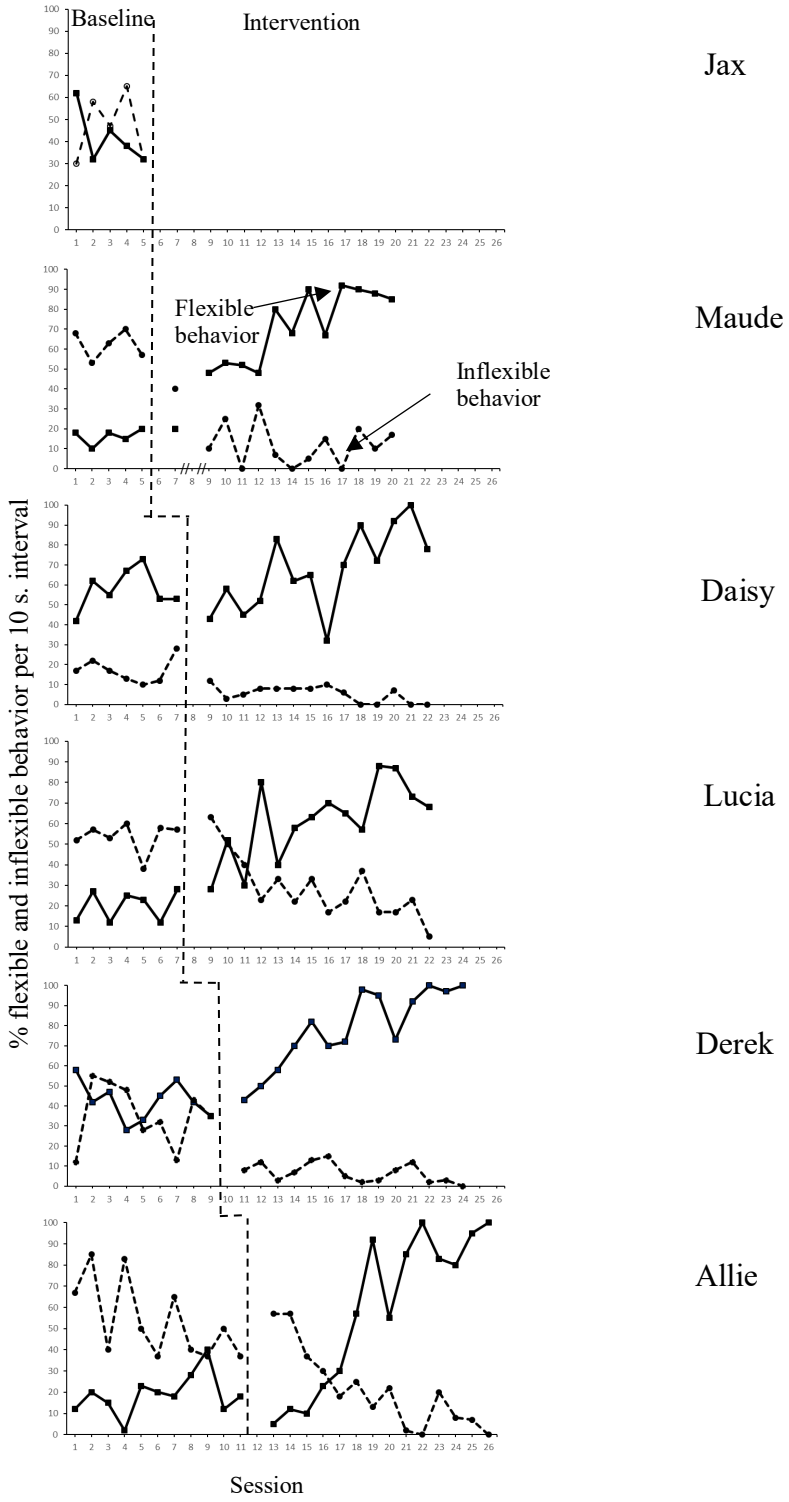
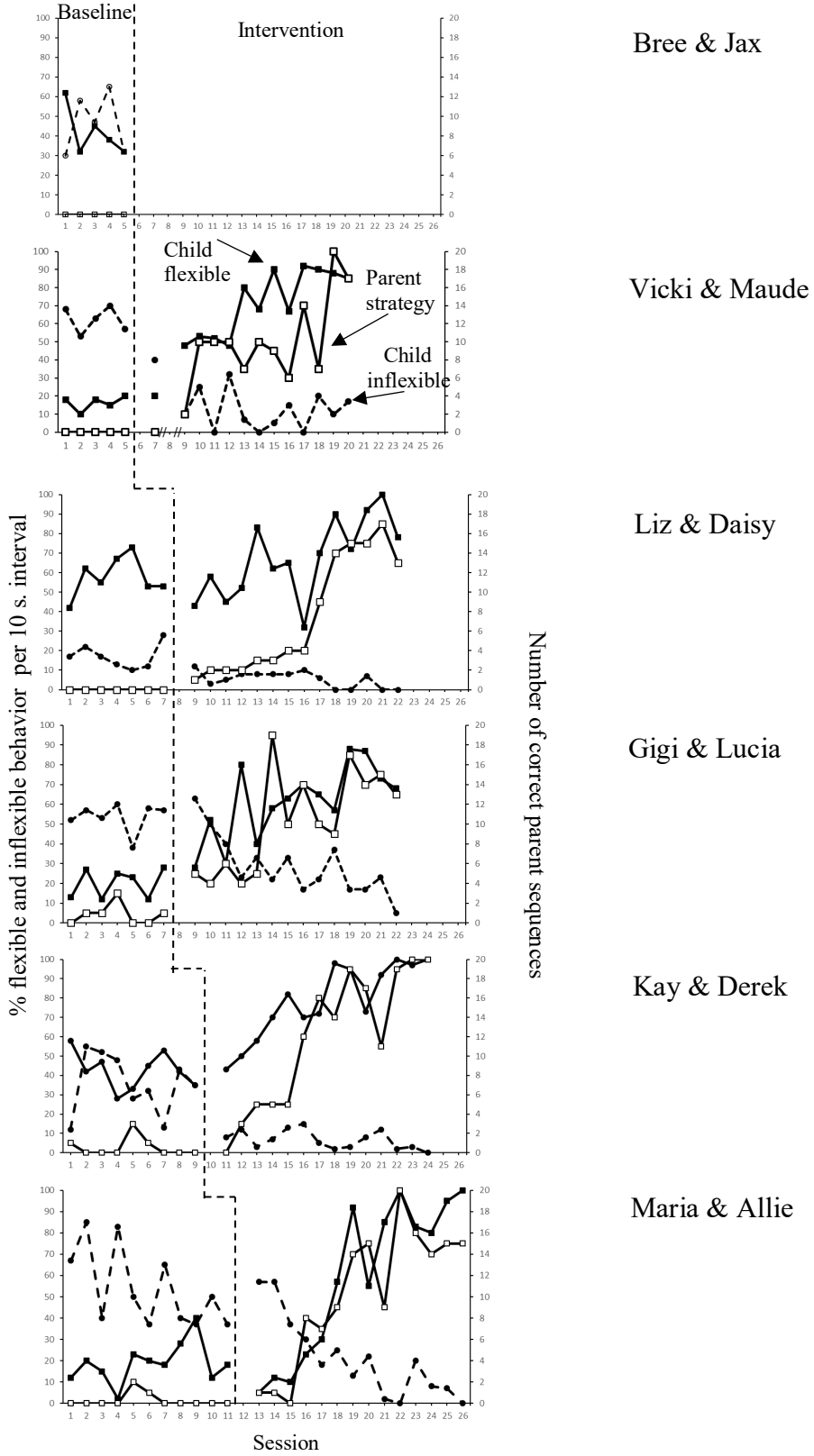


Figure 7

Relationship of Parent Strategy Use and Child Behavior



variable, increasing trend with a change in level and no overlap with previous data points. A vertical analysis revealed that no change in responding occurred for other tiers upon implementation of the intervention in tier two. Tau-U analysis was conducted for this data demonstrating a strong basic effect ($d = 0.93$) between baseline and the effect of the intervention package on parent strategy use.

Child flexible and inflexible behavior during play. Figure 6 displays Maude's percentage of flexible and inflexible behaviors during the 10-minute play sessions. In baseline, Maude exhibited frequent inflexible behaviors with a stable trend and minimal variability in responding during play sessions. Maude exhibited infrequent, flexible behaviors during play sessions with a stable trend and minimal variability in responding during the play sessions. During intervention, Maude decreased her use of inflexible behaviors and demonstrated an immediacy of effect. Data for Maude's inflexible behavior shows a slight decrease in trend with some variability, a change in level, and no overlap. Maude's flexible behavior remained low for the first intervention data point, resulting in one point of overlap. In the following session, Maude increased her use of flexible behaviors resulting in an increasing trend with some variability, a change in level, and no further overlap. A vertical analysis revealed that upon implementation of intervention in tier one, no change in responding occurred for other tiers. Tau-U analysis was conducted for this data demonstrating a strong basic effect ($d = 0.99$) between baseline and the effect of the intervention package and child flexible behavior during play. Similarly, the Tau-U analysis for the intervention package and inflexible behavior was also a strong basic effect ($d = 1.00$).

Parent strategy use and child behaviors. Figure 7 displays Vicki's strategy use and Maude's flexible and inflexible behaviors during play. During baseline, Vicki does not use any strategy sequences during the play sessions, and Maude demonstrates stable, low levels of flexible behaviors and stable high levels of inflexible behaviors. During the intervention phase, Vicki's responding remains at zero levels for the first data point; similarly, Maude's flexible behavior remained low, and only a slight decrease was shown for her inflexible behavior. During the next sessions, Vicki exhibits an increasing trend in strategy use, and Maude shows an increasing trend in flexible behaviors during play. This outcome is in contrast to Maude's decrease in inflexible behavior. All behaviors show a change in level and minimal to no overlap. Vertical analysis demonstrates behavior change for Tier 2 to be independent of the other tiers.

Dyad 3: Liz and Daisy

Parent strategy use. Figure 5 displays Liz's count of correct strategy use and rate during 10-minute play sessions. During baseline, Liz exhibited no variability in responding with zero sequences completed in sessions. During intervention, Liz's strategy use showed an immediacy of effect and no overlap with baseline data. The data path for Liz's responding shows minimal variability, increasing trend with a change in level. A vertical analysis revealed that upon implementation of intervention in tier two, no change in responding occurred for other tiers that remained in baseline. Tau-U analysis was conducted for this data demonstrating a strong basic effect ($d = 1.00$) between baseline and the effect of the intervention package on parent strategy use.

Child flexible and inflexible behavior during play. Figure 6 displays Daisy's percentage of flexible and inflexible behaviors during the 10-minute play sessions. In

baseline, Daisy exhibited low levels of inflexible behaviors with stable responding and minimal variability in during play sessions. Daisy exhibited some flexible behaviors with stable responding and some variability during the play sessions. During intervention, Daisy decreased her inflexible behaviors to near-zero levels, showing a slight change in level, and some overlap with baseline. Daisy's flexible behavior remained at mid to high levels during intervention, showing an increasing trend, variability, overlap with baseline, and no obvious a change in level. A vertical analysis revealed that upon implementation of intervention in tier two, shows no change in responding for other tiers that remained in baseline. Tau-U analysis was conducted for this data demonstrating a weak basic effect (d = 0.65) between baseline and the effect of the intervention package on child flexible behavior during play. The Tau-U analysis for the intervention package and inflexible behavior during play was a strong basic effect (d = 0.98).

Parent strategy use and child behaviors. Figure 7 displays Liz's strategy use and Daisy's flexible and inflexible behaviors during play. During baseline, Liz does not use any strategy sequences during the play sessions, and Daisy demonstrates stable, mid-levels of flexible behaviors and stable low-levels of inflexible behaviors. During intervention, Liz's responding moved to one and continued an upward trend, while Daisy's responding remained similar during the first few intervention sessions. Once Liz increased her number of strategy sequences, Daisy also increased her flexible behaviors following the same upward trend with variability as her mother. Alternatively, Daisy's inflexible behavior remained low and decreased further to zero and near-zero responding. Vertical analysis demonstrates behavior change for Tier three to be independent of the other tiers.

Dyad 4: Gigi and Lucia

Parent strategy use. Figure 5 displays Gigi's count of correct strategy use and rate during 10-minute play sessions. During baseline, Gigi exhibited some variability in responding with a range of 0-3 sequences completed in various sessions. During intervention, Gigi's strategy use shows an immediacy of effect and no overlap with baseline data. Gigi's data path showed a variable, increasing trend with a change in level. A vertical analysis revealed that upon implementation of intervention in tier three, no change in responding occurred for other tiers that remained in baseline. Tau-U analysis was conducted for this data demonstrating a strong basic effect (d = 1.00) between baseline and the effect of the intervention package on parent strategy use.

Child flexible and inflexible behavior during play. Figure 6 displays Lucia's percentage of flexible and inflexible behaviors during the 10-minute play sessions. In baseline, Lucia exhibited frequent inflexible behaviors with stable responding and minimal variability during play sessions. Lucia exhibited infrequent, flexible behaviors with stable responding and minimal variability during the play sessions. During intervention, Lucia decreased her use of inflexible behaviors with some initial overlap with baseline data. Lucia's data path of inflexible behavior shows a decreasing trend with some variability and a change in level toward the end of intervention. Data for Lucia's flexible behavior shows an increase in trend with some variability, a change in level, and minimal overlap. Lucia's flexible behavior remained low for the first intervention data point, resulting in one point of overlap. A vertical analysis revealed that upon implementation of intervention in tier one, no change in responding occurred for other tiers who remained in baseline. Tau-U analysis was conducted for this data,

demonstrating a strong basic effect ($d = 0.99$) between baseline and the effect of the intervention package on child flexible behavior during play. Similarly, the Tau-U analysis for the intervention package and inflexible behavior was also a strong basic effect ($d = 0.91$).

Parent strategy use and child behaviors. Figure 7 displays Gigi's strategy use and Lucia's flexible and inflexible behaviors during play. During baseline, Gigi uses minimal strategy sequences, between 0-3, per session. Lucia demonstrates stable, low levels of flexible behaviors and stable high levels of inflexible behaviors. During intervention, Gigi's responding shows an immediacy of change, while Lucia's flexible behavior overlaps with baseline for the first data point, and then begins an increasing trend without further overlap at the second data point through the final intervention session. As Gigi's number of strategy use increases during intervention, Lucia's use of flexible behavior also increases along a similar data path with a decrease in inflexible behavior. All behaviors show a change in level and minimal to no overlap. Vertical analysis demonstrates behavior change for Tier four to be independent of the other tiers.

Dyad 5: Kay and Derek

Parent strategy use. Figure 5 displays Kay's count of correct strategy use and rate during 10-minute play sessions. During baseline, Kay exhibited some variability in responding with a range of 0-3 sequences completed in sessions. During intervention, Kay's strategy use shows a slight delay in responding, resulting in an overlap of the first 2 data points with baseline data. Once Kay began to use the strategy sequences, data showed minimal variability, an increasing trend with a change in level, and minimal overlap with previous data points. A vertical analysis revealed that upon implementation

of intervention in tier four, no change in responding occurred for other tiers that remained in baseline. Tau-U analysis was conducted for this data demonstrating a strong basic effect (d = 0.95) between baseline and the effect of the intervention package on parent strategy use.

Child flexible and inflexible behavior during play. Figure 6 displays Derek's percentage of flexible and inflexible behaviors during the 10-minute play sessions. In baseline, Derek exhibited mid-range inflexible behaviors with no trend and high variability in responding during play sessions. Derek exhibited mid-range, flexible behaviors with no trend and high variability in responding during the play sessions. During intervention, Derek demonstrated an immediacy effect in inflexible behavior with a change in level, low variability and minimal trend, and levels remaining at zero and near-zero levels for the remaining intervention sessions. Derek's flexible behavior demonstrated an increasing trend with minimal variability, a change in level, and an initial overlap for the first two intervention data points only. A vertical analysis revealed that upon implementation of intervention in tier one, no change in responding occurred for other tier remaining in baseline. Tau-U analysis was conducted for this data, demonstrating a strong basic effect (d = 0.95) between baseline and the effect of the intervention package on child flexible behavior during play. Similarly, the Tau-U analysis for the intervention package and inflexible behavior was also a strong basic effect (d = 0.96).

Parent strategy use and child behaviors. Figure 7 displays Kay's strategy use and Derek's flexible and inflexible behaviors during play. During baseline, Kay uses minimal strategy sequences (range = 0-3) during the play sessions, and Derek

demonstrates mid-range responding, with high variability. During intervention, Kay's responding overlaps with baseline levels for the first two data points; however, the data demonstrate an increasing trend, change in level, and minimal overlap. Similarly, Derek's flexible behavior begins an increasing trend in intervention, following a similar sequence as Kay's path. Inflexible behavior decreases in intervention and remains low while flexible behavior and strategy use remained high. All behaviors show a change in level and minimal to no overlap. Vertical analysis demonstrates behavior change for Tier five to be independent of the other tiers.

Dyad 6: Maria and Allie

Parent strategy use. Figure 5 displays Maria's count of correct strategy use and rate during 10-minute play sessions. During baseline, Maria exhibited minimal variability in responding with a range of 0-2 sequences completed in sessions. During intervention, Maria's strategy use shows a slight delay in responding, resulting in overlap with baseline data for the first three data points. Once Maria began to use the strategy sequences, data showed an increasing trend with some variability and a change in level and no overlap from intervention session 4 through the end of the study. A vertical analysis revealed that upon implementation of intervention in tier six, no change in responding occurred for other tiers. Tau-U analysis was conducted for this data demonstrating a strong basic effect ($d = 0.94$) between baseline and the effect of the intervention package on parent strategy use.

Child flexible and inflexible behavior during play. Figure 6 displays Allie's percentage of flexible and inflexible behaviors during the 10-minute play sessions. In baseline, Allie exhibited frequent inflexible behaviors with a highly variable decreasing

trend in responding during play sessions. Maude exhibited low levels of flexible behaviors with no trend and variability in responding during the baseline play sessions. During intervention, Allie showed a decrease in inflexible behaviors, with some overlap, variability, and a decreasing trend. Data for Allie's flexible behavior shows an increasing trend with some variability, a change in level, and overlap. Allie's flexible behavior remained low for the first five intervention data points. In the following session, Allie increased her use of flexible behaviors resulting in an increasing trend with some variability, a change in level, and no further overlap. A vertical analysis revealed that upon implementation of intervention in tier one, no change in responding occurred for other tiers. Tau-U analysis was conducted for this data demonstrating a medium basic effect ($d = 0.79$) between baseline and the effect of the intervention package on child flexible behavior during play. The Tau-U analysis for the intervention package and inflexible behavior was also a strong basic effect ($d = 0.90$).

Parent strategy use and child behaviors. Figure 7 displays Maria's strategy use and Allie's flexible and inflexible behaviors during play. During baseline, Maria uses very few strategy sequences during the play sessions and Allie demonstrates variable, yet, low levels of flexible behaviors and high levels of inflexible behaviors. During intervention, Maria's responding remained low for the first three data points; similarly, Allie's flexible behavior remained low, and her inflexible behavior remained high with overlap from baseline levels. During the next sessions, Maria began an increasing trend in strategy use, and Allie immediately began an increasing trend in flexible behavior and a decrease during inflexible behavior. Vertical analysis demonstrates behavior change for Tier six to be independent of the other tiers.

Visual Analysis of Distal Outcomes

Figures 8 and 9 depict the data from distal outcomes. Figure 8 shows the percentage of child-directed vocal and accepting and giving toys during 10s. intervals for each play session across baseline and intervention. Figure 9 shows the percentage of child joy and parent joy independently as well as instances of shared joy by 10-second intervals across baseline and intervention for each dyad.

Dyad 1: Bree and Jax

Figure 8 shows directed vocals and the accepting and giving of toys during the 10-minute play sessions for Jax. In baseline, Jax's directed vocals showed a slightly increasing trend with high variability. Jax's acceptance and giving of toys were slightly below mid-range with no trend and some variability. No overlap, level change, or vertical analysis could be determined without the intervention phase.

Figure 9 shows joy for individual participants and shared instances using 10 s. partial interval recording during the 10-minute play session. Bree and Jax showed low levels of enjoyment throughout baseline, demonstrating no trend and minimal variability. Shared joy was highly variable with no apparent trend. No overlap, level change, or vertical analysis could be determined without the intervention phase.

Dyad 2: Vicki and Maude

Figure 8 shows directed vocals and the accepting and giving of toys during the 10-minute play sessions for Maude. In baseline, Maude's directed vocals showed low steady responding with no trend and minimal variability. In intervention, Maude's directed vocals were similar, with low responding, minimal variability, no apparent change in level, and high overlap with baseline data. Maude's acceptance and giving of toys were

Figure 8

Directed vocals and accepting and giving toys by child participants

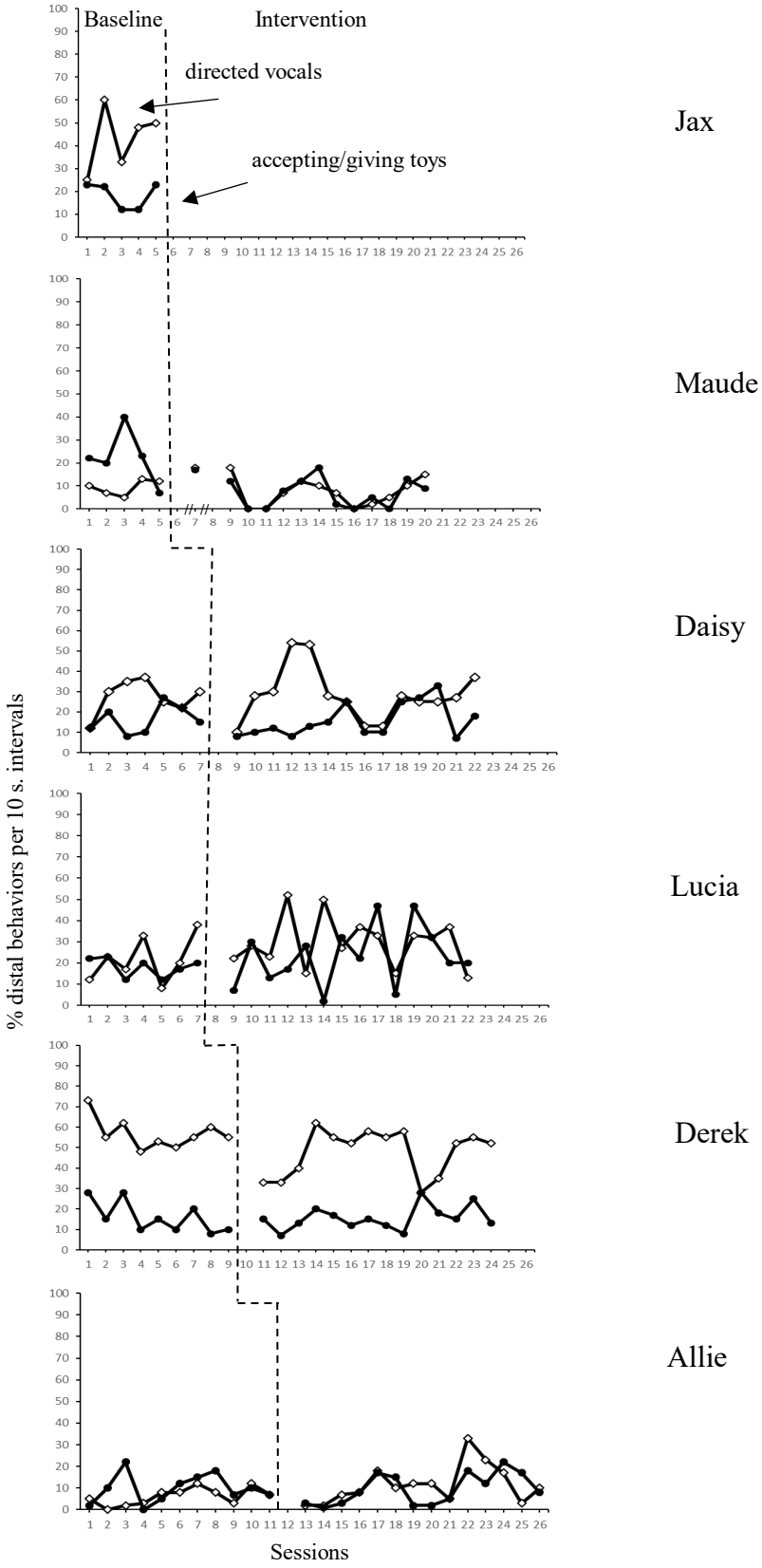
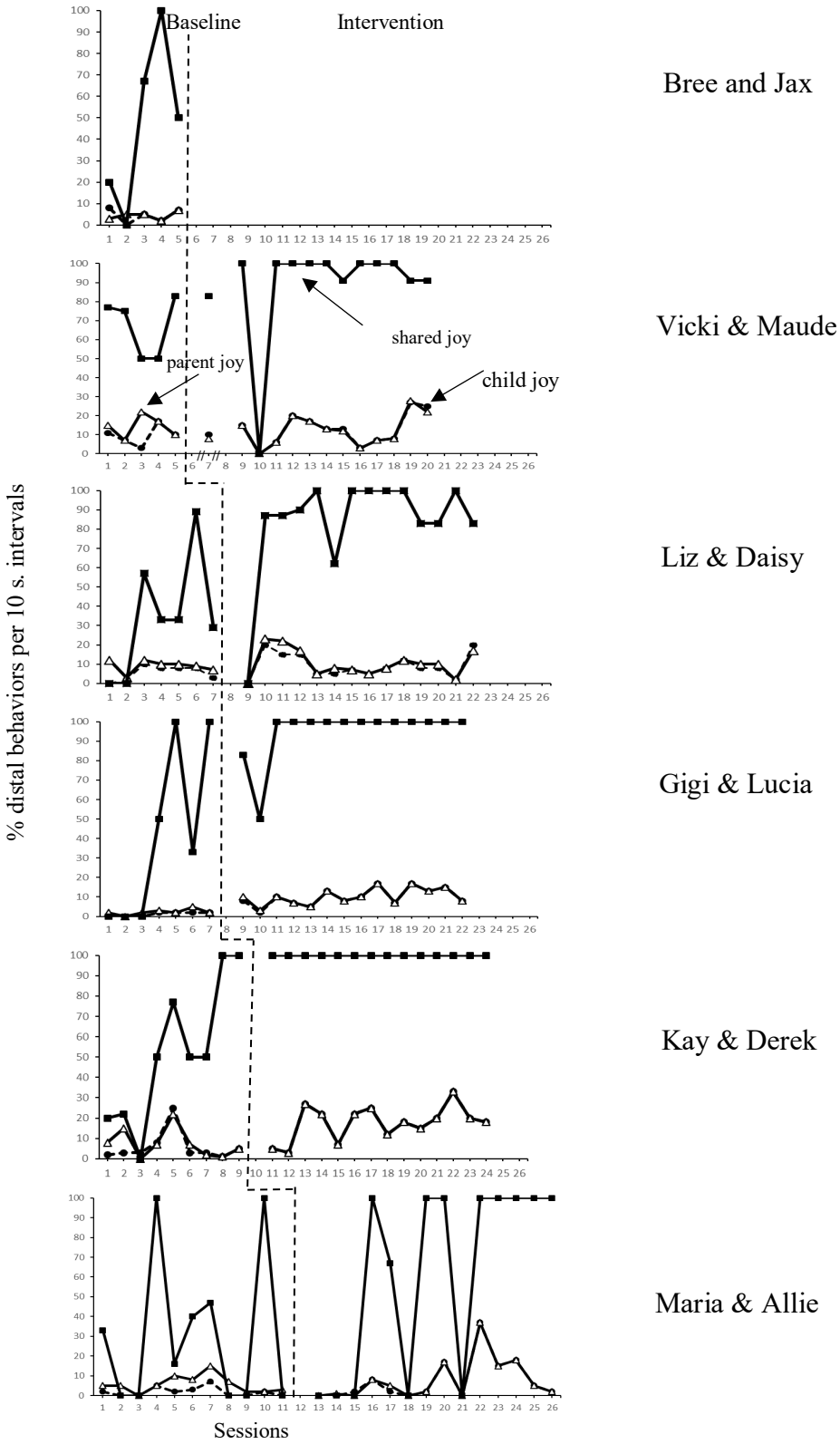


Figure 9

Child, parent, and shared joy during play sessions



slightly below mid-range with a decreasing trend and some variability. During intervention, Maude's toy behavior decreased to even less responding, resulting in some variability, a change in level, no apparent trend, and some overlap with baseline. A vertical analysis revealed that upon implementation of intervention in tier two, no change in responding occurred for other tiers.

Figure 9 shows joy for individual participants and shared instances using 10-second partial interval recording during the 10-minute play session. Vicki and Maude showed low levels of enjoyment throughout baseline, demonstrating no trend and some variability. During intervention, levels of individual joy remained low; therefore, no change in level occurred, and overlap was evident between phases. Shared joy was at mid-range, variable with no apparent trend in baseline. During intervention, shared joy increased show in a change in level, minimal variability with some overlap with baseline responding. As joy was highly variable for most participants, a vertical analysis did not reveal any change in responding upon implementation of the intervention phase in tier two.

Dyad 3: Liz and Daisy

Figure 8 shows directed vocals and the accepting and giving of toys during the 10-minute play sessions for Daisy. In baseline, Daisy's directed vocals showed low steady responding with no trend and minimal variability. In intervention, Daisy's directed vocals were similar, with low responding, a slight increase in variability, no apparent change in level, and high overlap with baseline data. Daisy's acceptance and giving of toys were slightly below mid-range with no trend and some variability. During intervention, Daisy's toy behavior remained similar to baseline with some variability, no change in level, no

apparent trend, and high overlap with baseline. A vertical analysis revealed that upon implementation of intervention in tier three, no change in responding occurred for other tiers.

Figure 9 shows joy for individual participants and shared instances using 10 s. partial interval recording during the 10-minute play session. Liz and Daisy showed low levels of enjoyment throughout baseline, demonstrating no trend and minimal variability. During intervention, levels of individual joy remained low; therefore, no change in level occurred, and overlap was evident between phases. Shared joy was at the midway on y-axis, highly variable with no apparent trend in baseline. During intervention, shared joy increased, showing a change in level, some variability, and some overlap with baseline responding. As joy was highly variable for most participants, a vertical analysis did not reveal any change in responding upon implementation of the intervention in tier three.

Dyad 4: Gigi and Lucia

Figure 8 shows directed vocals and the accepting and giving of toys during the 10-minute play sessions for Lucia. In baseline, Lucia's directed vocals showed low responding with no trend and high variability. In intervention, Maude's directed vocals were similar, with low responding, high variability, no apparent change in level, and high overlap with baseline data. Lucia's acceptance and giving of toys were slightly below mid-range with no trend and some variability. During intervention, Lucia's toy behavior increased in responding with high variability, no change in level, no apparent trend, and high overlap with baseline. A vertical analysis revealed that upon implementation of intervention in tier two, no change in responding occurred for other tiers.

Figure 9 shows joy for individual participants and shared instances using 10 s. partial interval recording during the 10-minute play session. Gigi and Lucia showed low levels of enjoyment throughout baseline, demonstrating no trend or variability. During intervention, levels of individual joy remained low but increased to a slightly higher level, where they remained stable with minimal variability and only slight overlap with baseline data. Shared joy was at the midway point on the y-axis, highly variable with an increasing trend in baseline. During intervention, shared joy increased to show in a change in level, minimal variability with some overlap with baseline responding. As joy was highly variable for most participants, a vertical analysis did not reveal any change in responding upon implementation of the intervention in tier four.

Dyad 5: ***Kay and Derek***

Figure 8 shows directed vocals and the accepting and giving of toys during the 10-minute play sessions for Derek. In baseline, Derek's directed vocals showed mid-range, steady responding with no trend and some variability. In intervention, Derek's directed vocals were similar, with mid-range responding, some variability, no apparent change in level, and high overlap with baseline data. Derek's acceptance and giving of toys were at low levels, with no trend and some variability. During intervention, Derek's toy behavior remained steady with baseline responding with some variability, no change in level, no apparent trend, and high overlap with baseline. A vertical analysis revealed that upon implementation of intervention in tier five, no change in responding occurred for other tiers.

Figure 9 shows joy for individual participants and shared instances using 10-second partial interval recording during the 10-minute play session. Kay and Derek

showed low levels of enjoyment throughout baseline, demonstrating no trend and some variability. During intervention, levels of individual joy remained low and variable; therefore, no change in level occurred, and overlap was evident between phases. Shared joy was variable with an increasing trend in baseline. During intervention, shared joy remained high, showing a change in level and no variability. It should be noted that this Dyad reached 100% shared joy in sessions for the last two data points in baseline and remained at this level for the rest of the study. As joy was highly variable for most participants, especially for the participant remaining in the baseline phase, a vertical analysis did not reveal any change in responding upon implementation of the intervention in tier five.

Dyad 6: Maria and Allie

Figure 8 shows directed vocals and the accepting and giving of toys during the 10-minute play sessions for Allie. In baseline, Allie's directed vocals showed low responding with no trend and some variability. In intervention, Allie's directed vocals were similar, with low responding, some variability, no apparent change in level, and high overlap with baseline data. Allie's acceptance and giving of toys were showed low responding, no trend, and some variability. During intervention, Allie's toy behavior remained low with some variability, no change in level, no apparent trend, and overlap with baseline. A vertical analysis revealed that upon implementation of intervention in tier six, no similar change in responding occurred for other tiers.

Figure 9 shows joy for individual participants and shared instances using 10 s. partial interval recording during the 10-minute play session. Maria and Allie showed low levels of enjoyment throughout baseline, demonstrating no trend and slight variability.

During intervention, levels of individual joy remained low, with no change in level, and obvious overlap between phases. A trend increasing trend occurred for both Maria and Allie during the intervention phase. Shared joy was highly variable with no apparent trend in baseline. During intervention, shared joy increased, but due to high variability and overlap with baseline data, a change is level was difficult to identify. As with individual joy for this dyad, an increasing trend in shared joy was also identified during the intervention phase.

Non-Experimental Results

Parents were asked to complete two sets of child assessments and parent-focused questionnaires, one before the start of baseline and the second after the last intervention session. Table 11 presents the scores for pre- and post-intervention assessments and questionnaires.

Social Validity

Adapted TARF-R assessments were conducted at mid-point for two participants and post-intervention for all participants. Scores of treatment acceptability for midpoint averaged 4.4 (range = 3.8–5.0) and at post-intervention averaged 4.8 (range = 4.0-5.0). Scores on effectiveness for midpoint averaged 4.5 (range = 4.0-5.0) and at post-intervention averaged 4.8 (range = 4.0 – 5.0). Scores on disadvantages for midpoint averaged 1.5 (range = 1.0–2.0) and at post-intervention averaged 1.6 (range = 1.0–3.0). Scores on contextual fit was 5.0 and at post-intervention averaged 4.8 (range = 4.0-5.0).

Table 11

Non-Experimental Measure Outcomes: Child Assessments and Parent Questionnaires

Non-Experimental Measure	Participant											
	Bree/Jax Dyad 1		Vicki/Maude Dyad 2		Liz/Daisy Dyad 3		Gigi/Lucia Dyad 4		Kay/Derek Dyad 5		Maria/Allie Dyad 6	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Child Assessments												
BIS	---	---	---	0.6	---	2.8	---	0.2	---	2.1	---	1.6
RBS-EC	2.6	---	1.9	0.6	2.2	2.2	0.4	0.4	1.9	1.6	1.5	2.2
Scale I	2.6	---	2.8	1.1	2.6	2.0	0.4	0.7	1.6	1.7	3.0	2.8
Scale II	2.7	---	0.3	0.1	2.0	1.8	0.9	0.8	2.9	2.2	1.0	2.0
Scale III	2.9	---	3.3	0.9	2.9	2.3	0.1	0.0	2.1	2.0	2.0	3.9
Scale IV	2.1	---	1.3	0.1	1.6	2.3	0.0	0.0	0.6	0.3	0.0	0.0
M-CHAT- R/F	4	---	11	6	7	12	7	6	12	8	6	5
Parent Questionnaires												
PSI-4 SF												
Total Stress	123 96%	---	80 60%	62 28%	87 68%	93 74%	38 1%	37 1%	98 76%	94 74%	88 68%	108 84%
Parental distress	36 80%	---	34 76%	31 68%	24 46%	23 38%	12 2%	12 2%	45 98%	45 98%	34 76%	44 99%
Parent/ child dysfunctional interaction	33 82%	---	27 70%	14 14%	25 62%	28 72%	12 4%	12 4%	18 32%	15 18%	22 50%	23 54%
Difficult child	54 99%	---	19 18%	17 10%	38 86%	42 94%	14 4%	13 2%	35 78%	34 76%	32 70%	41 92%

Table 11 (continued)

Non-Experimental Measure	Participant											
	Bree/Jax Dyad 1		Vicki/Maude Dyad 2		Liz/Daisy Dyad 3		Gigi/Lucia Dyad 4		Kay/Derek Dyad 5		Maria/Allie Dyad 6	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Self-Efficacy for Parenting	243	---	250	300	255	272	308	318	249	249	258	231
Family Quality of Life	4.0		4.1	4.8	4.6	4.8	4.8	4.9	2.8	3.0	4.1	3.5
Family interaction	4.0	---	4.0	5.0	4.5	4.8	5.0	5.0	2.7	1.7	4.3	3.8
Parenting	4.3	---	4.3	4.8	4.8	4.8	5.0	5.0	4.0	4.5	4.2	4.2
Emotional well-being	3.5	---	3.3	4.4	4.3	4.5	3.8	4.5	1.3	1.3	2.8	1.8
Physical/ material well-being	4.0	---	4.5	4.8	4.4	5.0	5.0	5.0	3.0	3.8	5.0	4.8
Disability related support	3.8	---	4.0	4.6	5.0	5.0	5.0	5.0	2.5	3.8	3.8	2.0

Note. BIS score: 0 = no problem, 1 = very mild problem, 2 = mild problem, 3 = moderate problem, 4 = severe problem, 5 = very severe or extreme problem. RBS-EC Scale: I. Repetitive Motor, II. Ritual & Routine, III. Restricted Interests and Behavior, IV. Self-Directed Behavior. RBS-EC score: 0 = does not occur, 1 = occurs weekly or less, 2 = occurs several times a day, 3 = occurs about daily, 4 = occurs many times a day. M-CHAT-R/F: 0-2 = low risk, 3-7 = moderate risk, 8-20 = high risk. Family Quality of Life Scale: 1 = very dissatisfied, 2 = dissatisfied, 3 = neither, 4 = satisfied, 5 = very satisfied. PSI-4SF: total stress, parental distress, difficult child: 15-80% = typical stress, 81-89% = high stress, 90-100% = clinically significant stress. Parent-child dysfunctional interaction: 15-80% = typical stress, 81-84% = high stress, 85-100% = clinically significant stress. Self-Efficacy: average score = 267 range = [210-308]. See discussion for more details about scale results.

Telehealth Social Validity. Social validity assessments specific to telehealth procedures were conducted post-intervention. Scores for treatment acceptability averaged 4.4 (range = 4.0–4.8). Scores on effectiveness averaged 4.7 (range 4.0–5.0). Scores on disadvantages averaged 1.9 (range 1.0–3.5). Scores for contextual fit averaged 4.5 (range = 4.0–4.6). Table 12 summarizes social validity and telehealth social validity ratings.

COVID-19 Questionnaire. Due to the overwhelming impact of the novel, Coronavirus pandemic, an additional questionnaire was included as a post-measure (See Appendix K for COVID-19 Questionnaire). Table 13 summarizes responses across participants as to the impact of the virus on their families.

Table 12

Social Validity and Telehealth Social Validity Ratings by Participant

	Participant				
Category and Administration	Vicki Dyad 2	Liz Dyad 3	Gigi Dyad 4	Kay Dyad 5	Maria Dyad 6
Acceptability					
Social Validity: Mid[a]	NA	3.8	5.0	NA	NA
Social Validity: Post[a]	5.0	4.0	5.0	5.0	5.0
Telehealth Social Validity[b]	4.8	4.0	4.25	4.0	5.0
Effectiveness					
Social Validity: Mid[a]	NA	4.0	5.0	NA	NA
Social Validity: Post[a]	5.0	4.0	5.0	5.0	5.0
Telehealth Social Validity[b]	4.5	4.0	5.0	5.0	5.0
Disadvantages					
Social Validity: Mid[a]	NA	2.0	1.0	NA	NA
Social Validity: Post[a]	1.0	2.0	1.0	3.0	1.0
Telehealth Social Validity[b]	2.0	2.0	1.0	3.5	1.0
Contextual Fit					
Social Validity: Mid[a]	NA	5.0	5.0	NA	NA
Social Validity: Post[a]	5.0	4.0	5.0	5.0	5.0
Telehealth Social Validity[b]	4.0	4.0	5.0	4.6	5.0

Note. Only 2 participants returned their social validity form at mid-intervention. Acceptability: [a] = 1, 2, 3, 4, 8; [b]= 1, 2, 3, 4. Effectiveness: [a] = 5, 7; [b] = 7, 13; Disadvantages: [a] = 6; [b] = 5, 11; Contextual Fit: [a] = 9; [b] = 9, 10, 12, 14, 10[a]. 1 = strongly disagree, 3 = neither disagree/agree, 5 = strongly agree. Higher numbers are more favorable with the exception of disadvantages where lower numbers are more favorable.

Table 13

COVID-19 Stressor Survey Results

Questions	Participant				
	Vicki Dyad 2	Liz Dyad 3	Gigi Dyad 4	Kay Dyad 5	Maria Dyad 6
Experiences					
Became ill from possible or certain exposure to the coronavirus	3	3	3	3	3
Hospitalized from exposure to the coronavirus	3	3	3	3	3
Job requires possible exposure to the coronavirus	1	1	3	2	3
Lost job or lost income due to coronavirus	1	3	3	1, 2	1
Increased responsibilities at home due to coronavirus	1	1	1	1	1
Difficulty getting food, medication, important medical procedures or other necessities due to coronavirus	3	3	3	3	1
Difficulties					
Getting social support[a]	C	B	A	D	E
Time exposed to information[b]	B	E	B	D	E
Overall distress[c]	C	C	B	D	D

Note. Experiences: 1 = happened to me; 2 = happened to someone close to me; 3 = doesn't apply to me. Difficulties: social support[a]: A = no difficulty; B = little difficulty; C = some difficulty; D = a lot of difficulty; E = extreme difficulty. Information[b]: A = none; B = less than an hour; C = about an hour; D = one to two hours; E = more than two hours. Distress[c]: A = none; B = little; C = some; D = a lot; E = extreme.

CHAPTER IV

DISCUSSION

This study evaluated the impact of a caregiver-mediated intervention package delivery via telehealth coaching on child flexibility for children on a waitlist for an autism diagnosis. This study had two primary aims. First, determine if this intervention package would affect the amount of parent strategy use and what strategies were most and least acceptable to caregivers. The second aim was to determine if the intervention package impacted child inflexibility (i.e., HO-RRBIs) and flexibility during play, and if so, to what extent. Secondary aims included (a) if the intervention package impacted other child characteristics (i.e., directed vocals, accepting or giving toys) and characteristics for both child and parent (i.e., individual and shared joy); (b) if participation in the study impacted caregiver stress, sense of efficacy, and quality of life; and (c) if the intervention package and mode of delivery (i.e., telehealth) were acceptable to the parents. In this chapter, the findings and directions for future research are presented. Limitations of the study are discussed.

Summary and Interpretation of Results

This study was designed to answer several research questions. The first four questions were experimental and were answered using the concurrent multiple-baseline across six dyads, 5 of whom completed the study. The remaining questions were non-experimental, which were answered using parent questionnaires and child assessments.

Research Question One

Is there a functional relation between the caregiver-implemented treatment package and an increase in the caregiver's strategy use (i.e., modeling, prompting, differential reinforcement of appropriate behavior, and response interruption and redirection)?

All participants increased their strategy use during the intervention. Three caregivers demonstrated an immediacy of change, while the other two demonstrated an increase in the third intervention session. All parent participants demonstrated a strong basic effect between the effect of the treatment package taught during the intervention and their frequency of strategy use. The most frequently used strategy sequence was Sequence A (i.e., model, wait, reinforce). The most challenging strategy sequence step (i.e., the one most frequently missed by parents) was reinforcement. All parent participants used 13 (range = 13-20) or more strategy sequences in the last two sessions showing increase overtime.

Key Points.

Chosen Strategies. The number of strategy sequences used by parents increased throughout the study; however, not all strategies were used in equal amounts. Sequence A, which included a model, five-second time delay, and a reinforcer, was the most frequently used sequence by far. Lesson plans for each of the fifteen sessions evenly distributed initial instruction on strategies ensuring each area was addressed (i.e., environmental arrangement, modeling, prompting, differential reinforcement, and RIRD), and further coaching was provided based on individual child behavior. Each intervention session began with a reminder of strategy use specific to previous behaviors observed (e.g., highlights from previous coaching sessions). Following this brief introduction, data collection occurred during parent/child play sessions with no instruction from the interventionist. Once this 10-minute data collection was complete, coaching occurred to address incorrect strategy choice concerning child behavior, correct use of strategies, and areas of strength during interactions. Because coaching occurred post-data collection,

parents ultimately had a choice of which strategies to implement. For example, RIRD was recorded as only occurring one time during play in a correct sequence (i.e., during a play session with Gigi and Lucia). It is possible that the sequence was attempted but incomplete and, therefore, was an unknown attempt. Another possibility was that sequence D (i.e., RIRD) should have been used more frequently, but may have been unappealing to parents. In the midpoint social validity questionnaire, Gigi wrote:

> Modeling, prompting, and reinforcement are working best and are the most comfortable. I think if you keep using these methods, they will become second nature to the parent and child, making it a routine. Interruption and redirection are the least comfortable.

It is unknown if the high frequency of sequence A was due to parent preference, appropriateness of sequence choice, or ease of implementation. Taking into consideration the feedback on the social validity questionnaires, all parents indicated a preference for modeling, prompting, and reinforcement. Further analysis of videos to determine a match between parent strategy choice and child behavior should occur. While the interventionist took care to respond to appropriate matching of parent strategy sequence and child behavior during coaching, data was not collected on this specifically. As recommended by past research, this intervention used *the least* intrusive mode first, (i.e., sequence A, modeling), and graduated to the *most* guidance, (i.e., sequence D, RIRD), based on the child's behavioral needs (Quigley et al., 2018; Ulke-Kurcuoglu, 2015). As data collection occurred during playtime, the majority of the interactions between child and parent should be least intrusive, maintaining a supportive and positive play environment (Nijhof et al., 2018). If this intervention was conducted during routines that required more parent

directives, such as toileting or clean-up, other strategies might have been necessary for task completion and thus used more often.

Environmental Arrangement. Environmental arrangement was one of the strategies introduced and discussed throughout intervention sessions. Emphasis on the importance of setting up the emotional and physical environment occurred during discussions between the interventionist and parent, in written information in the parent notebooks, and by watching an instructional video. The arrangement of the environment often occurred before the start of a session (e.g., bringing out certain toys, turning off the television). It, therefore, was not tallied for frequency as it could happen before, once, or several times during a session with equal effectiveness. Parents arranged their play environment based on individual needs and available space. Some examples include: (a) Liz created small play spaces for her and Daisy to use during the session, (b) Gigi set out certain toys on the table for Lucia to choose from, (c) Kay's play space organization evolved through the course of the study as she spent time organizing toys since the family was home all day due to COVID-19.

Parent Fidelity. Reinforcement was the most commonly missed step by the parent participants during intervention phases. Once the interventionist used coaching to address this strategy, most of the participants learned to use social or object reinforcement quickly, resulting in a decrease in missed steps as intervention progressed. However, the severity of child delay and high levels of parent stress may have impacted the use of positive parenting techniques (e.g., reinforcement) (Eisenhower et al., 2009). For Liz and Daisy, reinforcement was missed more than twice as many times as other participants during the intervention phase. Daisy was the only participant with multiple

diagnoses at the start of the study, where all other child participants had a developmental or speech delay. During the study, Daisy had two hospitalizations (one for the flu and another for multiple seizures). Liz also underwent surgery herself, endured a sprained ankle, and changed jobs twice. It is possible that due to Liz's life stressors combined with Daisy's multiple diagnoses, reinforcement (e.g., positive praise) was difficult to maintain.

In contrast, Maria missed the least amount of reinforcement opportunities during sequence steps and used reinforcing words freely with Allie during intervention play sessions. Allie had a diagnosis of a developmental delay, which Mom described as mild. Maria was married and considered herself financially stable, which may act as protective factors for parenting stress and allow for more positive parenting practices.

Research Question Two

Is there a functional relation between the caregiver-implemented treatment package and child's flexible and inflexible behavior during play?

Research question two used measures of child behavior in 10-second intervals during baseline and intervention for 10-minute play sessions with their parent. During the intervention, the parent received coaching and feedback from the interventionist. All child participants demonstrated a decrease in inflexible behavior and an increase in flexible behavior during the implementation of the treatment package. For four of the five participants, a strong basic effect was identified between the use of the treatment package and increased flexible behavior during play. Daisy was the exception, a weak basic effect between the intervention and her flexible behavior during play. Daisy demonstrated the highest levels of flexible play in comparison to the other children in the study. Although

her flexible behavior demonstrated an increasing trend, it was highly variable and frequently overlapped with her baseline performance.

Key Points.

Play Behaviors. The intervention was set to target inflexible and flexible behaviors in children during playtime with a parent. While the setting for the intervention was during play, skills specific to play were not taught to the child or the parent. Similarly, neither play diversity, nor the change in the development of play skills were measured. It was likely that the child participants would engage in the early stages of play based on development and age. Baseline sessions allowed the interventionist to observe the child's play level and assess the match of the toys provided and the child's level of engagement. These observations also allowed the interventionist to identify individual coaching areas for each dyad. The parent's perception of their child's ability to engage during play may have impacted the frequency of the parent's strategies during sessions. Specifically, the children with lower engagement may have required more prompting with less ability to respond to models during play.

Conversely, a more capable player could increase flexibility with the least intrusive sequence. The dyad with the highest levels of play engagement was Derek and Kay, which likely had to do with Kay's background as a preschool teacher. Despite their experience of playing together, both child and parent data demonstrated a strong basic effect with the implementation of the intervention. Kay's initial assessment of Derek's HO-RRBIs was in the problematic range of 3s and 4s on the RBS-EC; however, Derek responded to Kay's change in interaction. For example, during intervention session 8, both dyad participants had high levels of responding: Kay used sixteen sequences, and

Derek used flexible behavior in 72% of the sessions and inflexible behaviors in only 5% of the sessions. Anecdotally, after that session, for the first time, he declined the transition to watch his favorite television show, choosing play over a restrictive interest, television. He said to Kay, "Let's keep playing!" She looked at the computer and said, "Wow! I feel like I have a real play partner now."

Research has demonstrated that RRBIs frequently occur for toddler-aged children with ASD during play and have explored some areas of play diversity in clinical and classroom settings (Harrop et al., 2014). For example, Frey and Kaiser (2011) measured the diversity of object play by teaching imitation and modeling skills. Hanley and colleagues (2013) used embedded reinforcement to influence the preference of classroom play activities for preschool-aged children. Several studies used lag schedules of reinforcement to increase the variety of play in classroom settings (e.g., Silbaugh et al., 2020; Dracobly et al., 2017; Galizio et al., 2020; Radley et al., 2018). Yet, measuring play diversity under natural contingencies is less studied in behavior analytic research. Using natural play environments (i.e., in the home or community settings) allows for the identification of child and parent characteristics and active ingredients necessary to promote play diversity in toddlers at risk for ASD. Future research should include the measurement of flexible and inflexible behaviors as well as play diversity as supported by strategy sequences used in this study.

Toys. Materials chosen for the play kit were based on the materials used in *SPACE* (Shire et al., 2018). SPACE uses toys that offer various play options for many different levels of play skill levels and address multiple interests. Child participants showed a high preference for some materials over others; however, this preference

allowed the child's play behaviors to emerge. Maude often chose the large building blocks. Her play with blocks during baseline was limited to repetitive throwing. During the intervention phase, once Mom began to use the strategies, throwing emerged to building with the blocks, using multiple colors in various shaped towers. Purposeful interruptions were eventually not met with frustration, but instead resulted in eye contact and new actions that had not been used in previous play sessions.

Similarly, Derek lined up the Velcro cookies and counted them repetitively during baseline. During the intervention phase, Derek took turns baking with the cookies and giving bites to Kay and other characters in the play area. By offering novel toys mixed with the child's familiar toys, children were able to demonstrate their usual inflexible behaviors and the emergence of flexible behaviors with the same toys as the study progressed.

Research Question 3

Is there a functional relation between parent strategy use and the child's inflexible and flexible behaviors during play?

As answered in Research Question 2 and Research Question 3, both parent strategy use and flexible child behaviors during play increased while inflexible behavior decreased. On average, all parent participants used the highest cumulative number of strategy sequences during the last five sessions of the intervention condition. Similarly, on average, all child participants demonstrated their highest levels of flexible behaviors and lowest inflexible behaviors during the last five play sessions of the intervention condition.

Key Points.

Strategy Discrimination. Although behavior plans outlined parent strategy use for individual RRBIs, the protocol for strategy use remained the same for all participants: start with *least intrusive and graduate to the most directive.* At intervention session six, Vicki shared, "I never thought I'd see so many changes so fast" when Maude imitated several behaviors that Vicki demonstrated in session. Maude continued to progress as Vicki used strategies; however, there were incidences where Vicki used Sequence C, which introduced the prompt more frequently when a model may have previously been enough support to promote her flexibility. This observation led to the instruction of *avoiding prompt dependency* and revisiting the importance of starting with the model (see Appendix L). Coaching on how to avoid prompt dependency as well as fading procedures for parent strategy use should be included in the intervention package for future research.

Generalization and maintenance. Due to timing, generalization and maintenance were not programmed within this intervention. Using the strategies to attend to other routines and behaviors were discussed; however, these additional routines were not observed or measured. While planning for generalization and maintenance is recommended, the current study successfully demonstrated the feasibility and usability of strategy sequences during play. Future research should explore strategy use in other routines and fidelity over time; for example, the generalization of strategy use to multiple caregivers, across routines, and across behavioral topographies, which include a functional behavior assessment.

Research Question 4

Is there a functional relation between the caregiver-implemented treatment package and the following non-targeted outcomes (a) an increase in directed vocalizations by the child, (b) an increase in acceptance or giving of toys by the child, and (c) an increase in child, parent, and shared joy?

These three distal outcomes were chosen based on their influence in identifying signs of ASD during diagnostic assessments (i.e., ADOS; Lord, Rutte, et al., 2012; Lord, Luyster et al., 2012). Each non-targeted outcome was presented during intervention session one and was not addressed in coaching by the interventionist at any later time. In an attempt to determine if the intervention package might influence ASD symptomology beyond certain HO-RRBIs, directed vocalizations, accepting or giving toys, and joy was also measured by 10-second intervals during the 10-minute play sessions during baseline and intervention. The results do not support this outcome. Minimal to no change was identified for any of the child participants in the directed vocalization or accepting or giving toys. Joy remained low for all participants throughout the study. Shared joy increased during intervention for all participants; however, the number of joyful intervals remained low.

Key Points.

Focus on HO-RRBIs. When comparing target behavior of intervention programs for young children with ASD, behaviors which fall into the social communication category are more often chosen to be the focus (Harrop, 2015). This intervention package targets HO-RRBIs and, more specifically, inflexibility in pre-diagnosed toddlers. It was necessary to measure as possible carry-over effects into behaviors categorized as

communication (i.e., directed vocalizations) and social (i.e., accepting or giving toys and shared joy) behaviors. Results demonstrated that parent strategies used here did not carry over to non-targeted behaviors. That is, providing effective intervention pre-diagnosis is unlikely to mask autism behaviors overall. To further this point, other behaviors that could typically represent autistic behaviors were not a focus during intervention unless they were interfering and preventing engagement between the parent and child during play. For example, LO-RRBIs was not an area of focus as these behaviors may (a) disappear as a child grows (e.g., around age three; Honey et al., 2007; Welsh et al., 2019); (b) provide additional support for a child not apparent to an observer (e.g., anxiety reduction; Kapp et al., 2019; Lidstone et al., 2014), and (c) not always interfere with play (McLaughlin & Fleury, 2020).

While studies have shown more lengthy intervention (e.g., > 20 hours per week) to change developmental trajectories for young children with ASD, small-dosed interventions, as presented here, can make changes in behavior but are not intense enough to impact overall development (Sandbank et al., 2020). Future research could measure intervention programs that focus on RRBIs in combination with intervention components that focus on social communication to test both dosage and variation of technologies for behavior change. Combining both types of target behaviors into one package is especially noteworthy, as there are limited intervention packages that focus on RRBIs for this age group (Harrop, 2015; Lin, 2020; Lin & Koegel, 2018).

Research Question Five

Following the treatment package, is there a decrease in the caregiver's level of stress?

Parent stress was measured using PSI-4 short form, 4th Edition (PSI-4; Abidin, 2012). Stress scores decreased or remained at very low levels between pre- and post-intervention measurements for Vicki and Gigi. Liz increased her stress score in three areas, while Kay stayed at the same high level in one area. Maria increased her stress in all areas.

Liz increased in stress between pre- and post-measurement for all categories except *parental stress*. Yet, her scores remained within the typical stress range except for *difficult child*, which was in the high range at pre-intervention and increased to clinically significant levels at post-intervention. The reason for the increase in her *difficult child* score is unknown. However, during the intervention, Liz did return to work, requiring her to work night-shifts often. This change in schedule may have contributed to an increase in challenging behavior at home. In a systematic review by Shalev and colleagues (2020), the authors identified stress, economic status, and autism characteristics with less significant outcomes in a parent-mediated early intervention. Liz and Daisy were the only dyad with medium effects in child outcomes and an increase in stress. Although Daisy did not receive an autism diagnosis, per Liz's report, Daisy's behavior was a strong contributor to her stress (e.g., score in *difficult child* area).

Kay scored in the clinically significant range for *parental distress* at both pre- and post- measurement. Kay's parenting responsibilities included caring for her baby as well as Derek while her husband worked swing shifts, thus potentially contributing to her high levels of stress.

Maria scored within the typical stress for all areas at pre-intervention. In the post-intervention measure, Maria increased her *total stress* to high stress. She increased both

parental distress and *difficult child* to clinical levels of stress. It is unknown precisely why these scores increased quite dramatically between per- and post- measurement. Maria cared for both Allie and a second daughter, Allie's twin sister. Under usual circumstances, both girls were in full-day preschool; however, due to COVID-19 stay-at-home orders, the girls were now home full-time, which likely contributed to Maria's stress. During intervention conversations, Maria shared she felt guilty that she didn't realize how differently Allie was developing in comparison to her sister. She shared she was pleased with the progress Allie was making during the sessions, yet, she wished someone had shown her the importance of playing and interacting a long time ago. Maria also requested referrals for mental health support during the time of the study.

Total stress and *difficult child* percentile scores for Bree also scored within the clinically significant range at pre-intervention. Due to attrition, no post-scores were available. It is possible that Bree's high levels of stress combined with other life circumstances led to her attrition from participation in the study.

Future research should measure parent characteristics to identify their relationships with both parent and child outcomes as well as retention of participants from vulnerable populations.

Research Question Six

Following the treatment package, is there an increase in self-efficacy and quality of life as a caregiver?

Parent self-efficacy was measured using Parenting Tasks Index – Toddler Scale (Coleman & Hildebrandt Karraker, 2003). Scores for all parents increased between pre- and post-measurement except for Maria, whose scores decreased. All scores were within

the average range of responding except Gigi, who responded above average in pre-intervention.

Parent quality of life was measured using the Family Quality of Life Questionnaire (Hu et al., 2011). The overall quality of life scores between pre- and post-measures demonstrated an increase in quality of life for all participants except Maria. The scale contains five sub-scales, including: (a) family interaction, (b) parenting, (c) emotional well-being, (d) physical/material well-being, and (e) disability-related support.

Despite an increase for most participants, Kay's and Maria's scores remained the lowest on the quality of life scale. On sub-scale *family interaction*, Kay's score decreased by one point resulting in a rating close to less than satisfied on the post-test; her scores increased in parenting and disability support. Maria's score on disability support decreased to the lowest in the group on the post-measure. Maria wrote that it would be helpful to her to find a therapist that can help her and Allie continue to play and learn at the same time. She shared her disappointment with adequate services for her daughter.

The scores on the emotional well-being sub-scale were the lowest scores for all participants in both pre- and post-measurement. As past research suggests that parenting a child with special needs is stressful (Shalev et al., 2020), this sample of parents echoes these findings with scores ranging from 1.3 to 4.5. This sub-scale included questions around relieving stress, having supportive friends, free time, and respite care.

Research Question Seven

Following the treatment package, is there a change in parent-reported autism symptomology and restricted and repetitive behaviors?

Parent Scores on M-CHAT-R/F. All participants scored within the moderate to the severe range for ASD on the M-CHAT-R/F (Robins et al., 2009) at pre-intervention. Vicki decreased in her core of Maude's behavior in post-intervention despite her having received an autism diagnosis. Liz increased her score for Daisy in post-intervention despite Daisy not receiving a diagnosis of ASD during her diagnostic visit. Past research has shown that the M-CHAT-R/F is not always accurate in identifying ASD, but does tend to identify developmental delay (Guthrie et al., 2019).

Parent-Reported HO-RRBIs. All participants demonstrated decreased inflexible behavior during play sessions. Participants had similar ratings on the RBS-EC (Wolff et al., 2016) used to identify individual behaviors of focus and create intervention plans based on these behaviors. The RBS-EC was used as a pre- and post-measure resulting in some variation between the two time points. Parents likely reported on their child's behavior overall, throughout the day and during various routines. While the study merely reported on the child's behaviors during observed parent-child play. Therefore, it is essential to highlight that the data from this study demonstrates changes in child flexibility only during play. At the same time, the assessments completed by the parent may represent a much broader picture of the child's behavior. It is recommended that future research consider the routines in which the majority of inflexible behavior occurs and build coaching sessions around these routines to target the highest areas of need for the family.

The BIS (Boyd et al., 2018) was used as a post-measure only. Unlike the RBS-EC, which provides four sub-scale scores in differing areas of RRBIs, the BIS offers an overall inflexibility factor. This factor was below three for all participants. In the

development of the BIS, it was intended for children aged three and up. For consistency with other scales measuring RRBIs, BIS scores were initially compared to the RBS-R, also intended for an older sub-set of children. With permission from the first author of the BIS, it was recommended that the scale be used in the current study despite participants being under three-years-old. Outcomes demonstrate similar inflexibility scores to the overall score of the RBS-EC and the BIS at post-intervention for each participant. As the comparison between the BIS and RBS-EC has not been shown elsewhere, conclusions are cautioned.

Research Question Eight

Do caregivers perceive this intervention as

(a) worth the time and effort,

(b) positively affecting their child's development and their family life,

(c) strategies to be used over time within their family, and

(d) something that they would suggest to other families?

Social Validity. Parents rated the overall social validity of the intervention experience at post-intervention as having a good contextual fit (M = 4.8; range = 4.0 – 5.0), to be acceptable (M = 4.8; range = 4.0 -5.0), and effective (M= 4.8; range = 4.0 -5.0) where high numbers correspond with high satisfaction. For disadvantages, (M = 1.6; range = 1.0 – 3.0) where low number corresponds with high satisfaction. At the end of intervention session 15, Kay shared:

> This intervention is wonderful and working with you too.
>
> You are going to change a lot of lives with this work.

There were four open-ended questions on the social validity questionnaire and one comment section for telehealth social validity. Answers for these questions are summarized as follows.

Social Validity Question 1: *In reference to inflexible behaviors, are the strategies used successful in addressing these behaviors?* Vicki said arranging the environment and redirecting attention were the most effective ways to address behaviors. Liz answered this question as yes because the strategies helped the behaviors clam down. Kay shared the Derek had a great response to playing with her, and he began to act differently during these playtimes. Maria said this intervention turns interfering behaviors into a learning experience.

Social Validity Question 2. *Of the strategies used, which are you most comfortable using? Least comfortable using?* For Kay, it was least comfortable to just play versus providing guidance. Gigi shared that the model, wait, and reinforce sequence was the best strategy sequence for her. She said she was least comfortable using interruption.

Social Validity Question 3. *What is working best for your child?* For Kay, this was prompting and waiting. For Liz, combining reinforcement with play was most impactful on her child's behavior. Gigi shared modeling and prompting with reinforcement was most comfortable and most impactful. Vicki said modeling was the most impactful in changing Maude's behavior. Maria shared that playtime between her and Allie was the best part.

Social Validity Question 4. *In what way would you find it helpful to transition from the services provided as part of this research project to services your child will*

receive following diagnosis? For Kay, it would have been helpful to label materials in containers for easier access. Liz said he hoped to be able to keep the same schedule of playing with Daisy and using the strategies. She would like to be able to do it every day. Gigi said she hoped to continue using the same strategies she learned during the intervention. Vicki said:

> I believe this intervention has helped me as a parent discover ways to communicate, play, and show Maude new things as we learn together.

Utility of Telehealth. Parents rated the overall telehealth utility at post-intervention as having a good contextual fit (M = 4.2; range = 4.0 – 4.6), to be acceptable (M = 4.3; range = 4.0 -4.8), and effective (M= 4.5; rang =e 4.0 -5.0) where high numbers correspond with high satisfaction. For disadvantages, (M = 3.0; range = 2.0 – 3.5) where low number corresponds with high satisfaction. On average, six sessions per participant dyad, 32% of sessions overall, were rescheduled. Because the sessions were virtual (i.e., not requiring additional travel), the amount of time and money saved due to canceled sessions is potentially high. Each telehealth social validity questionnaire included a comment section summarized and discussed here.

The telehealth platform used at the start of the study was Vsee. Due to COVID-19, the Vsee changed policies requiring paid membership. At the same time, the University of Oregon made Zoom available for research use at no additional cost. A change in the telehealth platform from Vsee to Zoom occurred early during intervention for most participants. This change required some training on the part of the interventionist with each parent as the platforms ran slightly different. For example, Vsee

allowed the interventionist to call the participant on their receiving device resulting in a ring or beep, which acted as a reminder that it was time to meet.

In contrast, zoom required a login to a meeting room online, which had to be initiated by the parent. While a reminder could be sent via text or put on a virtual calendar, the response effort required to log into zoom was higher than it was for Vsee. Kay shared that using Zoom was more difficult than Vsee, but having a flexible interventionist was helpful.

Vicki found that using telehealth was sometimes disruptive as she is a single mother with two young children and a dog, which sometimes led to chaos. She also shared that face-to-face intervention creates a more in-depth experience for her. Vicki shared concerns of time and energy in teaching her child while being coached via telehealth. She shared her desire to have other professionals as the one intervening face to face. Past research had demonstrated similar efficacy and acceptability when parents were given the choice of face-to-face and early online intervention (DuPaul et al., 2018). While this research project was begun when telehealth was a choice, mid-way through the study, all services were forced only to occur virtually or not at all unless they were deemed as essential health services (Rodriguez, 2020). Thus, instead of only one online meeting or service being delivered online, virtual meetings expanded to the majority, replacing all face-to-face interactions, resulting in hours online each day. Future research should consider the role of choice and satiation in the mode of service delivery on efficacy and acceptability.

Gigi was cautious of participation in the study because it was telehealth. She shared her discomfort with computers and said she preferred face to face meetings. In her comments at the end of the study, Gigi wrote:

> It was a great experience and I enjoyed trying something new. The experience was successful.

Gigi also rated the option of returning to face to face instead of telehealth as neutral, demonstrating her willingness to participate in either type of delivery mode.

Equity of resources is also a consideration for future research. One participant, Bree, was loaned equipment for the study (i.e., laptop, headset, external camera, wifi booster, USB port, and 4-port mini-hub). Although Bree did not participate in post-intervention feedback, it should be noted that she had a very weak internet signal. She was sent additional resources (wi-fi booster) but was unable to install it due to her living situation. It is possible that her weak internet connection contributed to her attrition. Without adequate support, connection and equipment, telehealth can be frustrating and widen the gap between those who are resourced and those who are not.

COVID-19 questionnaire.

Open-ended comments related to COVID-19 include the following:

- Vicki, who was furloughed due to virus, shared concerns about maintaining a source of income for her family.
- Liz had a concern about limiting visitors due to an auto-immune compromised child.
- Maria shared her concern that life will be completely different due to social distancing because of the virus.

- Gigi said because of the virus, she has learned to be patient, flexible, and take care of her family to keep them safe.

Future research should consider the impact of uncontrollable circumstances requiring telehealth as the mode of communication to decrease the likelihood of undue stress and breaks in early intervention services. Streamlining service delivery to families with limited internet conductivity is essential, especially in uncertain times as the COVID-19 pandemic. Due to the shelter-in-place orders as a result of COVID-19, additional feedback was saught to describe individual experiences of families. No families reported becoming ill from the virus. Effects of the virus include changes in childcare, loss of pay due to furloughed employment, change in scheduling, and canceled therapy. Four of the six participants had their diagnostic appointment canceled and rescheduled as a virtual appointment. These cancellations resulted in wait time for an additional two months beyond their already lengthy wait times of five to eighteen months.

Limitations

ASD Assessments. Several limitations are worth mentioning. There was no overall measure for ASD symptomology beyond screening with the M-CHAT-R/F (Robins et al., 2009). Future research should consider a more thorough screener to better identify child behavior as related to ASD (e.g., parent-mediated STAT; Stone et al., 2000) with virtual coaching. Using a tool such as the ADOS Toddler Module and Module 1 (Lord, Luyster et al., 2012; Lord, Rutter et al., 2012) would have provided a baseline for severity, which should be used to inform intervention support and, in turn, the amount of support necessary for the parent to be a successful mediator. The implementation of

these tools requires specialized training, which most community-providers lack. Thus, implementing the intervention package without a full assessment was more likely to represent the real-life scenario for family, and early intervention requires. The time and money associated with training and implementing such assessments would exceed the necessary cost to implement an effective intervention.

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Early Intervention Providers. The interventionist did plan for carryover to other professionals serving the participating families. While meetings occurred with EI providers for Daisy, Allie, and Lucia, there was minimal interest in additional support beyond an informational meeting on the part of the EI providers. An additional intervention component to address continued support to the families beyond intervention is recommended for future practice. An area of continued support could be navigating

medical, educational, and behavioral health agencies and professionals. Parents in this study were recipients of non-research-based advice on behavioral strategies from well-meaning providers. For example, a healthcare provider suggested that one parent bite their child back in response to their child biting. A suggestion to use the "time-out chair" without identification of behavior function is a second example of misinformation provided to families. While the American Academy of Pediatrics recommends the use of scientifically supported and evidence-based interventions (e.g., applied behavior analysis), this governing board recognizes the variation of availability of such services based on region (Hyman et al., 2020). The academy also highlights the need for pediatric providers to be educated on the effectiveness of interventions for children with ASD (Hyman et al., 2020). Assistance from skilled professionals, especially when families are incredibly vulnerable (pre- and newly diagnosed), can assist in navigating the path to effective interventions. For example, the Early Social Interaction model (Wetherby et al., 2014) and navigating autism by offering online introductory courses for parents (e.g., *About Autism in Toddlers* and *Seamless Path for Families*) begin to address this gap in family support (Wetherby et al., 2018).

Measures. The measures used here are designed to identify RRBIs based on parent report. Both the RBS-EC and BIS demonstrated similar outcomes in their behavior findings, despite their unestablished reliability with children under 3 for the BIS and unintended use to identify target behaviors by ranked order of severity. Future research should work toward establishing the reliability of these and related measures with toddler aged children considering identification of ASD is conceivable before age 3. Additionally, measures that are intended to identify behaviors of inflexibility and other

RRBIs specific for intervention targets should be established for both research and clinical practices.

Future research should include a preference assessment to establish a preferred means of reinforcement. While the strategies used in this study included social praise and access to objects and toys, it is unknown if these were highly preferred interactions by the child participants. Other types of reinforcement may have produced faster behavior change and been more useful for particular dyads.

Implications for Research and Practice

Diagnosis

Autism prevalence is now at an astonishing 1 in 54 children and is diagnosed four times as often in boys than girls (Maenner et al., 2020). Some speculation of why these numbers are lower for girls includes the hypothesis of diagnostic tests normed for boys, differing traits in girls with autism often missed during diagnostic testing, and autism commonly thought of as a *male condition* (Happe & Frith, 2020). Recent research found minimal differences in diagnostic tools when comparing outcomes for boys and girls; however, minimum differences include the finding of less severe repetitive behaviors in girls (Kaat et al., 2020; Ratto et al., 2018).

There were four girls and one boy who completed the present study. Of the four girls, Daisy and Maude both received virtual diagnosis visits during the study. The virtual assessment resulted in a diagnosis of autism for Maude. Daisy did not receive a diagnosis but was asked to return for a three-month, in-person follow-up visit. M-CHAT-R/F scores for both girls were within the moderate range, and per-parent report demonstrated signs

of autism. The developmental-behavioral pediatrician with expertise in diagnosing autism in young children described both girls as having autistic traits.

Future research should investigate the issues of diagnostic assessments for girls at risk for ASD. First, professionals must identify their potential bias toward ASD traits as more frequent in males. The historical perspective of what autism looks like may have created a bias toward defining ASD by more evident social communication deficits (often found in boys) rather than considering less obvious social deficits (often found in girls). Girls who receive diagnoses often have higher severity scores, raising the question of girls with less obvious impairments being missed during the diagnostic assessment (Wallis et al., 2020).

Second, a better understanding of the range in restrictive and repetitive behaviors for girls demonstrating autistic traits is necessary. Specifically, greater exploration of the potential that autism may present as muted social deficits with minimal restrictive interests and repetitive behaviors for girls (Wallis et al., 2020). This difference in the manifestation of social exchanges could impact diagnosis at an early age for girls as although social exchanges within the family context may be frequent, engagement outside of the family may not be established yet. Thus limited exposure to others may mask social deficits and autistic behaviors. It is likely, however, once in a social situation, these difficulties will become more evident in both boys and girls. Therefore, while early diagnosis is the best route to getting ASD specific early intervention, diagnosis at a later age for some may be more accurate and more easily identifiable. Changes in developmental trajectory longitudinally speak to the importance of follow-up visits, taking stock in parent reports, and assessments with direct observation.

Finally, the reliability of virtual diagnosis visits must be better established. The use of telehealth to conduct medical assessments, appointments, and virtual intervention visits are becoming more common (Dahiya et al., 2020; Hyman et al., 2020). Although virtual screenings to identify at-risk children have increased in popularity (Thabtah, 2019), virtual assessments for diagnosing autism are less common (Barbaro & Yaari, 2020). Children with more severe autism traits can likely be identified via virtual visits; however, traits that are more nuanced (e.g., characteristics often associated with girls) can be missed resulting in a higher risk of false-negative outcomes. Consequently, overcompensation for missed information can result in a higher number of false-positive outcomes. The wait time for a diagnostic visit is too long for families, and virtual visits are one way to address this demand to assess a child sooner, although minimal research exits in the effectiveness (Dahiya et al., 2020; Smith et al., 2017). The effectiveness of virtual visits must be an area that researchers investigate to ensure reliability, usability, and accuracy of outcomes.

Intervention

Interventions that focus on social communication in toddler aged children with ASD are established in early intervention research and prominent in practice (Barbaro & Dissanayake, 2010; Dawson et al., 2010; Kasari et al., 2006; Wetherby et al., 2014). In contrast, interventions for RRBIs for this age group are less developed (Harrop, 2015; Zwaigenbaum et al., 2015). The current study addresses this gap in the literature through the use of intervention strategies (i.e., environmental arrangement, modeling, prompting, differential reinforcement, and RIRD) to address inflexibility during the natural context of play with their parent. While outcomes from this study were successful in parent

strategy use and change in child behavior, future research is necessary to establish evidence-based intervention for RRBIs for toddlers at risk for ASD.

All intervention strategies used in this study are identified as evidence-based practices for preschool-aged children and above, with only some established as evidence-based for toddlers with ASD (Sam et al., 2020). More specifically, within the category of challenging and interfering behavior, differential reinforcement, antecedent-based intervention (environmental arrangement in this study), and more broadly naturalistic and parent-implemented interventions are considered evidence-based practices for toddlers with ASD. Modeling, prompting, and RIRD requires further research to establish an evidence base with their use with these younger children. The current study does support the use of modeling and prompting; however, RIRD was used too infrequently to suggest it impacted inflexibility with these young children. Therefore, future research should establish the effectiveness and appropriateness of RIRD for toddlers around challenging and interfering behavior. The next phase of intervention development should include additional components (i.e., fading, play diversity, prompt dependency, and preference assessment) to explore further the impact of ABA technologies on RRBIs with this population.

The current study addressed inflexible and flexible behaviors during play; however, RRBIs as defining characteristics of ASD is much broader than the behavior investigated here. RRBIs may be less frequent, less intrusive, or, perhaps, parents are more tolerant of these behaviors in toddlerhood (Harrop et al., 2016). Qualitative studies to describe parent tolerance and perception of RRBIs in toddler-aged children should be conducted.

Measurement of RRBIs in this study was done with the RBS-EC and BIS, neither which are meant to identify intervention goals around these behaviors, but rather provide a score to determine severity. A next step is the development of a measurement tool and assessment, which translates RRBI identification into intervention targets allowing for a bridge between the research to practice gap.

Many children who receive early intervention make developmental gains increasing their likelihood of being included in general education settings and improve adaptive skills. It is unlikely that gains from this parent-mediated, naturalistic intervention could change a child's developmental trajectory to appear *less autistic* that they did before the intervention. It is essential to consider the goal of the intervention: to increase flexibility and decrease behaviors that interfere with social interactions between child and parent. While these characteristics are associated with autism symptomatology, the goal here was not to eradicate these types of behaviors but to change the intensity and frequency of interfering behaviors to improve one's quality of life. Future research and practice should consider the impact of RRBIs to ensure the end goal is socially significant to the child, family, and stakeholders, rather than change for the sake of change.

Early intervention research and practice continue to better the lives of young children and families. Yet, a gap remains between what early intervention research recommends and what is implemented in practice. While treatment fidelity of parents remained high throughout the study, maintenance data should be included in future research. Also, replication with early interventionists as coaches for parents (rather than the researcher as the coach) is recommended.

Past research had evaluated parent feedback on telehealth interventions when it was the exception (e.g., Ashburner et al., 2016; Boivert et al., 2010; DuPaul et al., 2018; Ferguson et al., 2019; Machalicek et al., 2016). Due to COVID-19, many service providers and parents have been forced into telehealth service delivery. Future research should address the efficacy and acceptability of telehealth for toddler intervention under the current circumstances. A positive outcome of COVID-19 is the upscaling organizations have had to do to reach clients and customers. Telehealth is now available to a broader audience, likely reaching more families in need of healthcare due to rural locations. This change in practice has likely come with growing pains. Future research must consider the elements of telehealth with families of toddlers: usability, acceptability, and effectiveness. Liz shared she was glad not to have to drive several hours for her diagnostic visit since she was now able to do it virtually. Yet, she shared her dissatisfaction with the virtual visit outcome leaving questions to the acceptability of virtual diagnosis. The practice of early intervention via telehealth must address the issues with the accuracy and acceptability of such an assessment.

The coaching model used in this study included the four essential components for parent-mediated interventions (i.e., collaborative planning, building on caregiver's competence, guided practice, and collaborative reflection and decision making) as recommended by Tomeny and colleagues (2019). While a component analysis of coaching was not addressed here, future research should include measurement of the social validity of the coaching components. This could assist in the identification of consistencies and differences across parent characteristics (e.g., socioeconomic status, ethnicity, child age, and disability) and the success of an early intervention. It the current

study, it is hypothesized such components as active feedback and shared decision-making input from both the parent and the interventionist built a partnership and a strong rapport between the adults in this study. Among others, these factors may have contributed to minimal attrition by participants, despite parent's high levels of stress associated with external factors (e.g., COVID-19 shelter in place mandates and parenting of a young child with developmental delays). The outcomes of this study and parent comments exemplify the importance of a coaching model that emphasizes partnership as well as rapport building by the interventionist during virtual telehealth interventions.

Conclusion

This study evaluated the effects of coaching via telehealth on a caregiver-implemented intervention package to address inflexible behaviors, HO-RRBIs, and during play for young children on the waitlist for an ASD diagnosis. A concurrent multiple-baseline design across six dyads was used. Visual analysis and Tau-U were used to evaluate the intervention results, and a functional relation was detected for all participants.

The use of parent-mediated interventions to change child behavior is not new (Barton & Fettig, 2013; Beaudolin et al., 2014; Harrop, 2015); however, various components of this study are unique and contribute to future practice. First, the strategies used to influence behavior change echoes previous research on the use of environmental arrangement, modeling, prompting, time-delay and reinforcement (Francais et al., 2020; Piazza et al., 2000; Raulston et al., 2019; Sam et al., 2020). This study contributes explicitly to the influence these technologies have on flexibility for toddler-aged children (Sam et al., 2020). Interestingly, parents in this study used modeling most frequently and

showed high levels of behavior change in their child despite past research naming prompting as most influential in behavior change (Quigley et al., 2018). Past research looked at play skills as targets in contrast to child flexibility during play (Ulke-Kurkcuoglu, 2015). The barrier behavior (i.e., inflexibility) is the focus for behavior change, so removing or decreasing the frequency of inflexibility allows for more interactive behaviors to occur naturally (e.g., matching law; Myerson & Hale, 1984). Few studies have targeted HO-RRBIs, and even less have done so for toddler-aged children (Harrop, 2015). Limited research on HO-RRBIs is partly due to the developmental trajectory of said behaviors, which are known to decrease over time as a child matures (Leonard et al., 2010). Despite this possibility of inflexibility changing over time, the impact of inflexible behaviors contributes to high levels of stress in families (Bishop et al., 2007; Boyd et al., 2012; Harrop, McBee, & Boyd, 2016). In the current study, empowering parents to change their child's behaviors resulted in more positive interactions and decreased parent stress. The children included here were pre-diagnosis, waiting for their assessment, and were not receiving any specialized intervention related to the symptoms of ASD, and, for most, not receiving any intervention. Providing parents with a skill set to decrease challenging behavior (i.e., inflexibility) increases both qualities of life and self-efficacy of a capable parent. Early intervention agencies should consider the impact of RRBIs on the child and family and include effective strategies, as demonstrated in this study during intervention with their toddler-aged child at risk for ASD. Given the insufficiency of intervention opportunities for young children around RRBIs for those at-risk and with ASD, this study informs

practice and future research in the means to address vital intervention options for families on lengthy waitlists for autism diagnoses.

APPENDIX A

DATA COLLECTION TOOLS

Task Analysis: Assessment of play expansion by parent

Instructional cue. Take notice of what your child is playing with. You can join her/him when you are ready

Assessment Method: Single opportunity across 10-minute session

Dyad: P___ Date:

Opportunity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Model play																				
2. **Wait** 5 seconds																				
3. **Reinforce** contingent on child imitation of modeled play (go back to 1)																				
4. If child does not correctly imitate parent modeled play, parent **models same play action again**																				
5. **Wait** 5 seconds																				
6. **Reinforce** contingent on child imitation of modeled play (go back to 1)																				
7. If child does not correctly imitate parent modeled play, parent **physically and verbally prompts modeled play**																				
8. **Wait** 5 seconds																				
9. **Reinforce** contingent on child imitation of modeled play																				
(go to step 1)																				
10. If child fails to imitate parent modeled play following physical/ verbal prompt and time delay due to **INFLEXIBILITY,** parent uses **RIRD** (Otherwise STOP)																				
11. **Wait** 5 seconds																				
12. **Reinforce** contingent on child imitation of modeled play (go to step 1)																				
13. If child fails to imitate parent modeled play following RIRD due to **INFLEXIBILITY**, try RIRD again (trial 2)																				
14. **Wait** 5 seconds																				
15. **Reinforce** contingent on child imitation of modeled play (go to step 1)																				
16. If child fails to imitate parent modeled play following RIRD on trial 2, **STOP**																				
# total sequences correct																				

Recording key: + correct; - incorrect

Insight: Observation Timer 4+

Tool for School Psychologists

Logan Radloff

★★★★★ 4.7, 309 Ratings

Free

48	0	0	0	0	0	0
49	1	0	0	0	1	1
50	1	0	0	0	1	0
51	1	0	0	0	0	1
52	1	0	0	0	1	0
53	1	0	0	0	1	0
54	1	0	0	0	1	0
55	1	0	0	0	1	0
56	0	1	0	0	0	0
57	1	0	0	0	0	1
58	1	0	0	0	0	0
59	0	1	0	0	0	0
60	0	1	0	0	0	0
Interval	Flex	Inflex	Chjoy	Pjoy	Vocal	Toy
Total	38	20	5	5	16	19
Percentage	63.30%	33.30%	8.30%	8.30%	26.70%	31.70%
Number of intervals	60					
Interval length	0:10					
Export date	2020-04-16-12:42					
*Note: The "Total" and "Percentage" rows come directly from Insight. Changes made to data will not be reflected in this row. The "Percentage" row is the total / number of intervals so they may add up to over 100%.						

APPENDIX B

TOY LIST

1. Melissa and Doug Wooden Cookie Set
2. Fisher-Price Little People Tree House Set
3. Plates, cups, utensils (2 cups, 2 plates, spoon and fork for each set)
4. Wind-up Toy (2 each)
5. Puzzle (6-8-piece puzzle)
6. Dump Truck
7. Mega Blocks
8. Stacking Cups
9. Ball
10. Bubbles
11. Plastic containers for sorting
12. Storage bag

APPENDIX C

PARENT BINDER CONTENTS

- Contact Information for PI and EI provider if different
- Recruitment Flyer
- Recruitment Form
- Consent Form
- Assent Form
- HIPPA Agreement
- Strategy Tutorial Sheets for all four strategies
- Strategy Video Instructions
- Social Validity (with and without interview questions)
- Social Validity for Telehealth
- Intervention Targets and Replacement Behavior instructions and fill in Sheet
- Action plan worksheet for HO- RRBIs and LO-RRBIs
- Telehealth instructions
- List of toys and toy suggestions
- Caregiver/Child Play Practice Log
- Baseline instructions

APPENDIX D

DYAD BEHAVIOR INTERVENTION PLANS

Dyad 1 Bree and Jax (JX): Behavior Intervention Plan

Focus Behavior Definitions

Number of Behaviors to Code: 2 Inflexible and 1 Flexible
Flexible Behavior: coded as *instances of functional play*

- **Label:** Toy play
- **Defined:** Objects and toys used purposefully but not limited to their obvious intentional use. For example, a car can be driving on the floor or leg as a road. Play is beyond lining up toys and sensory seeking and repetitive play.
- **Code:**
    - *Yes, behavior occurred*: if toys are used as they are intended (e.g., blocks building a tower); if Mom prompts of models play idea and JX imitates or continues with play for 10 seconds without repetitive or sensory seeking play, this is marked as *yes behavior occurred.*
    - *No behavior did not occur*: if toys are used in a repetitive or sensory seeking way: (e.g., rolls car on the cheek for sensory input); if Mom prompts of models play idea and JX imitates one time only or does not imitate at all and reverts to sensory seeking or repetitive play, this is marked as *no behavior did not occur.*
    - *No opportunity:* if toys are unavailable, no toy engagement occurs, or no interactive play with Mom occurs (possibly due to challenging behavior or no activity); this is marked as *no opportunity*.
- **Strategies: Model/prompt, DR, Environmental Arrangement**

Inflexible Behavior: coded as *child inflexible play*
Behavior 1: (section 2: 26 and 28/Section 3:20)

- **Label:** Upset if Interrupted; Inflexible Routine; Limited and Intense Interests
- **Definition:** Inflexible routine and does not allow for interruptions during play due to a strong attachment to the item. Interruptions include: change items during play, changing activities during play, not able to have access to a particular item during play session resulting in obvious distress (e.g., crying, self-injury, aggression, yelling) that lasts three or more seconds.
- **GOAL:** Increase acceptance of new items and change during play; the decrease of CB in response to interruptions and change during play.
- **Code:**
    - *yes, behavior occurred*: each time demonstrates obvious distress for three or more seconds in response to routine or play interruption described in

the label. If Mom takes the toy from JX and attempts to give him another one and JX demonstrates distress, this is marked as *yes behavior occurred.* If Mom begins to put away one activity and replace it with another and JX demonstrates distress, this is marked as *yes behavior occurred.*

- *No behavior did not occur:* If Mom takes the toy from JX and attempts to give him another one or begins to put away one activity and replace with another and JX does not demonstrate distress this is marked as no behavior did not occur
- *no opportunity:* If mom does not attempt to interrupt routine or play of JX, this is marked as *no opportunity*.

Strategy: DR; Model/Prompt; Environmental Arrangement
Behavior 2: (Section 3: 19 and 21)

- **Label:** Fixation with parts of objects and sensory seeking behaviors
- **Definition**: Fixation with parts of objects (spinning wheels, moving swing, turning propeller) or engages in sensory seeking behaviors (visual: side of the eye, touch: rubs on face/hits self with toy, mouths or smells toys, sound repeats play for sound experience) for more than 3 seconds that *takes the place of responding to Mom during play*
- **GOAL**: Decrease lower-order RRBIs (parts of objects and sensory seeking behaviors) by interrupting these behaviors and directing JX to appropriate play interactions with Mom and materials.
- **Code**:
  - *Yes, behavior occurred*: each time JX engages in fixation of an object or sensory behavior for three or more seconds instead of responding to Mom's attempt to play. If Mom presents a toy or activity to JX, and he engages in fixation or sensory seeking behavior for three or more seconds, this is marked as *yes, behavior occurred*. Even if JX takes the item from Mom, but only to engage in fixated or sensory behaviors, if this behavior occurs for three or more seconds during a play interaction, this is marked as *yes, behavior occurred.*

  - *No, the behavior did not occur:* If Mom presents a toy or activity to JX and she takes the item and stops or has no fixation or sensory behaviors, this is marked as *no behavior did not occur*

  - *No opportunity:* If mom does not attempt to interact or play with JX, this is marked as *no opportunity*. If JX is engaging in this behavior, and Mom does not attempt to interact, this is marked as *no opportunity*.

- **Strategy Response: RIRD; Environmental Arrangement**

Dyad 2 Vicki and Maude (MA): Behavior Intervention Plan

Focus Behavior Definitions

Number of Behaviors to Code: 1 Flexible and 2 Inflexible
Flexible Behavior: coded as *instances of functional play*

- **Label:** Toy play
- **Defined:** Objects and toys used purposefully but not limited to their obvious intentional use. For example, a car can be driving on the floor or leg as a road. Play is beyond lining up toys and sensory seeking and repetitive play.
- **Code:**
    - *yes, behavior occurred*: if toys are used as they are intended (e.g., blocks building a tower); if Mom prompts of models play idea, and MA imitates or continues with play for 10 seconds without repetitive or sensory seeking play, this is marked as *yes behavior occurred.*

    - *No behavior did not occur*: if toys are used in a repetitive or sensory seeking way: (e.g., rolls car on the cheek for sensory input); if Mom prompts of models play idea, and MA imitates one time only or does not imitate at all and reverts to sensory seeking or repetitive play, this is marked as *no behavior did not occur.*

    - *no opportunity:* if toys are unavailable; no toy engagement occurs; or no interactive play with Mom occurs (possibly due to challenging behavior or no activity) this is marked as *no opportunity*.

- **Strategies: Model/prompt, DR, Environmental Arrangement**

Inflexible Behavior: coded as *child inflexible play*
Behavior 1: (Section 1: 6/Section 3: 17 and 20)

- **Label:** Narrow preoccupation with one type of toy or repetitive use of the toy.
- **Defined:** Inflexible routine and does not allow for interruptions during play due to a strong interest in items. Interruptions include: change items during play, changing activities during play, not able to have access to a particular item during the play session. Any of the above list results in obvious distress (i.e., crying, self-injury, aggression, yelling) that lasts three or more seconds.
- **GOAL:** Decrease in distress/challenging behavior and increase acceptance of new play materials and interactions with Mom
- **Code**:
    - *yes behavior occurred*: each time MA demonstrates obvious distress for three or more seconds in response to routine or plays interruption described in the label. If Mom takes the toy from MA and attempts to give her another one and demonstrates distress, this is marked as *yes behavior occurred.* If Mom begins to put away one activity and replace it

with another and MA demonstrates distress, this is marked as *yes behavior occurred.*

- *No behavior did not occur:* If Mom takes the toy from MA and attempts to give her another one or begins to put away one activity and replace it with another and MA does not demonstrate distress, this is marked as *no behavior did not occur.*

- *No opportunity:* If mom does not attempt to interrupt routine or play of MA, this is marked as *no opportunity*.

- **Strategy Use: DR, Model/Prompt, and Environmental Arrangement**

Behavior 2: (Section 3: 19 and 21)

- **Label:** Fixation with parts of objects and sensory seeking behaviors
- **Defined**: Fixation with parts of objects (spinning wheels, moving swing, turning propeller) or engages in sensory seeking behaviors (visual: side of the eye, touch: rubs on face/hits self with toy, mouths or smells toys, sound repeats play for sound experience) for more than 3 seconds that *takes the place of responding to Mom during play*
- **GOAL**: Decrease lower-order RRBIs (parts of objects and sensory seeking behaviors) by interrupting these behaviors and directing MA to appropriate play interactions with Mom and materials.
- **Code**:
  - *Yes, behavior occurred*: each time MA engages in fixation of an object or sensory behavior for 3 or more seconds instead of responding to Mom's attempt to play. If Mom presents a toy or activity to MA and he engages in fixation or sensory seeking behavior for 3 or more seconds, this is marked as *yes, behavior occurred*. Even if MA takes the item from Mom, but only to engage in fixated or sensory behaviors, if this behavior occurs for 3 or more seconds during a play interaction, this is marked as *yes, behavior occurred.*

  - *No, behavior did not occur:* If Mom presents a toy or activity to MA and she takes the item and stops or has no fixation or sensory behaviors, this is marked as *no behavior did not occur*

  - *no opportunity:* If mom does not attempt to interact or play with MA this is marked as *no opportunity*. If MA is engaging in this behavior and Mom does not attempt to interact, this is marked as *no opportunity*.

- **Strategy Response: RIRD; Environmental Arrangement**

Dyad 3 Liz and Daisy (DA): Behavior Intervention Plan

Focus Behavior Definitions

Number of Behaviors to Code: 1 Flexible and 2 Inflexible

Flexible Behavior: coded as *instances of functional play*

- **Label:** Toy play
- **Defined:** Objects and toys used in purposeful manner but not limited to their obvious intentional use. For example: car can be driving on floor or on leg as a road. Play is beyond lining up toys and sensory seeking and repetitive play.
- **Code:**
    - *yes behavior occurred*: if toys are used as they are intended (e.g., blocks building a tower); if Mom prompts of models play idea and DA imitates or continues with play for 10 seconds without repetitive or sensory seeking play, this is marked as *yes behavior occurred.*

    - *no behavior did not occur*: if toys are used in a repetitive or sensory seeking way: (e.g. rolls car on cheek for sensory input); if Mom prompts of models play idea and DA imitates 1 time only or does not imitate at all and reverts to sensory seeking or repetitive play, this is marked as *no behavior did not occur.*

    - *no opportunity:* if toys are unavailable; no toy engagement occurs; or no interactive play with Mom occurs (possibly due to challenging behavior or no activity)
      this is marked as *no opportunity*.

Strategies: Model/prompt, DR, Environmental Arrangement

Inflexible Behavior: coded as *child inflexible play*

Behavior 1: (section 2: 28; section 3: 20)

- **Label:** Inflexible routine and attachment to objects
- **Defined**: Inflexible routine and does not allow for interruptions during play due to strong attachment to item. Interruptions include: change items during play, changing activities during play, not able to have access to a particular item during play session resulting in observable distress (i.e., crying, self-injury, aggression, yelling) that lasts 3 or more seconds.
    - NOTE: *Self injury will be tracked for type and frequency by PI*
- **GOAL**: Decrease in distress/challenging behavior and increase acceptance of new play materials and interactions with Mom
- **Code**:

- *yes behavior occurred*: each time DA demonstrates observable distress for 3 or more seconds in response to routine or play interruption described in label. If Mom takes the toy from DA and attempts to give her another one and DA demonstrates distress this is marked as *yes behavior occurred.* If Mom begins to put away one activity and replaces it with another and DA demonstrates distress as described above this is marked as *yes behavior occurred.*

- *no behavior did not occur:* If Mom takes a toy from DA and attempts to give her another one or begins to put away one activity and replace with another and DA does not demonstrate distress this is marked as *no behavior did not occur*

- *no opportunity:* If mom does not attempt to interrupt routine or play of DA this is marked as *no opportunity*.

- **Strategies: Environmental Arrangement; Model/Prompt; DR**

Behavior 2: (Section 3: 19)

- **Label:** Sensory seeking behaviors
- **Defined**: Engages in sensory seeking behaviors (visual: side of eye, touch: rubs on face/hits self with toy, mouths or smells toys, sound repeats play for sound experience) for more than 3 seconds that *takes the place of responding to Mom during play*
- **GOAL**: Decrease lower order RRBIs (parts of objects and sensory seeking behaviors) by interrupting these behaviors and directing DA to appropriate play interactions with Mom and materials.
- Code:
  - *Yes behavior occurred*: each time DA engages in a fixation of object or sensory behavior for 3 or more seconds instead of responding to Mom's attempt to play. If Mom presents a toy or activity to DA and she engages in fixation or sensory seeking behavior for 3 or more seconds, this is marked as *yes, behavior occurred*. If DA takes the item from Mom, but only to engage in fixated or sensory behaviors, if this behavior occurs for 3 or more seconds, this is marked as *yes, behavior occurred.*

  - *no behavior did not occur:* If Mom presents a toy or activity to DA and she takes the item and has no fixation or sensory behaviors OR immediately stops them, this is marked as *no behavior did not occur*

  - *no opportunity:* If mom does not attempt to interact or play with DA this is marked as *no opportunity*. If DA is engaging in this behavior and Mom does not attempt to interact, this is marked as *no opportunity*.

- **Strategies:** RIRD; Environmental Arrangement

Dyad 4 Gigi and Lucia (LU): Behavior Intervention Plan

Focus Behavior Definitions

Number of Behaviors to Code: 1 Flexible and 2 Inflexible

Flexible Behavior: coded as *instances of functional play*

- **Label:** Toy play and social play
- **Defined:** Objects and toys used purposefully but not limited to their obvious intentional use. For example, a car can be driving on the floor or leg as a road. Play is beyond lining up toys and sensory seeking and repetitive play.
- **Code:**
    - *yes, behavior occurred*: if toys are used as they are intended (e.g., blocks building a tower); if Mom prompts of models play idea, and Lucia imitates or continues with play for 10 seconds without repetitive or sensory seeking play, this is marked as *yes behavior occurred.*

    - *No behavior did not occur*: if toys are used in a repetitive or sensory seeking way: (e.g., rolls car on the cheek for sensory input); if Mom prompts of models play idea, and Lucia imitates one time only or does not imitate at all and reverts to sensory seeking or repetitive play, this is marked as *no behavior did not occur.*

    - *no opportunity:* if toys are unavailable; no toy engagement occurs; or no interactive play with Mom occurs (possibly due to challenging behavior or no activity) this is marked as *no opportunity*.

- **Strategies: Model/prompt, DR, Environmental Arrangement**

Inflexible Behavior: coded as *child inflexible play*

Behavior 1: (section 2: 25)
- **Label:** Arranging (lines up or arranges toys of other objects)
- **Defined:** Arranges toys in a particular manner and becomes upset or protests if interrupted or toys are re-arranged. Inflexible response to toy arrangement includes protests or obvious upset/frustration that lasts three or more seconds.
- **GOAL:** Increase acceptance of new items and change during play; a decrease of CB in response to interruptions and change during play.
- **Code:**
    - *yes, behavior occurred*: each time demonstrates obvious distress for three or more seconds in response to routine or plays item change as described in the label. If Mom takes the toy from LU and attempts to give her another one and LU demonstrates distress, this is marked as *yes behavior occurred.* If Mom begins to put away or rearrange an activity and replace

it with another and LU demonstrates distress, this is marked as *yes behavior occurred.*

- *No behavior did not occur:* If Mom takes the toy from LU and attempts to give her another one or begins to put away one activity and replace with another and LU does not demonstrate distress this is marked as no behavior did not occur.
- *No opportunity:* If mom does not attempt to interrupt routine or play of LU, this is marked as *no opportunity*.

- **Strategy: DR; Model/Prompt; Environmental Arrangement**

Behavior 2: (Section 2: 28)

- **Label:** Upset if interrupted
- **Defined**: Cries or becomes upset if Mom removes a toy or offers a new one. Upset behavior occurs for more than 3 seconds that *takes the place of responding to Mom during play*
- **GOAL**: Increase of acceptance of interruption by modeling and prompting new opportunities or RIRD if the behavior is more extreme
- **Code**:
  - *Yes, behavior occurred*: each LU engages in fixation of the object for three or more seconds instead of responding to Mom's attempt to play. If Mom presents a toy or activity to LU, and she becomes frustrated by the interruption, this is marked as *yes, behavior occurred*.

  - *No, the behavior did not occur:* If Mom presents a toy or activity to LU and she takes the item and stops or has no frustration around the offer of a new toy, this is marked as *no behavior did not occur*

  - *No opportunity:* If mom does not attempt to interact or play with LU, this is marked as *no opportunity*. If LU is engaging in this behavior, and Mom does not attempt to interact, this is marked as *no opportunity*.

- **Strategy Response: RIRD; Environmental Arrangement; Model; Prompt**

Dyad 5 Kay and Derek (DER): Behavior Intervention Plan

Focus Behavior Definitions

Number of Behaviors to Code: 1 Flexible and 2 Inflexible

Flexible Behavior: coded as *instances of functional play*

- **Label:** Toy play (Mom called it pretend play/silly play)
- **Defined:** Objects and toys used purposefully but not limited to their obvious intentional use. For example, a car can be driving on the floor or leg as a road. Play is beyond lining up toys and sensory seeking and repetitive play.
- **Code:**
    - *yes, behavior occurred*: if toys are used as they are intended (e.g., blocks building a tower); if Mom prompts of models play idea, and DER imitates or continues with play for 10 seconds without repetitive or sensory seeking play, this is marked as *yes behavior occurred.*

    - *No behavior did not occur*: if toys are used in a repetitive or sensory seeking way: (e.g., rolls car on the cheek for sensory input); if Mom prompts of models play idea and DER imitates one time only or does not imitate at all and reverts to sensory seeking or repetitive play, this is marked as *no behavior did not occur.*

    - *no opportunity:* if toys are unavailable; no toy engagement occurs; or no interactive play with Mom occurs (possibly due to challenging behavior or no activity)
      this is marked as *no opportunity*.

- **Strategies: Model/prompt, DR, Environmental Arrangement**

Inflexible Behavior: coded as *child inflexible play*

Behavior 1: (section 2: 28 and 30/Section 3:17)
- **Label:** Upset if Interrupted; Inflexible Routine; Limited and Intense Interests
- **Defined:** Inflexible routine and does not allow for interruptions during play due to strong attachment to the item. Interruptions include: change items during play, changing activities during play, not able to have access to a particular item during play session resulting in obvious distress (e.g., crying, self-injury, aggression, yelling) that lasts three or more seconds.
- **GOAL:** Increase acceptance of new items and change during play; the decrease of CB in response to interruptions and change during play.
- **Code:**
    - *yes, behavior occurred*: each time demonstrates obvious distress for three or more seconds in response to routine or play interruption described in the label. If Mom takes the toy from DER and attempts to give him

another one and DER demonstrates distress, this is marked as *yes behavior occurred.* If Mom begins to put away one activity and replace it with another and DER demonstrates distress, this is marked as *yes behavior occurred.*

- *no behavior did not occur:* If Mom takes the toy from DER and attempts to give him another one or begins to put away one activity and replace with another and DER does not demonstrate distress this is marked as no behavior did not occur
- *no opportunity:* If mom does not attempt to interrupt routine or play of DER, this is marked as *no opportunity*.

- **Strategy: DR; Model/Prompt; Environmental Arrangement**

Behavior 2: (Section 3: 19 and 21)

- **Label:** Fixation with parts of objects and sensory seeking behaviors
- **Defined**: Fixation with parts of objects (spinning wheels, moving swing, turning propeller) or engages in sensory seeking behaviors (visual: side of the eye, touch: rubs on face/hits self with toy, mouths or smells toys, sound repeats play for sound experience) for more than 3 seconds that *takes the place of responding to Mom during play*
- **GOAL**: Decrease lower-order RRBIs (parts of objects and sensory seeking behaviors) by interrupting these behaviors and directing DER to appropriate play interactions with Mom and materials.
- **Code**:
  - *Yes, behavior occurred*: each time DER engages in fixation of an object or sensory behavior for three or more seconds instead of responding to Mom's attempt to play. If Mom presents a toy or activity to DER and he engages in fixation or sensory seeking behavior for three or more seconds, this is marked as *yes, behavior occurred*. Even if DER takes the item from Mom, but only to engage in fixated or sensory behaviors, if this behavior occurs for three or more seconds during a play interaction, this is marked as *yes, behavior occurred.*

  - *No, the behavior did not occur:* If Mom presents a toy or activity to DER and she takes the item and stops or has no fixation or sensory behaviors, this is marked as *no behavior did not occur*

  - *No opportunity:* If mom does not attempt to interact or play with DER, this is marked as *no opportunity*. If DER is engaging in this behavior, and Mom does not attempt to interact, this is marked as *no opportunity*.

Strategy Response: RIRD; Environmental Arrangement

Dyad 6 Maria and Allie (AL): Behavior Intervention Plan

Focus Behavior Definitions

Number of Behaviors to Code: 1 Flexible and 2 Inflexible

Flexible Behavior: coded as *instances of functional play*

- **Label:** Toy play (Mom called it pretend play/silly play)
- **Defined:** Objects and toys used purposefully but not limited to their obvious intentional use. For example, a car can be driving on the floor or leg as a road. Play is beyond lining up toys and sensory seeking and repetitive play.
- **Code:**
    - *yes, behavior occurred*: if toys are used as they are intended (e.g., blocks building a tower); if Mom prompts of models play idea, and AL imitates or continues with play for 10 seconds without repetitive or sensory seeking play, this is marked as *yes behavior occurred.*

    - *No behavior did not occur*: if toys are used in a repetitive or sensory seeking way: (e.g., rolls car on the cheek for sensory input); if Mom prompts of models play idea, and AL imitates one time only or does not imitate at all and reverts to sensory seeking or repetitive play, this is marked as *no behavior did not occur.*

    - *no opportunity:* if toys are unavailable; no toy engagement occurs; or no interactive play with Mom occurs (possibly due to challenging behavior or no activity)
      this is marked as *no opportunity*.

- **Strategies: Model/prompt, DR, Environmental Arrangement**

Inflexible Behavior: coded as *child inflexible play*

Behavior 1: (section 2: 28 /Section 3:17)

- **Label:** Upset if Interrupted; Limited and Intense Interests
- **Defined:** Does not allow for interruptions and does not change the focus of interest beyond own fixations during play due to strong attachment to the item. Interruptions include: change items during play, changing activities during play, not able to have access to a particular item during play session resulting in obvious distress (e.g., crying, self-injury, aggression, yelling) that lasts three or more seconds.
- **GOAL:** Increase acceptance of new items and change during play; the decrease of CB in response to interruptions and change during play.
- **Code:**
    - *yes behavior occurred*: each time AL demonstrates obvious distress for three or more seconds in response to routine or play interruption described in the label. If Mom takes the toy from AL and attempts to give her

another one and AL demonstrates distress, this is marked as *yes behavior occurred.* If Mom begins to put away one activity and replace it with another and AL demonstrates distress, this is marked as *yes behavior occurred.*

- *no behavior did not occur:* If Mom takes the toy from AL and attempts to give her another one or begins to put away one activity and replace with another and AL does not demonstrate distress this is marked as no behavior did not occur
- *no opportunity:* If mom does not attempt to interrupt routine or play of AL, this is marked as *no opportunity*.

- **Strategy: DR; Model/Prompt; Environmental Arrangement**

Behavior 2: (Section 3: 19 and 21)

- **Label:** Fixation with parts of objects and sensory seeking behaviors (mouthing and carrying objects)
- **Defined**: Fixation with parts of objects (spinning wheels, moving swing, turning propeller) or engages in sensory seeking behaviors (visual: side of the eye, touch: rubs on face/hits self with toy, mouths or smells toys, sound repeats play for sound experience) for more than 3 seconds that *takes the place of responding to Mom during play*
- **GOAL**: Decrease lower-order RRBIs (parts of objects and sensory seeking behaviors) by interrupting these behaviors and directing AL to appropriate play interactions with Mom and materials.
- **Code**:
  - *Yes, behavior occurred*: each time AL engages in fixation of an object or sensory behavior for three or more seconds instead of responding to Mom's attempt to play. If Mom presents a toy or activity to AL, and she engages in fixation or sensory seeking behavior for three or more seconds, this is marked as *yes, behavior occurred*. Even if AL takes the item from Mom, but only to engage in fixated or sensory behaviors, if this behavior occurs for three or more seconds during a play interaction, this is marked as *yes, behavior occurred.*

  - *No, the behavior did not occur:* If Mom presents a toy or activity to AL and she takes the item and stops or has no fixation or sensory behaviors, this is marked as *no behavior did not occur*

  - *No opportunity:* If mom does not attempt to interact or play with AL, this is marked as *no opportunity*. If AL is engaging in this behavior, and Mom does not attempt to interact, this is marked as *no opportunity*.

- **Strategy Response: RIRD; Environmental Arrangement; Model; Prompt; DRA**

APPENDIX E

BASIC INFORMATION SHEET

"***Tick Tock! Making the most of waiting time for an early autism diagnosis."***

Please help us to better understand the outcomes of this study by answering the following questions.

Primary Caregiver Information:

1. What is your date of birth? _____month_____day_____year
2. What gender do you identify as? □ Male □ Female □ Other
3. What is your race/ethnicity? □ Black or African American □ Asian/American

   □ Indigenous to North America/Alaskan Native □ White □Hispanic or Latino

   □ Native Hawaiian or other Pacific Islander □ Other

   _____
4. Which best describes your financial situation? Please circle the best descriptor.

   Do you have*: not enough just enough a little extra tons of extra*

   Do you have money to buy nice things?

   never rarely sometimes often always
5. What is your highest education level achieved?

   □ High school diploma or GED
   □ Associate degree
   □ Bachelor degree
   □ Master's degree
   □ Doctorate
   □ Other_____
6. What is your current marital status?

   □ never married □ separated
   □ living with someone □ divorced
   □ married □ widowed

7. Have you ever had training in using behavioral strategies with your child?

   □ No □Yes, please specify_____

8. How many minutes is the drive from your home to the University of Oregon campus? _____

Child Information:

9. What is this child's date of birth? _____month_____day_____year

10. What is this child's gender? ____male ____female

11. Does your child have a current disability diagnosis? _____yes _____no

    If yes, please specify_____

12. Besides your son or daughter participating in this study, with whom do you currently live?

    - □ no one else
    - □ spouse
    - □ other children; how many?_____ _____
    - □ relatives, specify _____

13. What is the date of your autism assessment?

Contact Information:

14. Parent/Guardian/Caregiver preferred contact to schedule or reschedule sessions:

15. Please provide a mailing address for information relating to this study:

APPENDIX F

SAMPLE LESSON PLAN

Session 1

P____ Date of Training_____ Completed by_____

Item Being Reviewed	Check Here	Initial
Greeting/Check-in	❑	
Congratulations on completing baseline	❑	
Completion of forms and intake questionnaires	❑	
Described each part of intervention session (see *Session timeline* in the **session timeline** section of parent binder) • Video at the start of each session • Intervention/coaching for 15-30 minutes • Coaching components	❑ ❑ ❑	
Behavior Plan • Pull *Behavior Brainstorm Worksheet* from **choosing the behavior section.** • Complete this worksheet together if not completed previously. • Turn to *Focus Behavior Plan* in **Behavior Plan section** • Circle top behaviors from *Behavior Brainstorm Worksheet* this plan. Put rank of 1 or 2 and copy the definition.	❑ ❑	
Next Steps • Suggest that parent take notice of these behaviors from now to next session • When do they occur? Why do they occur? • Add to the section *what do they look like* on the focus behavior plan.	❑	
Introduce the activity list in the strategies section	❑	
Ask for questions	❑	
Confirm next meeting time	❑	
Say thank you and goodbye	❑	

Note. Independent lesson plans were made for each intervention session (i.e., 15 session plans in all).

APPENDIX G

PARENT STRATEGY SHEETS

Environmental Arrangement

Definition: When the caregiver sets up the environment to let the child know what he or she can expect during their time in that space. Here, the environment should be set up for social exchanges, communication between the caregiver and child, and say "let's play."

Purpose: Alters physical environment and materials available to increase play and engagement with the caregiver, promotes prosocial behaviors, and reduces challenging behaviors of children. (Davis & Fox, 1999)

Example: The caregiver adds three choices of a preferred toy and places them in a clear plastic jar with lid; the child brings jar to the caregiver for assistance, caregiver facilitates the trade of materials and play ideas.

Non-example: All toys are available at once, so the child does not need a caregiver to access anything novel, or television is on during playtime, which distracts both child and caregiver from engaging with one another.

How to do it:

1. Scan the environment for interfering toys that may prevent play and remove unwanted distractions
2. Scan the environment again and look for items that will get play going. Make these toys that support play more obvious.
3. Hide toys under blankets or in sight but out of reach to promote fun interaction.

Think About:

- What play interactions can I try with this toy?
- What will I do if a toy gets too distracting?
- What toys were difficult last time, and which ones were fun for us to play with?
- Am I ready to re-introduce a toy that was distracting so I can use a new strategy to support new play?

You got this!

Modeling and Prompting

Definition:

Modeling: showing a new way to use a toy to further play experience and exploration

Prompting: using a small teachable step or helping hints to demonstrate how to do a new or unfamiliar experience

Modeling = showing so the child can copy
Prompting = giving a little help either using a visual or physical assistance

Purpose: Decrease frustration of "unable" toy play or unaware social behavior. It is important to remember in play the teacher is not modeling or prompting *the correct way*, as there are many creative ways to use a toy, but instead expanding play to include others and make it more interactive rather than isolate.

Example: The caregiver hands the child a shape for the shape sorter, the child takes shape and begin flipping the toy between their fingers. The caregiver holds another shape up at the child's eye level and says "look" then puts shape into sorter as a model. The caregiver hands another to the child and says, "you try." If the child doesn't imitate, graduated guidance should be used to prompt the child for success.

Non-example: The caregiver removes the child's current toy, says, "you're doing it wrong," and does hand over hand to show the child how to manipulate toy OR caregiver allows the child to spin toy over and over for 10 minutes without interruption or social interaction.

How to do it:

1. Model: Show children an action with an item they are interested in. Demonstrate a way to use it offering turns to the child if they seem interested.
2. Prompt: put a toy into the child's hand and supporting them with either verbal cues ("shake, shake, shake!") or physical prompts (hand-over-hand shaking movement) while they are touching the toy.
3. Slowly, (one at a time), show fun ways to play and interact with the toys and situations in the environment.

Think About

- What prompts does my child respond best to? verbal, visual, physical
- What new ideas can we try?
- How can I introduce a more flexible way to play with a toy?
- How can I add social play into object play?

You got this!

Differential Reinforcement of Appropriate Behavior

Definition: A behavior intervention that can increase the occurrence of new and appropriate behaviors instead of the behavior that encourages the child to play alone or in inappropriate ways.

Reinforce = strengthen, increase the amount of time something will happen

Purpose: Providing a reinforcing item to reduce repetitive or restrictive behavior (e.g., inflexible, repetitive, isolated play) and increase flexibility, social play, and interaction (Savage & AFIRM, 2017).

Example: The child plays with the truck without taking notice of anything the caregiver offers to the child. The caregiver gently removes his hand from the truck and put it on bubbles (another new, but favorable activity). The child looks at bubbles and smiles, the caregiver blows bubbles, and the child switches attention from truck to bubbles and caregiver. The caregiver gives child small pieces of a fruit snack, as this is a pre-determined reinforcement because the child gave up routine toy/action (truck rolling) and came to participate with a new toy (bubbles) and caregiver.

Non-example: Child changes attention to new toy with no reinforcement from caregiver

How to do it:

1. Model and prompt for desired behavior.
2. Reinforce any effort with an identified reinforcer
3. Reinforce appropriate play with an identified reinforcer
4. Reinforce target behaviors with an identified reinforcer

Think About:

- What will I model/prompt?
- What will I use to reinforce the target behaviors?
- Will I use different reinforcers for different behaviors?

You got this!

Response Interruption and Redirection

Definition: A behavior strategy that stops the disruptive, harmful, or distracting behavior because it is preventing the child from participating in opportunities in their environment that are available to increase developmental play skills.

Response Interruption = stop the unwanted behavior

Redirection = give them ideas of other activities

Purpose: A way to eliminate or decrease behaviors that interfere and consistently compete with one's overall development (Tomaszewski, Regan, & AFIRM Team, 2017) so the child can participate more fully in the world around them.

Example: Child rolls trucks, the child continues to roll the truck over and over without looking at the caregiver or other toys offered. Caregiver models and prompts play behaviors, but the child does not remove focus or eye gaze from the repetitive rolling of the truck. The caregiver gently stops the truck, removes the child's hand from the truck, and puts the child's hand on the pop-up toy. The child changes focus to the pop-up toy, and the caregiver removed the truck from the play area. The caregiver gently prompts the child using a hand over hand method to use the pop-up toy. The caregiver gives an exploding fist pump when the child does the pop-up, which is one of his favorite social reinforcers.

Non-Example: child continues to roll a truck for the entire play session with no interaction

How to Do It:

1. Interrupt the behavior (with gentle physical or verbal redirection)
2. Introduce another item, activity or opportunity
3. Model and prompt how to use/do a new action
4. Reinforce any effort with the identified reinforcer

Think about:

- How will you interrupt?
- What activity, toy, or opportunity will you introduce?
- How will you model/prompt?
- How will you reinforce it?

You can do it!

APPENDIX H

COACHING FIDELITY CHECKLIST

Fidelity Checklist for Coaching Sessions

P__ Date of Training_____ Completed by_____

Item Being Reviewed	Check Here	Initial
1. Greeting/Check-in	❑	
2. Review topics from the last session and answer questions	❑	
3. Data Video 10 minutes	❑ / NA	
4. Play session feedback and coaching	❑	
5. Confirm paperwork and social validity	❑ / NA	
6. Introduce or discuss parent strategies	❑	
7. Confirm Next Steps • What Coach will do before the next meeting • What Parent will do before the next meeting	❑ ❑	
8. Ask for questions	❑	
9. Confirm Next Meeting Time	❑	
10. Say thank you and goodbye	❑	

Number completed and NA: _____11__/11
% Correct (including NA): _____100___%

APPENDIX I

SOCIAL VALIDITY QUESTIONNAIRE

Participant #
Please rate the following based on your experience. Use 1 (strongly disagree) to 5 (strongly agree) for each item.

1. I find this approach is an acceptable way for me to respond to my child's inflexible/difficult behavior.

1 2 3 4 5
strongly disagree neither disagree/agree strongly agree

2. I would be willing to use this strategy again to respond to my child's inflexible/difficult behavior.

1 2 3 4 5
strongly disagree neither disagree/agree strongly agree

3. I believe my child accepted (responded positively) this strategy during our play-time.

1 2 3 4 5
strongly disagree neither disagree/agree strongly agree

4. I like the procedures used in this strategy.

1 2 3 4 5
strongly disagree neither disagree/agree strongly agree

5. I believe this strategy is likely to be effective in reducing my child's inflexible/difficult behavior.

1 2 3 4 5
strongly disagree neither disagree/agree strongly agree

6. I believe my child experienced discomfort when I used this strategy.

1 2 3 4 5
strongly disagree neither disagree/agree strongly agree

7. I believe the strategy is likely to increase flexible play and positive social interaction.

1	2	3	4	5
strongly disagree		neither disagree/agree		strongly agree

8. I believe this strategy would be acceptable for other parents to use with their children.

1	2	3	4	5
strongly disagree		neither disagree/agree		strongly agree

9. Overall, I had a positive reaction to this strategy.

1	2	3	4	5
strongly disagree		neither disagree/agree		strongly agree

10. Overall, I believe telehealth (computer communication) was a good way to learn this strategy.

1	2	3	4	5
strongly disagree		neither disagree/agree		strongly agree

Modified from: The Treatment Acceptability Rating Form-Revised; (TARF-R; Reimers & Wacker, 1992)

Open-Ended Social Validity Questions

1. **In reference to interfering behaviors, are the strategies used successful in addressing these behaviors? Why/Why not?**
2. **Of the strategies being used, which are you most comfortable using? Least comfortable using?**
3. **What is working best for your child?**

APPENDIX J

SOCIAL VALIDITY QUESTIONNAIRE-TELEHEALTH

(Adapted TREATMENT ACCEPTABILITY RATING FORM—REVISED; TARF-R, Reimers & Wacker, 1988)

Please score each item by circling the number that best indicates how you feel about the telehealth procedures.

1. How clear is your understanding of the telehealth procedures?

1	2	3	4	5
Not at all clear		Neutral		Very clear

2. How acceptable do you find the telehealth procedures?

1	2	3	4	5
Not at all acceptable		Neutral		Very acceptable

3. The telehealth procedures were easy to use.

1	2	3	4	5
Not at all		Neutral		Very easy

4. If you had the opportunity to go through coaching sessions face to face rather than through telehealth sessions, how acceptable would it be to make the switch to face to face sessions?

1	2	3	4	5
Not at all acceptable		Neutral		Very acceptable

5. To what extent do you think there might be disadvantages in telehealth procedures?

1	2	3	4	5
None likely		Neutral		Many likely

6. How acceptable did you find the recording and submitting of videos outside of the telehealth sessions?

1	2	3	4	5
Not at all acceptable		Neutral		Very confident

7. How helpful were the telehealth sessions?

1	2	3	4	5
Not at all helpful		Neutral		Very helpful

8. How disruptive was is to carry out the telehealth procedures?

1	2	3	4	5
Not at all disruptive		Neutral		Very disruptive

9. How much do you like communicating using telehealth to learn intervention procedures?

1	2	3	4	5
Do not like it at all		Neutral		Like it very much

10. How willing would you be to suggest using telehealth coaching to others needing assistance?

1	2	3	4	5
Not at all willing		Neutral		Very willing

11. How much discomfort are you likely to experience while using telehealth procedures?

1	2	3	4	5
No discomfort at all		Neutral		Very much discomfort

12. How well will carrying out the telehealth procedures fit into your existing routine?

1	2	3	4	5
Not at all well		Neutral		Very well

13. How effective will the telehealth procedures be in teaching and supporting other parents?

1	2	3	4	5
Not at all effective		Neutral		Very effective

14. How well does the telehealth meet your needs in learning strategies to improve children's behavior?

1	2	3	4	5
Not at all		Neutral		Very much

Addendum to Social Validity

Do you have any additional comments to make about the telehealth procedures?

APPENDIX K

COVID-19 QUESTIONNAIRE

Coronavirus Stressor Survey

Below are several stressful experiences related to the ongoing coronavirus pandemic. For each experience, check one or more of the boxes to the right to indicate that: (a) it happened to you personally; (b) it happened to someone close to you; or (c) it doesn't apply to you.

Experience	Happened to me	Happened to someone close to me	Doesn't apply
1. Become ill from possible or certain exposure to the coronavirus			
2. Hospitalized from exposure to the coronavirus			
3. Job requires possible exposure to coronavirus			
4. Lost job or lost income due to the coronavirus pandemic			
5. Increased responsibilities at home due to the coronavirus pandemic			
6. Difficulty getting food, medication, important medical procedures or other necessities due to the coronavirus pandemic			

7. Over the past week, how much difficulty have you had getting the social support you need due to the coronavirus pandemic?

a) no difficulty at all
b) very little difficulty
c) some difficulty
d) a lot of difficulties
e) extreme difficulty

8. Over the past week, how many hours a day are you exposed to coronavirus information (radio, TV, Twitter, Facebook, Instagram, newspapers)?

a) none at all
b) less than an hour
c) about an hour
d) one to two hours
e) more than two hours

9. Over the past week, how much distress have you experienced related to the coronavirus?

a) no distress
b) very little distress
c) some distress
d) a lot of distress
e) extreme distress

10. Please describe anything else that concerns you about the impact of Coronavirus on you, your friends, or your family.

_____

_____

APPENDIX L

AVOIDING PROMPT DEPENDENCY

Avoiding Prompt Dependency in Modeling & Prompting

Definition:

- Modeling: showing a new way to use a toy to further play experience and exploration
- Verbal or Physical Prompting: using small teachable steps or helping hints to demonstrate how to do a new or unfamiliar experience

Modeling = "showing" so the child can copy
Verbal or Physical Prompting = "giving a little help" either using a visual or physical assistance

Purpose: Decrease frustration of "unable" behavior. It is important to remember you are not modeling or prompting *the only correct way*, as there are many creative ways to do something, but slightly increasing your child's understanding of how to complete a task.
Example: **Starting with the right amount of help.** The caregiver hands the child a shape for the shape sorter; the child takes shape and begins flipping the toy between their fingers. The caregiver holds another shape up at the child's eye level and says "look" then puts shape into sorter as a model. The caregiver hands another to the child and says, "you try." If a child doesn't imitate, graduated guidance should be used to prompt the child for success.
Non-example: **Starting with too much help.** The caregiver sees the child struggling to put a shape in the sorter. The caregiver put her hand over the child's hand and guides the child's hand to put the shape in the sorter. Next time child has the shape in their hand; they wait for the caregiver to guide them again.

Avoiding Prompt Dependence: Sometimes, when performing a task that is **possible but challenging** for a child, they learn to wait for help rather than challenge themselves to complete the task on their own. In the non-example above, the child could be approaching *prompt dependency*; that is, the child becomes dependent on the help from a caregiver rather than trying on their own.

The key here is *possible but challenging.*

1. Begin to observe what tasks your child might be able to do with practice, but can't quite do yet.

2. Use the steps of the first model (wait), second model (wait), and then provide a prompt only if they can't complete the task with model 1 or 2.

3. Start at the first model every time! Your child will surprise you when they begin to follow your lead after some practice with these new steps.

How to do it:

- Model: **Show** child an action with an item that s/he is interested in. **Demonstrate** a way to complete the task.

- Prompt: **Physical or verbal guidance**. Put a toy into the child's hand and supporting them with either verbal cues ("shake, shake, shake!") or physical prompts (hand-over-hand with a shaking movement) while they are touching the toy or pouring the crackers into the bowl.

- Remember to always **congratulate** them for their hard work with hugs, kisses, and happy words.

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