CAREGIVER-IMPLEMENTED RESPONSIVE INTERVENTIONS: SUPPORTING CAREGIVERS BASED ON PERFORMANCE

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Responsive Interactive Interventions (RII) are play-based strategies ideal for implementation in the natural environment for young children with autism spectrum disorder (ASD). This manuscript provides a systematic literature review of caregiver-implemented RIIs used for young children with ASD. Relevant components reviewed include common responsive strategies, methods for delivering information to caregiver participants and supporting them through practice, caregiver and child measures and results, and types of fidelity measures. The current review has led to the creation of a research study focusing on identifying the necessary supports for caregivers to achieve fidelity of implementation and maintain accurate responding when using three RII strategies. The level of supports delivered were based on performance from one session to the next. Two participant dyads achieved fidelity within each curricular lesson. Target accurate and inaccurate responding were achieved with minimal to no supports. However, fidelity criteria for accurate responding was not maintained on previously taught strategies once new strategies were initiated. Target inaccurate criteria was maintained, for both participants, for the duration of the study.

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1.0 INTRODUCTION

Social communication skills are identified as a core deficit in children with Autism Spectrum Disorder (ASD; American Psychiatric Association, 2013). Social communication consists of a variety of verbal and nonverbal behaviors used to mediate social situations (Whetherby, Watt, Morgan, & Shumway, 2007). These behaviors include expressive and receptive communication, body orientation, joint attention and engagement, interactive play skills, and imitation (Houghton, Schuchard, Lewis, & Thompson, 2013). Targeting behaviors that make up a child's social communication skills are essential in early intervention (EI) for children with ASD as these behaviors have been identified as crucial to acquiring access to the language-learning environments and social situations (Kong & Carta, 2013). Behavioral issues can also arise for children with ASD due to limited social and communication skills (Watkins et al., 2017). Persistent problem behaviors reduce a child's opportunities to participate in inclusive settings and ultimately affect later academic achievement (Prizant, Wetherby, Rubin, & Laurent, 2003) and quality of life (Watkins et al., 2017).

To address the social communication deficits in young children with ASD, research has been conducted using different intervention approaches, different teaching agents, and different locations. However, for young children, the primary source of learning often occurs within the home environment with the primary caregiver. By focusing on delivering quality interventions within the home and transferring skills to the primary caregiver, young children with ASD

experience increased opportunities to work on social communication skills (Kong & Carta, 2013).

1.1 INTERVENTION APPROACHES

Interventions that have been developed to address social communication skills in children with ASD fall into one of three approaches – behavioral, naturalistic behavioral, and developmental (Luiselli, Russo, Christian, & Wilczynski, 2008; Ingersoll, 2010; Schreibman et al., 2015). The behavioral approach uses techniques based on Applied Behavior Analysis, which posits that behaviors are controlled by the antecedents that occur before a behavior and by the consequences that follow (Cooper et al., 2007). Discrete Trial Training (DTT: Lovass, 1987) and Verbal Behavior (VB; Skinner, 1957) are examples of behavioral approaches. Within these approaches, teaching usually occurs in contrived highly structured settings in which the context is carefully managed to optimize learning (Tsao, 2008). Both DTT and VB are often paired with the application of errorless learning, a technique that provides a hierarchy of response prompts that eliminates the opportunity to emit an incorrect response (Etzel & LeBlanc, 1979). Because errorless learning reduces an individual's history of incorrect responding, it inherently increases exposure to reinforcing stimuli.

A naturalistic behavioral approach is also based on the principles of Applied Behavior Analysis. Examples include Incidental Teaching (IT; McGee, Morrier, & Daly, 1999) and Pivotal Response Treatment (PRT; Koegel, et al., 1989). Although there are significant overlaps in implementation style and strategy use (Ingersoll, 2010; Schreibman et al., 2015), the naturalistic behavioral approach is distinguished from a pure behavioral approach by its use of

the natural environment and more developmentally appropriate contexts for learning, rewards that are natural consequences of the behaviors displayed, and child preferred materials (Schreibman et al., 2015).

The developmental approach differs significantly from the behavioral approach but has much in common with the naturalistic behavioral approach in that it occurs in natural contexts focusing on child-selected materials, child-initiated interactions, and reinforcement that is natural to the setting and interaction (Ingersoll, 2010). In contrast, however, the developmental approach uses indirect *facilitative strategies* to promote general social communication skills rather than *prompting* to elicit discrete skills, often in environments that have been arranged to increase the probability of child initiations (Ingersoll, 2010; Veneker, McDuffie, Weismer, & Abbeduto, 2011). Such facilitative strategies represent adult responsivity (i.e., contingent imitation, indirect language stimulation, affective attunement) to promote developmentally appropriate social communication behaviors. Examples of the developmental approach include DIR/Floortime (Greenspan, 1992; Greenspan & Weider, 1997) and the Denver model (Rogers & DiLalla, 1991, Rogers & Lewis, 1989).

Etzel and LeBlanc (1979) proposed that the best approaches are interventions that increase motivation during age-appropriate, social situations. Although the behavioral approach increases access to rewards through prompting and errorless learning procedures, the rewards are often artificial (i.e., not related to the context or the interaction), focusing heavily on responses rather than initiated behaviors and limiting generalization of those behaviors to age-appropriate and functional social situations in the natural environment. The naturalistic behavioral approach, created in response to these limitations, employs the use of child-selected toys, child initiated activities, and natural rewards, but is still centered on predetermined opportunities and prompting

procedures focused on eliciting narrowly defined social communication skills (e.g., pointing, specific words) rather than facilitating the broader range of social-communication behaviors (e.g., social engagement, play, imitation). The developmental approach by utilizing such responsive facilitative strategies as contingent imitation, indirect language stimulation, and affective attunement creates naturally motivating and rewarding environments within social situations, placing emphasis on initiations rather than responses (Schreibman et al., 2015). This emphasis also increases motivation to socially engage through the removal of directives, demands, and prompting, thus decreasing escape behaviors prevalent among young children with autism. Such motivation rich environments also increase the likelihood that socially interacting will become naturally reinforcing and thus more likely to generalize to other people, settings, and materials.

No matter which social-communication intervention approach is used, for young children, the most natural environment is the child's home. Interventions taking place in the home can take advantage of play situations with consistent communication partners and with items the child has readily available, ensuring that teaching will occur within the contexts under which social communication behaviors should naturally occur and generalize (Kong & Carta, 2013). For early learners, the most appropriate communication partners are parents and other caregivers because they are the ones from whom the earliest social communication skills such as language, imitation, play, and joint attention are typically learned (Hart & Risley, 1995).

Responsive Interaction Interventions (RII), which are prominent in developmental approaches to social communication, are strategies that seek to increase caregiver responsiveness to child behavior (Kong & Carta, 2013). The development of RII can be traced back to early research on parental control. Baumrind (1966) identified three models of parental control:

permissive, authoritarian, and authoritative. The models provide two extremes, *permissive*, which is characterized by making no demands to control child behavior, and *authoritarian*, characterized by directing the child's actions and implementing rule-governed punishment (Turner, Chandlar, & Heffer, 2011). The third model, authoritative, lies in the middle of the extremes and includes both providing direction and parental responsiveness. Through the evaluation of relevant literature, it was found that authoritarian parenting styles led to greater academic achievement (Baumrind, 1966). These findings were later confirmed through examining the effects of each model on the academic achievement of young children (Baumrind, 1991; Baumrind & Black, 1967). Though early research was not specific to children with ASD or social communication behaviors, it demonstrated a relationship between caregiver behavior and child achievement and highlighted the notion of parental responsiveness as a key component to success.

The connection between parental responsiveness and early childhood development has since been examined using Relationship-focused Interventions (RFI; Bornstein & Tamis-LeMonda, 1989; Landry, Smith, & Swank, 2003, 2006; McCollum & Hemmeter, 1997; Trivette, 2003) and has born new packaged interventions such as Responsive Teaching (RT; Mahoney & MacDonald, 2007) that include RII strategies. Karaaslan and Mahoney (2015) identify RII strategies as contingency, reciprocity, affect, and match. These strategies promote immediate responding to behavior, maintaining interactions that are fun, taking a turn and waiting, and imitating the child's behavior at their current level of performance.

1.2 RESPONSIVE INTERACTIVE INTERVENTIONS

Given that the home environment with caregivers as intervention agents represent advantageous conditions for young children to learn and use social communication behaviors, RIIs would seem to be an appropriate method for targeting these pivotal skills in children with ASD. Evidence suggests that RIIs increase generalized social communication skills rather than targeting specific skills, one at a time (Ingersoll, 2010). Increased responsiveness of caregivers has been shown to be beneficial for the acquisition of language and other social communication behaviors (Siller & Sigman, 2002; Mcduffie & Yoder, 2010; Veneker et al., 2011). A number of social communication intervention models for children with ASD have either focused exclusively on (e.g., Greenspan & Weider, 1997; Mahoney & Perales, 2003; Solomon, Necheles, Ferch, & Bruckman, 2007) or included RII strategies in conjunction with direct teaching approaches (Kaiser, 1993; Rogers & DiLalla, 1991; Yoder & Warren, 1998). Many of these have been created with caregiver implementation in mind.

Literature on the use of RII in EI demonstrates a relationship between the use of caregivers as interventionists and decreased parental stress (Solomon, et al., 2014), an increase in child exposure to quality interventions and social interactions (Mahoney & Perales, 2003), and improved child-caregiver relationships (Kenny & Winick, 2000). Although both naturalistic behavioral and developmental approaches are implemented by caregivers, developmental approaches that include RIIs are usually intended to be exclusively implemented by the caregiver (Ingersoll, 2010).

1.3 CAREGIVER TEACHING MODELS IN RII

Methods for teaching caregivers how to implement RII strategies are an important component regardless of the model. Modes for transferring information from the experimenter to the caregiver and supporting strategy use throughout implementation can be found in the RII literature. The transfer of information can come in the form of a didactic lesson during individual sessions (Schaefer & Briesmeister, 1989), group interactions (Roberts & Kaiser, 2012; Cardon, 2012; Girolametto, Weitzman, & Greenberg, 2004), or distance learning such as web-based lessons (Antonini, et al., 2014). During the didactic component, caregivers are provided with information about the rationale and benefits of strategy use, how to perform the strategies, and tips for implementing.

Systems of support are also employed to aid in the acquisition of the designated strategies by giving caregivers the opportunity to view and to practice the strategies in the presence of the trainer. Commonly used caregiver supports are live modeling and self-modeling (DiCarlo, Onwujuba, & Baumgartner, 2014), use of video recordings as examples and non-examples of appropriate implementation (Roberts, Kaiser, Wolfe, Bryan, & Spidallieri, 2014; Schertz, Odom, Baggett, & Sideris, 2013) and coaching (Kaiser, Hancock, & Niefeld, 2000). Such supports occur separately from the initial delivery of the strategy information during the didactic lesson. Each type of support provides an example of the strategies, a method for delivering feedback based on the caregiver's performance, and/or a means for problem solving challenging situations during implementation. Depending on the type of support in place, the time of delivery in relationship to the caregiver's practice of the intervention differs. The delivery of these supports can be delineated into three key stages of practice: prior to practice, during practice and after practice. Modeling, video modeling, and verbal rehearsal generally take place prior to practice.

Coaching and informational aids occur during practice. Oral and written feedback, video feedback, homework, and collaborative problem solving occur after practice.

With a variety of supports available, the relative contribution of each type of support (i.e., before, during, or after practice) toward the caregiver's ability to accurately implement the intervention is essential information. Identifying relevant and effective supports can help to streamline caregiver teaching methods. Systems of support are used to increase the likelihood that caregivers will implement strategies as intended. Examining the literature on caregiver implemented RIIs for young children with ASD will provide an understanding of commonly used support systems and help in the development of future research in identifying the active ingredients within those systems.

1.3.1 Fidelity of implementation

Intervention fidelity in caregiver-implemented interventions is the measure of the caregiver's ability to accurately and consistently implement the intervention (Schoenwald et al., 2010). Research employing caregivers as interventionists must define how the strategies are to be implemented and measure the extent the caregivers implement the strategies as intended. Doing so helps to ensure that a demonstrated functional relationship between the intervention (i.e., the independent variable) and the outcome (i.e., the dependent variable) is the result of the prescribed intervention (Kennedy, 2005). The expectation is that if fidelity is high, child outcomes will be correspondingly positive (Barton & Fettig, 2013).

Dunst, Trivette, and Rabb (2013) outline quality and quantity as two key features in measuring fidelity found across the literature on early childhood interventions. These features were also described as *how much* and *how well* (p 92). *How much* refers to the quantity of

intervention and is often measured as an amount. *How well* refers to the quality of implementation as it relates to the underlining characteristics intended for the intervention (Dunst et al., 2013). Both aspects can and should be measured to ensure that it is the intervention (independent variable) that has truly been responsible for behavior change (dependent variable). These dimensions were derived from common components found within fidelity measures in educational research.

Beyond concentrating on the features described by the aforementioned fidelity definitions, it is also clear that procedures for measuring fidelity must be both reliable and valid (Barton & Fettig, 2013). Reliability refers to the repeatability of findings or individual measures (Cooper et al., 2007). Measurement of behavior should remain consistent across repeated evaluations (Johnston & Pennypacker, 1993). For a fidelity measure in a study to be considered reliable, two independent evaluators must reach the same, accurate measurement. Validity refers to whether measurement of behavior directly relates to the intent of the overall investigation and answers three important questions: 1) Is the behavior to be measured socially significant? 2) Is the dimension of the behavior being measured relevant to the investigation's purpose? 3) Is the behavior being measured at relevant times and under relevant conditions (Cooper et al, 2007).

Fidelity measures used in caregiver-implemented interventions can be either indirect or direct. Indirect measures include self-reports and adherence questionnaires, which are often selected because they are simple and timely options. Brown and Rahn-Blakeslee (2009) discussed the give and take of selecting appropriate measurement procedures, pointing out that while indirect methods such as self-report are simpler and more cost effective, they are inherently less reliable. While there is value in the information that indirect measures provide, emphasis has been placed on moving away from using only anecdotal and indirect measures to

direct measures of fidelity to better establish evidence-based practices. Direct observational methods, although more time-consuming, provide more information regarding implementation components and better address the key features of fidelity (Brown & Rahn-Blakeslee, 2009).

Direct observational methods include data collection based on observing the behaviors of the caregiver in real time or through video. Rating scales, checklists, and concrete observational data are methods that provide information on the implementer's ability to apply a desired intervention with accuracy and consistency. Each observational method offers strengths and weaknesses in the measurement of fidelity. A rating scale evaluates adherence to intervention based on a point scale continuum with quality indicators such as *sometimes, always, never*. Different types of rating scales, adaptations of the Likert scale, are widely used in RII interventions (e.g., Ingersoll, Dvortcsak, Whalen, & Sikora, 2005; Lesack, Bearss, & Celano, 2014; Stadnik & Stahmer, 2015). Critical features of an intervention are rated on the continuum scale using the judgments of the rater given the behaviors observed, typically a judgment that represents a summary over some period of time. Once completed, fidelity of implementation is typically summarized by a single score that represents responding across the continuum on all the critical features of the intervention (Ary, Jacobs, Sorensen, & Walker, 2014). Rating scales attempt to provide information on both quality and quantity. However, capturing quantity using a rating scale is often subjective, leaving a range of frequency of behaviors (e.g., sometimes, most of the time) as acceptable. This method also presents challenges when reporting reliability data. Accuracy of reporting depends on rater characteristics affecting objectivity and reliability (Ilgen, Ma, Hatala, & Cook, 2015). Typically, interobserver agreement is measured within plus or minus one point on the point scale continuum, so on a five-point scale, for example, acceptable variability can represent 60% of the scale or a range of *sometimes* to *all the time*. The

range of acceptable adherence to quantity measures weakens reliability across observers. Untrustworthy reliability weakens the validity of the results.

Checklists use a yes/no system to indicate the presence or absence of a predetermined and defined behavior. As a direct measure, it is tied to observation of behaviors as they occur in real time (Ilgen et al., 2015). Unlike a rating scale, a checklist does not summarize judgments across time on a continuum, but rather is a concrete measure of whether a behavior has or has not occurred (Ary et al., 2014). An advantage to the checklist is that the use of operationally defined behaviors and a clear scoring system creates more accurate data collection, but works best for features of an intervention that are intended to occur once per measurement period. When identifying whether checklists address the *how much* or *how well* dimensions, it is important to understand the features of an intervention being measured and the purpose of the data derived from the checklist (Ginsburgh, McLlroy, Oulanova, Eva, Regehr, 2010). When working with interventions that include strategies that are meant to occur more often than once or interspersed across a period, the yes/no system does not address the key dimensions of fidelity very well unless the checklist becomes a measure of frequency by noting each time the feature occurs. For example, if the feature is "presentation of a communicative temptation every 3 minutes," a simple yes/no may be a difficult judgment to make if the implementer is erratic in administering the feature. Limiting coding to a yes/no system provides the opportunity to accurately determine if a behavior has or has not occurred so long as the listed behaviors are empirical and conducive to a yes/no response. Checklists are particularly advantageous for measuring the occurrence of one-time events. Agreement between observers may be harder to achieve than in a rating scale paradigm in which there is some wiggle room in determining agreement, but the rigor of reaching reliability creates a more accurate system for determining accurate fidelity. This rigor

contributes to the validity of the system as it demonstrates the consistency of the measurement procedure.

Direct observational data methods also include ***concrete*** methods for coding behavior such as frequency, duration, latency, or time sampling procedures (Hintz, Volpe, & Shapiro, 2008). Selecting a measurement method is dependent on the measurable dimensions of behavior, repeatability (instances of behavior occurring repeatedly through time), temporal extent (instances of behavior occur across some amount of time), and temporal locus (instances of behavior occur at specific points in time) (Cooper et al., 2007). To use concrete observational data to measure fidelity, intervention strategies must be broken down into discrete, operationally defined behaviors. This process lends itself to addressing the *how well* feature of fidelity as each step in the intervention is measured every time the intervention is delivered. Each characteristic of the intervention is measured, portraying the implementer's ability to accurately use intervention strategies. These concrete methods also easily permit the determination of *how much* (or *how often*) an intervention is delivered. Using these more accurate measurement procedures in turn strengthen the precision of reliability. Concrete measurement methods have greater accuracy, which provides proof that the observed measurement of behavior is, in fact, the true value (Johnson & Pennypacker, 1993a). Increasing accuracy increases the opportunity to demonstrate valid procedures, as measurement is more likely to be replicable and true to the behaviors that have occurred. The features of fidelity (i.e., how much and how well) and the concepts of reliability and validity must be taken into consideration throughout research to ensure appropriate application of intervention and an evaluation of effective practice.

1.4 STATEMENT OF THE PROBLEM

There are three different intervention approaches to establishing social communication in young children with ASD: behavioral, naturalistic behavioral, and developmental (Luiselli et al., 2008; Ingersoll, 2010; Schreibman et al., 2015). RIIs, which are representative of the developmental approach, may be ideal for young children with ASD as they increase motivation and are applied in the child's natural environment (Kong & Carta, 2013). RIIs also promote generalization of skills through targeting general social communication skills, appropriate to a play context, rather than singling out individual behaviors, one at a time (Ingersoll, 2010). Within RII interventions, strategies are taught to caregivers using a variety of didactic delivery models and support methods with the intention that they learn to deliver the intervention to their children accurately and consistently, that is, *with fidelity*. To better understand how caregivers achieve fidelity in the delivery of the intervention, researchers need to better understand how didactic delivery and the system of supports used before, during, and following parent practice contribute to fidelity. Furthermore, to demonstrate the reliability and validity of the intervention, and clearly address the dimensions of fidelity (i.e. *how much* and *how well*), researchers must employ concrete observational methods to measure fidelity as precisely as possible.

2.0 LITERATURE REVIEW

The purpose of this literature review is to determine relevant trends in RII literature and identify areas of interest for future development. Specifically, this literature review will address three main questions:

1. What RII strategies were taught to caregivers?
2. What were the methods used for supporting caregivers in learning to implement interventions?
3. What were the caregiver and child outcome of the studies?
    a. What caregiver and child measures were used?
    b. To what extent was caregiver fidelity measured in the studies as a dependent variable or to assure consistency/accuracy of intervention delivery and how was it measured?

2.1 SEARCH METHOD

2.1.1 Search criteria

A comprehensive search of electronic databases (PsychINFO, ERIC, and PsychArticles) accessed through the PittCat library system was conducted in the spring of 2016. The following key words were included in the search terms: *responsive, RII, child led, communication, social,*

language, parent, autism, ASD. These terms were used in coordination with the following limiters to further restrict the search: *infant, toddler, birth-5, peer reviewed.* Additionally, ancestral searchers of relevant reviews were conducted to identify articles that met inclusion criterion (Kong & Carta, 2011; Patterson, Smith, & Mirenda, 2011).

2.1.1.1 Inclusion criteria

Studies included for review met the following criteria: (a) studies were peer reviewed and included the systematic manipulation of an intervention to test for a desired outcome, (b) the independent variables (IV) included were responsive in nature and made up all or part of the intervention of focus, (c) the study included parents as the primary implementer of the IV and provided parent outcome measures, (d) child participants were identified with ASD and under 6 years of age. Studies were excluded if (a) caregivers acted as an agent but there wasn't sufficient description of their participation or measurement of their behaviors (e.g., Kennedy & Winick, 2000; Landa, Holman, O'Neil, & Stuart, 2011; Siller & Sigmand, 2002; Siller & Sigman, 2008), (b) the study did not include a sufficient responsive component (e.g., Lesack et al., 2014; Randolph, Sticher, Schmidt, & O'Connor, 2011; Symon, 2005; Koegel, Symon, & Koegel, 2002; Rocha, Schreibman, & Stahmer, 2007), and (c) all participants within the study were not identified as being within the appropriate age range of birth -5 years and diagnosed with ASD (e.g., Girolametto, Sussman, & Weitzman, 2014; Hemmeter & Kaiser, 1994; Kaiser & Roberts, 2013; Stadnick et al., 2015; Yoder & Warren, 2002).

2.2 RESULTS

The results of the search yielded 15 studies for review, eight randomized controlled trials (RCT: Aldred, Green, & Adams, 2004; Green et al., 2010; Ingersoll & Wainer, 2011; Kasari, Gulsrud, Wong, Kwon, & Locke, 2010; Kasari, Gulsrud, Paparella, Hellemann, & Berry, 2015; Kasari et al., 2014; Siller, Swanson, Gerber, Hutman, & Sigman, 2014; Solomon et al., 2014), five single-subject design studies (SS: Ingersoll & Gergans, 2007; Ingersoll & Wainer 2013; Kaiser, Hancock, & Nietfeld, 2000; Kashinath, Woods, & Goldstein, 2006; Vismara, Colombi, & Rogers, 2009), and two quasi-experimental group design studies (Ingersoll & Dvortcsak, 2006; Prelock, Calhoun, Morris, & Platt, 2011). Each study was examined to identify the intervention strategies taught to caregivers, methods for training and supporting parents, adult and child outcomes, including methods of measurement, and generalization of caregiver behaviors, including methods of measurement (See Tables 1 & 2).

2.2.1 Intervention strategies

The fifteen studies represented twelve different packaged interventions representing eight using a developmental approach (Aldred et al., 2004; Green et al., 2010; Ingersoll & Gergans, 2007; Kaiser et al., 2000; Kashinath et al., 2006; Prelock et al., 2011; Siller et al., 2014; Solomon et al., 2014), three studies combining both naturalistic behavioral and developmental approaches (Ingersoll & Dvortcsak, 2006; Ingersoll & Wainer, 2011; Ingersoll & Wainer, 2013), and four studies combining both behavioral and developmental approaches (Kasari et al., 2010; Kasari et al., 2014; Kasari et al., 2015; Vismara et al., 2009).

The specific packaged interventions included: a developmental Social Communication Intervention (Aldred et al., 2004), a developmental approach called Parent-mediated

Communication-focused Treatment in Children with Autism (PACT; Green et al., 2010), three studies using Project ImPACT, a combination of naturalistic behavioral and developmental approaches (Ingersoll & Dvortcsak, 2006; Ingersoll & Wainer, 2011; Ingersoll & Wainer, 2013), a developmental, Reciprocal Imitation Training program (RIT; Ingersoll & Gergans, 2007), Enhanced Milieu Teaching, a developmental approach (EMT; Kaiser et al., 2000), Joint Attention, Symbolic Play, Engagement, and Regulation (JASPER; Kasari et al., 2015) or an adaptation of the model which both combine behavioral and developmental approaches (Kasari et al., 2010). Additional developmental approaches include Routines Based interventions (RBI; Kashinath et al., 2006), More Than Words (MTW; Prelock et al., 2011), Focused Playtime Paragraph. Intervention (FPI; Siller et al., 2013), Play and Language for Autistic Youngsters (PLAY) Project Home Consultation model (Solomon et al., 2014). Lastly, the Early Start Denver Model was represented in the literature and combines behavioral and developmental methods (ESDM; Vismara et al., 2009) (see Table 1).

Each of the studies under review involved the use of RII strategies as all or part of the intervention. Although a variety of methods were covered across the fifteen studies, there was a great deal of overlap, often presented in a different format or package. Use of different terms also indicated that many authors were reporting similar strategies under different names. For example, “establishing shared attention” vs “following the child’s lead” and “synchronicity” vs. “commenting.” In coding the articles under review, strategies were identified and grouped together based on definition, rather than term. Overall, 5 different responsive strategies were found within the literature: 1) following the child’s lead, 2) contingent imitation, 3) commenting, 4) modeling and expanding language, and 5) expanding play.

2.2.1.1 Following the child's lead

A common thread across all studies (100%) was the implementation of the method of following the child's lead as a key component of the intervention. Following the child's lead includes allowing the child to select the item or activity of interest while avoiding recruitment of the child's interaction elsewhere, remaining on their level, and engaging in the play the child has selected.

2.2.1.2 Imitating the child

Imitating the child (i.e., contingent imitation) was another common intervention strategy seen in the literature. Contingent imitation includes the caregiver replicating the child's object actions, motor movements, and/or vocal behaviors. These actions need not be an exact replication of the child's behavior but are recognizable as sufficiently similar (Ingersoll & Schreibman, 2006). For example, if the child engages in banging two blocks together, the caregiver would mirror the behavior by also banging two blocks together or banging together two objects similar in size and/or shape. Twelve studies (80%) incorporated imitating the child as a part of their intervention to increase the communicative responsiveness of the parent (Aldred et al., 2004; Ingersoll & Dvortcsak, 2006; Ingersol & Gergans, 2007; Ingersoll & Wainer, 2011; Ingersoll & Wainer, 2013; Kaiser et al., 2000; Kasari et al., 2010; Kasari et al., 2014; Kasari et al., 2015; Kashinath et al., 2006; Prelock et al., 2011; Siller et al., 2013).

Table 1 Design, Caregiver Training Components, and Interventions

	Author(s)	Design	Caregiver Training Components		Intervention
			Dosage	Caregiver Supports	
1	Aldred et al., (2004)	RCT	Workshops, 1 individual clinic session per month across 6 months, followed by 2 sessions per month across 6 months	Video feedback	The Child's Talk Project
2	Green et al. (2010)	RCT	Bi-weekly, 2h clinic sessions for 6 months, followed by booster sessions for 6 months	Video feedback	PACT
3	Ingersoll & Dvortcsak (2006)	Quasi experimental, group design	1 session per week across 9 weeks. 6, 1 hour group clinic sessions. 3, 45m individual clinic sessions	Homework Coaching (twice across 9 weeks)	Parent Training curriculum
4	Ingersoll & Gergans (2007)	SS	1, 30-40 minute clinic session per week, across 10 weeks	Modeling, practice and feedback	RIT
5	Ingersol & Wainer (2011)	Quasi experimental, group design	bi-weekly, 2 hour clinic sessions per week across 3-4 months	45m, bi-weekly coaching sessions (interspersed with group sessions) Modeling, feedback, Written manual	Project ImPACT
6	Ingersoll & Wainer (2013)	SS	1-2, 1h, individual clinic sessions per week, across 12 weeks	Coaching, Written manual	Project ImPACT

Table 1 continued

7	Kaiser et al., (2000)	SS	2, 45m individual, clinic sessions per week, across 12 weeks 9 individual, home sessions for generalization	Feedback, role-playing, modeling, coaching	EMT
8	Kasari et al. (2010)	RCT	3, 40m individual clinic sessions per week across 8 weeks.	Modeling, guided practice, feedback, worksheets/informational aids	JA Intervention
9	Kasari et al. (2015)	RCT	a) 2, 30m individual clinic session per week across 10 weeks b) 1, 1h individual clinic session per week across 10 weeks	a) coaching written materials	a) JASPER b) PEI
10	Kasari et al. (2014)	RCT	a) 2, 1h individual sessions in the home per week, across 12 weeks b) 1, 2h group session per week, across 12 weeks	a) coaching, written materials b) written materials	a) CMM b) CEM
11	Kashinath et al. (2006)	SS	2, 60-90 minute home sessions per week, across 5-6m	Handouts, Verbal rehearsal, Video modeling, Modeling and practice with feedback, Collaborative problem solving	RBI
12	Prelock et al. (2011)	Quasi experimental, group design	2,5h group clinic sessions across 8 weeks	Oral and written feedback based on video recorded sessions	a) MTW b) JAT
13	Siller et al. (2014)	RCT	1, 90m individual home session per week across 12 weeks	Modeling and coaching, Video feedback, collaborative problem solving	FPI

Table 1 continued

14	Solomon et al. (2014)	RCT	1, 3h individual home visit per month across 12 months.	Coaching, modeling, video feedback	PLAY Project
15	Vismara et al. (2009)	SS	1, 1h individual clinic session per week across 12 weeks	Handouts, observed practice, feedback, coaching, modeling	a) ESDM b) PRT

Notes: RCT: Random Controlled Trial, SS: Single Subject, PACT: Parent-mediated Communication-focused Treatment in Children with Autism, RIT: Reciprocal Imitation Training, EMT: Enhanced Milieu Teaching, JA: Joint Attention, JASPER: Joint Attention, Symbolic Play, Engagement, and Regulation, PI: Psychoeducational Intervention, CMM: Caregiver-Mediated Module, CEM: Caregiver Education Module, RBI: Routine Based Intervention, MTW: More Than Words, JAT: Joint Attention Training, FPI: Focused Playtime Intervention, ESDM: Early Start Denver Model, PRT: Pivotal Response Training

2.2.1.3 Commenting

Commenting on the child's behavior during intervention was also identified as a key component to addressing responsiveness to child behaviors (Kong & Carta, 2011). The strategy involves the caregiver's use of language to insert intention and narration onto the child's behaviors (Green et al., 2010). For example, if the child engages in banging two clocks together, the caregiver might insert the comment of, "Bang, Bang", "clap, clap", or "one, two." Comments are meant to be at the child's developmental level and may be repetitive throughout play-sessions. Commenting on child behaviors has been identified as a specific intervention strategy within nine of the fifteen (60%) studies (Aldred et al., 2004; Green et al., 2010; Ingersoll & Dvortcsak, 2006; Ingersoll & Wainer, 2011; Ingersoll & Wainer, 2013; Kasari et al., 2010; Kasari et al., 2014; Kasari et al., 2015; Prelock et al., 2011) and has also been referred to in the literature as linguistic mapping (Green et al., 2010; Ingersoll & Gergans, 2007). Three studies also discuss the removal of directives, questions and prompts as a supplement to commenting (Ingersoll & Dvortcsak, 2006; Ingersoll & Wainer, 2011; Ingersoll & Wainer, 2013).

2.2.1.4 Modeling and expanding language

Modeling and expanding language, and variations of such strategies, were used within several of the studies reviewed. Modeling includes providing appropriate language around the interest or behaviors of the child without obligating the child to imitate (Kashinath et al., 2006). Expanding language includes directly repeating vocal output emitted by the child and expanding on that language in an intentional and developmentally appropriate manner. Identifying the child's current language ability and expanding to the next hierarchal level provides appropriate examples for the child based on their interests. For example, if the child is engaging in banging two blocks together, the caregiver might begin by saying, "bang, bang" and then continue to include additional word models, such as "bang, bang blocks" or "bang, bang red block." Twelve of the 15 studies (80%) included modeling and expanding language as an intervention strategy (Aldred et al., 2004; Green et al., 2010; Ingersoll & Dvortcsak, 2006; Ingersoll & Gergans, 2007; Ingersoll & Wainer, 2011; Ingersoll & Wainer, 2013; Kaiser et al., 2000; Kasari et al., 2010; Kasari et al., 2014; Kasari et al., 2015; Kashinath et al., 2006; Vismara et al., 2006).

2.2.1.5 Expanding play

Several studies also focused on expanding play routines. Procedures for expanding play parallel those of expanding language. Within this strategy, caregivers use moments of engagement to provide expanded examples of appropriate play with child-selected toys, without obligating the child to imitate those play examples. For example, after imitating the child's behavior of banging the blocks together the caregiver might incorporate stacking the blocks on top of one another. Eight of the 15 studies (53%) incorporated expanding play (Green et al., 2010; Ingersoll & Dvortcsak, 2006; Ingersoll & Wainer, 2011; Ingersoll & Wainer, 2013; Kaiser et al., 2000; Kasari et al., 2010; Kasari et al., 2014; Kasari et al., 2015). Aldred et al. (2004) discussed

"variation" as a method of expanding play. In this example, subtle breaks are used to expand the child's interactive games and transfer control from the child to the caregiver (Aldred, Pollard, & Adams, 2001, p472).

2.2.1.6 Other strategies

Within the packaged interventions reviewed, many continue beyond the use of RII strategies and incorporate direct teaching components. These included techniques derived from naturalistic behavioral strategies and were described as: prompting and shaping (Ingersoll & Dvortcsak, 2006; Ingersoll & Wainer 2011, Ingersoll & Wainer 2013; Kaiser et al., 2000; Vismara et al., 2009) and gestural and visual prompts to continue in each routine (Kashinath et al., 2006).

In addition, items in the environment were manipulated in coordination with prompting strategies to provide communicative opportunities. Five studies included some type of communicative temptation. Ingersoll and Dvortcsak (2006) identified in-sight and out of reach, inadequate portions, sabotage, and silly-situations as methods for using the environment to create the necessity for spontaneous language use. These same strategies were used in two additional studies (Ingersoll & Wainer, 2011; Ingersoll & Wainder, 2013). Similarly, Aldred et al. (2004) and Green et al. (2010) incorporated the use of "*communicative teasers"* that are defined as deliberate mistakes posed within the environment (Aldred et al., 2004, p 472). In all studies, communicative temptations are incorporated into the strategy use repertoire of the caregiver after mastery of RII techniques.

2.2.1.7 Intervention packages

Nearly all the studies included multiple RII strategies within their intervention package. Eight studies (53%) used all five RII strategies: following the child's lead, contingent imitation,

commenting, modeling and expanding language, and expanding play (Aldred et al., 2004; Ingersoll & Dvortcsak, 2006; Ingersoll & Wainer, 2011; Ingersoll & Wainer, 2013; Kaiser et al., 2000; Kasari et al., 2010; Kasari et al., 2014; Kasari et al., 2015). One study used four of the five RII strategies: following the child's lead, commenting, modeling and expanding language, and expanding play (Green et al., 2010). Three studies used three of the RII strategies (Ingersoll & Gergans, 2007; Kashinath et al., 2006; Prelock et al., 2011). Two of these three studies used a combination of: following the child's lead, contingent imitation, and modeling and expanding language (Ingersoll & Gergans, 2007; Kashinath et al., 2006). Prelock et al. (2011) used a combination of following the child's lead, contingent imitation and commenting as the RII strategies that made up their packaged intervention. Two studies (13%) used two of the RII strategies (Siller et al., 2014; Vismara et al., 2009). Siller et al. (2014) and Solomon et al. (2014) used both following the child's lead and contingent imitation, while Vismara et al. (2009) used following the child's lead and modeling and expanding language.

Differential effects of RII strategies were rarely identified across the studies under review. Due to the nature of group design studies, researchers were not able to report on the active components of the intervention, but rather the effects of the entire package on child behaviors. The opportunity to make such claims within the single subject design studies, was also limited due to the selection of primary dependent variables. All but one of the studies using single subject design (Ingersoll & Wainer, 2013) used caregiver outcomes as the primary dependent variable, allowing for a functional relationship to be demonstrated between caregiver training strategies and the measure of caregiver outcome, but limiting what can be said about the relationship between RII strategies and changes in child behaviors.

2.2.2 Parent training strategies

The way the intervention was taught to caregiver participants can be broken down into two methods: 1) Delivery of new content, or how and when new content was relayed to caregivers and 2) Systems of support, or how that content was supported during the delivery of the intervention to the child. These methods were not mutually exclusive as any given intervention may use one or more methods as the primary means of teaching intervention strategies.

2.2.2.1 Delivery of new content

The means in which the intervention was taught to caregivers include location of delivery and temporal and formatting characteristics. Location of delivery and implementation across the literature includes natural (home) and contrived (clinic) settings. The key temporal factors identified in the literature include when the content was delivered (i.e., all at once or a little at over time) and for what duration (i.e., during a two-hour session or 10-minute synopsis). Dosage refers to the total time spent in intervention (Schreibman et al., 2015). Formatting characteristics identified in the literature include didactic, whole group, or a combination of formats, used when delivering intervention information. Location and characteristics of dosage and format are important when assessing caregiver interventions due to social validity concerns, all contribute to the feasibility of converting research to practice (Schreibman et al., 2015). Specifics on delivery per study can be found in Table 1.

The setting of intervention is of interest when it comes to caregiver-implemented interventions because it highlights accessibility and other social validity concerns as well as the potential for generalization. Each of the play-based interventions represented is ideal for implementation in the caregiver's home, the natural environment of any young learner (Kenny & Winick, 2000). Only four studies (Kasari et al., 2014; Kashinath et al., 2006; Siller et al., 2013;

Solomon et al., 2014) were exclusively conducted in the participants' homes rather than a contrived setting. There was, however, an expectation that caregivers conduct at home practice or homework across studies. In most instances, however, home practice and homework were not measured as a dimension of the study.

Across the 15 studies under review, seven delivered content to caregivers on a weekly basis (Ingersoll & Dvortcsak, 2006; Ingersoll & Gergans, 2007; Ingersoll & Wainer, 2013; Kaiser et al., 2000; Prelock et al., 2011; Siller et al., 2013; Vismara et al., 2009). Of the remaining studies, two conducted bi-weekly sessions (Green et al., 2010; Ingersoll & Wainer, 2011), three conducted sessions twice per week (Kasari et al., 2014; Kaiser et al., 2015; Kashinath et al., 2006), and one conducted sessions three times per week (Kasari et al., 2010). Solomon et al. (2014) and Aldred et al. (2004) held one session per month.

Duration of sessions ranged from approximately 30-45 minutes, seen in four studies (Ingersoll & Gergans, 2007; Kaiser et al., 2000; Kasari et al., 2010; Kasari et al., 2015) to 2-2.5 hours, seen in three (Green et al., 2010; Ingersoll & Wainer, 2011; Prelock et al., 2011). The majority, six studies, conducted session approximately 1-1.5 hours in length (Ingersoll & Dvortcsak, 2006; Ingersoll & Wainer, 2013; Kasari et al., 2014; Kashinath et al., 2006; Siller et al., 2014; Vismara et al., 2009). The monthly session held by Solomon et al. (2014) lasted for 3 hours. Aldred et al. (2004) did not indicate the duration of their monthly sessions.

Dosage, or total hours of time the trainer engages the caregiver, across studies varied due to differences in the duration of individual sessions and length of the study. Total time spent engaging with the trainer was calculated by multiplying the number of sessions by the duration of each session. The range in total dosage was between 6 and 36 hours. Three studies engaged in in-person intervention for 5-6 hours total (Ingersoll & Dvortcsak, 2006; Ingersoll & Gergans,

2007; Ingersoll & Wainer, 2011). Total length of each of the three studies was 9 weeks (Ingersoll & Dvortcsak, 2006), 10 weeks (Ingersoll & Gergans, 2007), and 12-16 weeks (Ingersoll & wainer, 2011) respectively. Three studies reported 10 total hours of intervention (Kasari et al., 2014; Kashinath et al., 2006; Prelock et al., 2011). Total length of the studies was 10 weeks (Kasari et al., 2014), 20-24 weeks (Kashinath et al., 2006), and 8 weeks (Prelock et al., 2011). Four studies reported a total of 12-18 hours of intervention. Vismara et al. (2009) reported a total of 12 hours in intervention across 12 weeks; Kasari et al. (2010) reported a total of 16.5 hours in intervention across 8 weeks, and Kaiser et al. (2000) and Siller et al. (2014) both reported 18 hours in intervention across 12 weeks. Two studies reported up to 24 hours in intervention. Ingersoll and Wainer (2013) reported a range of 12-24 hours of total time caregivers spent receiving intervention across 12 weeks. Kasari et al. (2014) reported 24 hours in intervention for all participants across a 12-month period. Finally, Solomon et al. 2014 reported that each participant received a total of 36 hours of intervention across a 12-month period. Two studies conducted 6 months of intervention, followed by 6 months of booster or follow-up sessions. Green et al. (2010) reported 24 hours of total time in intervention across the first 6 months. Aldred et al. (2004) did not report the duration of each intervention session.

The primary means for delivering information was the use of a one-to-one didactic format, which was used by 12 studies (Green et al., 2010; Ingersoll & Gergans, 2007; Ingersoll & Wainer, 2011; Ingersoll & Wainer, 2013; Kaiser et al., 2000; Kasari et al., 2010; Kasari et al., 2014; Kasari et al., 2015; Kashinath et al., 2006; Siller et al., 2013; Solomon et al., 2014; Vismara et al., 2009). One study used a group format to deliver information to caregiver participants (Prelock et al., 2011). The two remaining studies used a combination of methods. Ingersoll and Dvortcsak (2006) incorporated both group and individual meetings for their

participants; however, the delivery of content occurred during the group interactions while additional supporting strategies were used during individual sessions. Similarly, Aldred et al. (2004) implemented initial workshops for participants and then proceeded to individual sessions.

2.2.2.2 Support of content

A variety of methods were used to support caregivers through strategy implementation (see Table 1). Methods included using supports at key times in relationship to caregiver practice. Six different methods were identified across the literature to help support caregiver implementation of strategies. Video feedback was used in four studies (Aldred et al., 2004; Green et al., 2010; Siller et al., 2013; Solomon et al., 2014); modeling in eight studies (Ingersoll & Gergans, 2007; Ingersoll & Wainer, 2011; Ingersoll & Wainer, 2013; Kaiser et al., 2000; Kasari et al., 2010; Siller et al., 2013; Solomon et al., 2014; Vismara et al., 2009); coaching in nine studies (Ingersoll & Dvortcsak, 2006; Ingersoll & Wainer, 2011; Ingersoll & Wainer, 2013; Kaiser et al., 2000; Kasari et al., 2014; Kasari et al., 2015; Siller et al., 2013; Solomon et al., 2014; Vismara et al., 2009); oral and/or written feedback in six studies (Ingersoll & Gergans, 2007; Kaiser et al., 2000; Kasari et al., 2010; Kashinath et al., 2006; Prelock et al.,2011; Vismara et al., 2009); homework in four studies (Ingersoll & Dvortcsak, 2006; Ingersoll & Wainer, 2011; Ingersoll & Wainer, 2013; Kaiser et al., 2000;), and collaborative problem solving in one study (Kashinath et al., 2006). Each method was used to help caregivers continue accurate implementation of the techniques taught to them by practitioners.

Many studies included multiple modes of support for their caregiver participants. Thirteen studies (87%) included at least two modes of support, one of which was usually a form of supplemental written materials or manuals (Ingersoll & Wainer, 2011; Ingersoll & Wainer, 2013; Kasari et al., 2010; Kasari et al., 2014; Kashinath et al., 2006; Vismara et al., 2009). In

addition, seven studies (47%) included supports that were delivered at each key stage of the learning process, that is, before, during, and following caregiver practice (Ingersoll & Gerfans, 2007; Ingersoll & Wainer 2011; Ingersoll & Wainer, 2013; Kaiser et al., 2000; Kasari et al., 2015; Kashinath et al, 2006; Siller et al, 2013; Solomon et al., 2014; Vismara et al., 2009). For example, Kasari et al. (2010) used modeling to teach the techniques prior to caregiver practice, guidance provided during practice, and oral feedback provided after practice. Informational aids, in the form of handouts, were also given to participants. Kashinath et al. (2006) employed the use of multiple supports across sessions. Video rehearsal, video modeling, practice with feedback and collaborative problem solving ensured that participants received support throughout the entire process. In contrast, there were studies that focused supports during only one key component of the session. Two studies (13%), Prelock et al. (2011) and Aldred et al. (2004) only provided oral and written feedback based on video recorded sessions. Although homework was a commonly used support, clear information and data were rarely reported on caregiver's use and completion of assigned tasks. This limits the information researchers have on the amount of practice conducted within the caregiver home and in the absence of the trainer.

2.2.3 Child outcomes

Six studies (40%), five RCT and one quasi-experimental group design, focused on child outcomes as the primary dependent variable (Ingersoll & Wainer, 2011; Kasari et al., 2010; Kasari et al., 2014; Kasari et al., 2015; Prelock et al., 2011; Siller et al., 2014).

Three studies (20%) used concrete observational measures for child engagement, reporting on joint engagement of participants at entry, exit, and follow up (Kasari et al., 2010; Kasari et al., 2014; Kasari et al., 2015). Kasari et al. (2010) and Kasari et al (2015) both reported

measures of Joint Engagement (JE) as a primary child outcome. Both studies demonstrated a significate increase in the duration of time child participants, from the intervention group, were jointly engaged with the caregiver participants. For Kasari et al. (2010) this increase in JE was contrasted to a decrease in child object-engagement; however, there was little to no change in child initiations. Kasari et al. (2014) also provided data on JE and child initiations for joint attention in their comparison between the caregiver education model (CEM) and the caregiver-mediated model (CMM). While both groups saw an increase in the duration of time the child spent in JE, there was a greater rate of growth for the CMM group.

Ingersoll and Wainer (2011) included child language measured during sessions, social communication skills measured using the Social Engagement and Language scales of the Social Communication Checklist (SCC; Ingersoll & Dvortcsak, 2010) and Social responsiveness measured using the Social Responsiveness Scales (SRS; Constantino, 2002). Caregivers also provided ratings on the SCC and SRS at the onset and end of the study. Results from the study included a significant change in child language used during play with their caregivers, a significant change in ability according to the SCC, and no significant change in autistic social impairment according to the SRS. Implications of these findings suggest that their use of all five RII strategies had an impact on child behavior, however, due to the nature of the design, it is not clear which strategies correlate to specific changes in child behavior.

Prelock et al. (2011) used the Communication Symbolic Behavior Scale- Developmental Profile (CSBS-DP; Wetherby & Prizant, 2002) to provide information on social, speech and symbolic communication before and after implementation of their quasi-experimental group design. Word production was also measured using parent report on the MacArthur-Bates Communicative Developmental Inventories (MCDI; Fenson et al., 2006). Results from pre- and

post-measures for both assessments, as well as parental perception of child behavior indicated that the children made gains in social interactions and vocabulary development. However, there was no control group included within the study to make clear comparisons.

Siller et al. (2014) reported on attachment-related child behaviors that looked at a brief separation and reunion of the caregiver and child. Data included trainer observed attachment behaviors and parent-reported attachment behaviors. Results indicated slight differences in parent-reported changes and trainer observed changes. Parent-reported attachment behaviors increased significantly after treatment. Results of the trainer observed behaviors were less conclusive, showing a difference in avoidant behaviors between the control and treatment groups without a clear understanding of whether or not the behaviors of the treatment group decreased due to intervention or the avoidant behaviors of the control group increased over time.

Two additional studies, outside of those six previously mentioned, included child outcomes within their studies, but did not use them as the primary dependent variable. For example, Green et al. (2010) and Solomon et al. (2014) provided pre- and post-measures using the ADOS-G. Both random controlled trials discussed the effectiveness of their intervention on autism symptoms relevant to the ADOS-G amongst other child and caregiver outcomes. Green et al. (2010) saw only a small effect size on ADOS-G scores. Conversely, Solomon et al. (2014) saw a change in at least one category for 54% of participants. Children receiving the PLAY intervention were more likely to see a change in autism classification and symptoms.

2.2.3.1 Caregiver outcomes

Six studies (40%) included caregiver outcomes as their primary measurement. One study, a quasi-experimental group design, focused on the change in parent knowledge (Ingersoll & Dvortcsak, 2006). Five studies, all single subject design, included caregiver implementation

fidelity as the primary dependent variable (Ingersoll & Gergans, 2007; Ingersoll & Wainer, 2013; Kashinath et al., 2006; Kaiser et al., 2000; Vismara et al., 2009).

Ingersoll and Dvortcsak (2006) measured caregiver knowledge using a pre-and post-multiple choice quiz including 10 questions relating to the strategies they were taught. Parents received an average score of 29% with a range of 0%-60% prior to training and 75% with a range of 40%-100% after training.

Two studies (13%) used a rating scale system to measure implementation fidelity (Ingersoll & Wainer, 2013; Vismara et al., 2009). Ingersoll and Wainer (2013) used a five-point rating scale and provided scores on average caregiver fidelity. To demonstrate fidelity of implementation, caregivers had to reach a score of 80% across five identified dimensions of fidelity (a rating of a 4 or above on a 5- point scale). Vismara et al. (2009) also used a rating scale, The Early Start Denver Model Fidelity Scale, to measure caregiver mastery of skills. Criteria for caregivers to demonstrate fidelity was set at 85% accurate demonstration of skills. Both studies reported increases in caregiver fidelity for all participants at the onset of intervention. Ingersoll and Wainer (2013) provided data that show caregivers had low to moderate fidelity of intervention during baseline and each participant met their fidelity criteria at some point during treatment. However, their data also showed that participants decreased in average fidelity when new strategies were taught to caregivers. The authors also provided data comparing caregivers' average fidelity to child spontaneous language using multilevel modeling. These data showed a significant relationship between the two outcomes; higher fidelity scores were related to greater child spontaneous communication. Vismara et al. (2009) provided data showing all but one participant met their fidelity criteria during treatment and correct implementation maintained through follow-up sessions for those participants. The use of the

Likert/rating scale provided a range of information regarding *how much* and *how well.* The rating scale did not provide a direct count of desirable behaviors, and therefore did not address exactly *how much* of the desired behavior occurred. Quality of implementation, or *how well*, was dependent upon each defined target of the rating scale system. Across studies, measures addressed *how well* more accurately using the rating scale measure by incorporating quality indicators in both the defined behaviors as well as the rating scale scoring system.

The remaining three studies (20%) using caregiver fidelity as the primary independent variable by using concrete observational methods for data collection. The concrete methods demonstrated were 30-second interval recording (Ingersoll & Gergans, 2007) and frequency count (Kashinath et al.,2006; Kaiser et al., 2000). Both concrete methods represented, address more exactly the concepts of *how much* and *how well.* By nature, these methods provide a dimension of behavior and provide the reader with an accurate number of behaviors exhibited by the caregiver. *How well* the intervention was delivered across implementation is also represented by a direct count of behavior (either across the duration of a given session or per 30s), if the behavior definitions are exact and relay quality parameters. Behaviors that did not meet the quality standard, would not be counted within the frequency of behaviors emitted.

For caregivers to demonstrate fidelity, each study used a set standard for the level of accurate caregiver behaviors emitted. Ingersoll and Gergans (2007) identified that caregiver behaviors had to be implemented correctly for 80% of intervals in order to meet fidelity criteria. Kaiser et al. (2000) stated their criteria was “80% correct use of the technique during a specific number of applications” (p 434). Kashinath et al. (2006) set fidelity criteria for behaviors that “maintained above baseline levels for three consecutive sessions” (p 473).

Results for participants in all three studies varied. Ingersoll and Gergans (2007) measured caregiver behavior for contingent imitation and linguistic mapping, and object imitation and gesture imitation. During baseline, two out of three participants exhibited low rates of contingent imitation and all participants exhibited low rates of object imitation and gesture imitation. High rates of linguistic mapping were exhibited by all three participants in baseline, several data points reaching fidelity criteria prior to treatment phase. These rates were maintained for two participants throughout treatment, with the remaining caregiver behaviors demonstrating a drastic level change in linguistic mapping and low levels of contingent imitation (although these low levels were slightly above baseline behaviors). Caregivers' use of modeling, prompting and reinforcement were measured per minute throughout the study. All three participants increased correct strategy use from baseline to intervention and two of the three participants maintained high levels of fidelity across all three behaviors during follow-up. The increase in caregiver ability to correctly implement the strategies targeted for change demonstrates a relationship between teaching and support procedures and caregiver fidelity.

Kashinath et al. (2006) measured the frequency of strategy use during environment arrangement and time delay for two participants and during time delay and contingent imitation for two participants. All four participants met fidelity criteria (demonstrating strategy use above baseline levels) for both strategies targeted. The increase in caregiver's ability to correctly implement the strategies targeted for change demonstrates a relationship between teaching and support procedures and caregiver fidelity.

Kaiser et al. (2000) measured the frequency and percent of correct use of the four milieu teaching procedures. Combining these measures provides a clear picture of both *how much*, the frequency techniques were used, and *how well*, what percent of those attempts were used

correctly. All six participants were slow to start once entered into the treatment phase. Frequency of technique use remained at near zero levels for all participants and percent correct use was both low and limited. However, all six participants increased in frequency and percent correct by at least session eight of the 24 sessions. Once the caregiver participants achieved correct implementation, it was maintained, with little exception for the duration of the study and into follow-up.

Two studies (13%) used caregiver fidelity as a supplemental measurement (Ingersoll & Wainer, 2011; Kasari et al. 2010). Both studies used a 5-point rating scale system. Kasari et al. (2010) examined caregiver quality of involvement in relationship to the primary outcome, joint engagement (JE), using a regression analysis. Their data indicated that caregiver quality of involvement significantly predicted increased JE. Ingersoll and Wainer (2011) demonstrated a significant increase in caregiver accuracy of implementation across all RII strategies, from pre- to post-treatment.

2.2.3.2 Caregiver-child interaction outcomes

Three studies (20%) also focused on caregiver-child interaction outcomes as their primary measure (Aldred et al., 2004; Green et al., 2010; Solomon et al., 2014). These measures included parental synchrony, a measure identifying the percent of maternal verbal behaviors synchronized to child attention and play behaviors (Green et al., 2010) and the Maternal Behavior Rating Scale (MBRS; Solomon et al., 2014). In addition, Aldred et al. (2004) established a video coding system for parent-child interactions that included communication acts, asynchronous parental communication, synchronous parental communication, semantic contingency, and shared attention (p. 1422).

Results reported on caregiver-child interactions were similar across studies. Green et al. (2010) reported "strong" effects on parent-child interactions, but noted that this was less relevance in relationship to shared attention, as compared to parent synchronous responses and child communication initiations (p. 2158). Caregiver-child interaction data reported by Solomon et al. (2014) demonstrated a significant effect on participants in the treatment group. The greatest change for caregiver-child interaction data were within responsiveness and affect. Aldred et al. (2004) saw inverse effects between their control and treatment groups. Treatment group participants increased synchronous interactions and decreased asynchronous interactions while the control group increased in asynchronous interactions.

2.2.3.3 Social validity

Eight of the 15 studies (53%) contained measures of social validity including the Parental Stress Index (PSI), satisfaction surveys, value of skills questionnaires and measures of maternal depression. Four studies (27%) provided outcomes from the PSI, three of which observed decreases in parental stress (Aldred et al., 2004; Ingersoll & Wainer 2011; Solomon et al., 2014) and one reporting an increase in stress for some parents relating to learning new strategies (Kasari et al., 2015). Four studies (27%) included parental satisfaction measures. Positive remarks and scores were provided by caregivers on items such as, attitude towards the strategies learned and effectiveness on child outcomes (Ingersoll & Gergans, 2007; Ingersoll & Dvortcsak, 2006; Kaiser et al., 2000; Kashinath et al., 2006).

Table 2. Measurement per Study

	Author(s)	Caregiver Measures	Child Measures	Fidelity Data/Measurement Method	Caregiver Generalization
1	Aldred et al., (2004)	PSI Parent-Child Interaction	Vineland Adaptive Behavior Scales ADOS MCDI	N	N
2	Green et al. (2010)	Parental synchrony	ADOS-G MCDI CSBS-DP	N	N
3	Ingersoll & Dvortcsak (2006)	Parent Satisfaction, Knowledge test	N	N	N
4	Ingersoll & Gergans (2007)	Parent Satisfaction, Strategy Use	Spontaneous Imitation	Percent of Strategy Use per Interval	Y
5	Ingersol & Wainer (2011)	Parent-child Interaction, Parent Stress Index, BIRS	SCC, SRS	5 pt Rating Scale	N
6	Ingersoll & Wainer (2013)	Fidelity	Spontaneous language	5 pt Rating Scale	N
7	Kaiser et al., (2000)	Parent Implementation Measures Parent Satisfaction	Spontaneous and prompted utterances, diversity and complexity of language Child language development	Combined Milieu/Responsive Interaction Code	Y

Table 2 continued

8	Kasari et al. (2010)	Quality of Involvement Scale Self-Report of adherence to practice	Engagement states Functional and symbolic play F of JA	4 pt Likert scale	N
9	Kasari et al. (2015)	PSI	Joint Engagement, Play skills, play level, joint attention.	N	N
10	Kasari et al. (2016)	a) Caregiver Diary, CQI	a) Joint Engagement, Caregiver-child interaction, ESCS, Diversity of play acts	5 pt rating scale	N
11	Kashinath et al. (2006)	Frequency of strategy use, Parent satisfaction	Frequency of child communication (specific to the child)	Frequency	Y
12	Prelock et al. (2011)	Value of skills questionnaire	Social, speech, symbolic JA	N	N
13	Siller et al. (2014)	Maternal synchronization	Expressive communication	N	N
14	Solomon et al. (2014)	PSI CES-D	MBRS CBRS FEAS MCDI-GW MCDI-SW	N	N
15	Vismara et al. (2009)	Acquisition on ESDM techniques	Communication behaviors	Rating Scale	N

Notes: PSI: Parental Stress Index, BIRS: Behavior Intervention Rating Scale, CQI: Caregiver Quality of Involvement, CES-D, ESDM: Early Start Denver Model, ADOS-G: Autism Diagnostic Observation Schedule-Generic, MCDI: MacArthur Communicative Development Inventory, CSBS-DP: Communication and Symbolic Behavior Scales- Developmental Profile, SCC: Social Communication Checklist, SRS: Social Responsiveness Scale, JA: Joint Attention, JE: Joint Engagement, ESCS: MBRS: Maternal Behavior Rating Scale, CBRS: Child Behavior Rating Scale, FEAS: Functional Emotional Assessment Scale, MCDI-GW: MacArthur Communicative Development Inventory- Word and Gesture, MCDI-SW: MacArthur Communicative Development Inventory-Words and Sentences.

2.3 DISCUSSION

This review examined the current literature on caregiver-implemented RII strategies to young children with ASD. Fifteen studies were identified as meeting the inclusion criteria and each were examined for the following features: 1) Intervention strategies, 2) parent training strategies, and 3) outcomes, including fidelity. Trends were examined across the four features examined. Of the identified studies, a range of intervention types (i.e., behavioral, naturalistic behavioral, developmental) were identified; however, each included a developmental component, corresponding to their use of RII strategies in play-based settings.

2.3.1 Intervention strategies

Trends in intervention packages included commonly used RII strategies across the literature reviewed. These were identified as following the child's lead, contingent imitation, commenting, modeling and expanding language, and expanding play. Most of the intervention packages represented used all five of these RII strategies. Although some studies speculated on the strategies that represented "active ingredients" of the intervention, study designs did not allow for such analyses. Although the designs provided information as to whether or not the entire package of selected RII strategies had an effect on child behavior, they could not draw any conclusions about the individual effects of the strategies selected.

Ingersoll and Wainer (2013) was the only study that discerned which strategies contributed the most to children spontaneous language. This study used caregiver fidelity as the primary dependent variable, and drew conclusions based on multilevel modeling of caregiver fidelity and child spontaneous language. They identified that the responsive techniques such as

following the child's lead, imitating child behavior, and modeling and expanding language were key elements in changing child spontaneous language. Amongst these responsive strategies, it was noted that modeling and expanding language, on its own, did not produce relevant change in child spontaneous language. For practical implementation of RII, it is essential that researchers identify the active ingredients within these packaged interventions and, in turn, eliminate or pay less attention to those strategies that are inactive (Goldstein, 2002). By so doing, interventionists could make the better use of their time with caregivers and simplify the interventions that they are expecting parents to implement.

2.3.2 Caregiver teaching models in RII

Common trends for teaching and supporting caregivers were also identified in terms of the delivery of content and the relationship of supports to the three stages of practice: 1) supports delivered prior to practice, 2) supports delivered during practice, and 3) supports delivered after practice. Delivering content to caregivers primarily took place in a 1:1 context, similar to what would be used during in-home early intervention services. Group delivery was only seen in three of the studies reviewed, two of which employed the use of a group format to delivering content but individual sessions for the supporting strategies.

Many studies relied on more than one support system to help caregivers maintain implementation of RII techniques. Supports across all three stages of practice were identified in seven studies (Ingersoll & Gergans, 2007; Ingersoll & Wainer 2011; Ingersoll & Wainer, 2013; Kaiser et al., 2000; Kasari et al., 2015; Kashinath et al, 2006; Siller et al, 2013; Solomon et al., 2014; Vismara et al., 2009). While the use of supports throughout the process provides a model for sufficient caregiver support, it was unclear if support in one component is more powerful

than support in another. Identifying the most powerful supporting strategies can help researchers and practitioners identify the level and type of interaction needed to produce meaningful change in caregiver behavior (Schreibman et al., 2015).

Within the literature dosage ranged from 6-36 hours, total time caregivers spent in intervention. Comparing total dosage between studies was difficult as the total duration of each study also varied considerably; studies ranged from 8-48 weeks in duration.

2.3.3 Outcomes

The studies under review represented three different types of outcomes based on the selection of primary dependent variables: 1) Child outcomes, 2) Caregiver outcomes, 3) Caregiver and Child-interaction outcomes. Six studies measured child outcomes as the primary dependent variable, six used caregiver outcomes, and three used caregiver-child interaction outcomes. Additionally, more than half of the studies under review did not include a fidelity component with five studies using fidelity as the primary caregiver dependent variable. Of the seven studies that included fidelity measures either as a primary dependent variable or a secondary measurement, four used a rating scale system and three used frequency of caregiver correct strategy use. Finally, just over half of the studies included measures of social validity.

2.3.3.1 Child outcomes

Six studies measured child outcomes as the primary dependent variable, five group design and one single case design (Ingersoll & Wainer, 2011; Kasari et al., 2010; Kasari et al., 2014; Kasari et al., 2015; Prelock et al., 2011; Siller et al., 2014). While positive results were reported on targeted child outcomes, only half of the studies also included a measurement of caregiver

fidelity. To demonstrate a functional relationship between the intervention and child outcomes, researchers must establish that the intervention alone is responsible for child gains. Without the assurance that the intervention was implemented as intended (i.e., with fidelity), the functional relationship cannot be unequivocally established. For those studies that omitted caregiver fidelity all extraneous variables have not been ruled out. Those studies that did report caregiver fidelity relied on a rating scale system. Using this system provides information on *how well* caregivers implemented the intervention. However, ratings do not accurately address both *how well* and *how well* an intervention is implemented which may weaken reliability and replication.

2.3.3.2 Caregiver outcomes

For those studies using caregiver outcomes as the primary dependent variable, relationships between the interventions (i.e., parent training strategies) and the dependent variables (i.e., caregiver fidelity) were established. Across the studies, it was reported that, compared to baseline, the majority of participants increased their ability to accurately implement the intervention once training began. However, based on the design of the studies, it was impossible to discern which parent training components, consisting of delivery of content and support systems, were most effective in bringing about changes in caregiver implementation of the intervention strategies.

Within the literature, the use of fidelity as a dependent measure was limited, which also limited the representation of measurement methods. Across the relevant studies, two employed a rating scale system and three used direct measures, either frequency count or interval recording. The identification of concrete observational measures within the literature may demonstrate a move away from less precise direct methods that may not fully establish the *how much* and *how well* of caregiver implementation (Brown & Rahn-Blakeslee, 2009). However, the overall

representation of fidelity across the literature is concerning. Future research needs to include a better representation of fidelity as both a primary and secondary measure. Research using caregiver fidelity as the primary dependent variable must consider measurement methods that provide the best picture of *how much* and *how well* in addition to better identification and justification for the fidelity criteria standards set for caregivers.

Once researchers have identified fidelity as a priority and use concrete observational methods to measure accurate implementation, it becomes important to also identify clear and appropriate standards for the achievement of fidelity. Trends in standards within the studies reviewed included achieving 80-85% fidelity. Other identified standards included "above baseline measures" and "a predetermined amount." It is important to determine the level of fidelity that is needed in the implementation of the strategies to produce a meaningful change in child behavior.

2.3.3.3 Social validity outcomes

Eight studies discussed caregiver stress and satisfaction in relationship to child gains. In most instances, there was a reported decrease in parental stress alongside an increase in parent satisfaction and child outcomes. However, there were also reported increases in stress and attrition. These results lead to speculation on intensity of the interventions taught to caregivers. As mentioned by Kaiser et al. (2015), there was a possibility that the increase in stress was due to the rigorous nature of the intervention and the pressure to preform strategies correctly. Researchers must find the most effective and efficient ways of teaching caregivers to implement strategies that are the most effective so as not to contribute to caregiver stress. Consequently, identifying the active ingredients in both the strategies one is teaching and the strategies one is using to teach caregivers are effectual topics for future research.

2.4 CONCLUSIONS AND RESEARCH QUESTIONS

The overarching trends found through this literature review bring to light many areas of interest. Three main areas have been isolated for future research: 1) Identifying active ingredients within intervention packages, 2) Identifying active ingredients within parent training packages, 3) measurement methods and criteria standards for the measurement of fidelity as an outcome. In reviewing the literature on caregiver-implemented RII strategies for young children with ASD, clear areas of strength and weakness have been identified. The following research study seeks to capitalize on the strengths of the current literature using similar methods of supporting caregiver participants and to improve upon those areas that are weak, such as fidelity measures and identifying the necessary supports for caregivers to achieve fidelity.

Trends in caregiver training models have emerged within the earlier literature review of RII studies. The most commonly used package to train caregivers to implement RIIs included the use of a didactic (i.e., delivering information about the RII strategies and rationale for use in a one-to-one setting), followed by supports in the delivery of intervention through three stages of practice: 1) prior to practice, 2) during practice, and 3) after practice. Each stage of practice is assigned a specific support or set of supports. Prior to practice models of appropriate strategy use are demonstrated. During practice, coaching is used to give the caregiver immediate, behavior specific corrective and positive feedback. After practice, feedback is delivered on correct and incorrect implementation.

The current study seeks to address two main areas of need within the RII literature for young children with ASD. First, it will attempt to identify the effectiveness of caregiver supports delivered based on session to session performance ultimately determining the supports necessary to achieve fidelity of implementation. Second, a concrete observational method will be used to collect caregiver fidelity. Specifically, this study will address the following questions:

1. What effect do specific caregiver support strategies have on caregiver fidelity of implementation?
2. What types of supports do caregivers require to establish and maintain fidelity of implementation across the duration of the study using three different RII strategies?
3. How does the frequency of child utterances vary with changes in caregiver fidelity?

3.0 METHOD

3.1 CLEARANCES AND CONSENTS

Approval for the study was gained through the University of Pittsburgh Institutional Review Board. Caregiver and child consent were obtained, in writing, prior to the start of the study. The caregivers gave consent for themselves and their children to participate and be videotaped across the duration of the study.

3.2 PARTICIPANTS

3.2.1 Recruitment

Two participant dyads were recruited for this study. Participants were recruited through local agencies by the Primary Investigator (PI) and were screened during an initial phone call to determine if they met the inclusion criteria. Recruitment included providing agencies with flyers and posting flyers to the relevant, company FaceBook pages. Contact for interested participants was initiated by the caregiver. Twelve potential participants initiated contact with the PI. Of these, four were unable to participate due to location (over 2 hours away), two indicated they

would not be able to make the time commitment, two declined to participate, and three scheduled face-to-face meetings.

Two of the three face-to-face meetings resulted in participation in the study. The third potential participant felt their child would be over-booked due to the services they were already receiving in addition to a three day a week commitment. During an initial visit to determine eligibility for participation in the study, the PI took a 10-minute play sample to determine a score for the Childhood Autism Rating Scale 2 (CARS2: Schopler, Van Bourgondien, Wellman, & Love, 2010) for all child participants to develop a standard comparison of autism symptoms across child participants.

3.2.2 Participation criteria

Child participant characteristics included: 1) ASD diagnosis by a licensed psychologist or medical doctor as per the DSM-IV or DSM-V criteria and/OR a qualifying score (identifying the child as moderate to severe) on the CARS protocol (Schopler, et al., 2010); 2) Under the age of 5 years at the start of the study, 3) No previous exposure to the Ingersoll and Dvortcsak (2010) curriculum or any other RII approach, and 4) Child participants demonstrated a minimum verbal repertoire of five different vocalizations, words, and/or signs during the 10-minute CARS play sample. Exclusion criteria included: 1) no ASD diagnosis with a disqualifying score on the CARS protocol, 2) co-morbid diagnoses of a physical or visual impairment, 3) over the age of 5 years, 4) previous experience with an RII curriculum and 5) non-verbal or significantly limited verbal repertoire.

Caregiver participant characteristics included: 1) no previous exposure to the Ingersoll and Dvortcsak (2010) curriculum or training in any other RII approach; 2) availability to attend a

minimum of 3 sessions per week, 3) willingness to participate within their own home for the duration of the study, 4) willingness to be videotaped during the study; 5) easy, dependable access to an email account at home.

3.3 PRE- AND POST-INTERVENTION ASSESSMENTS

Child and caregiver participants were given pre- and post- assessments respectively. Caregivers completed the Autism Parenting Stress Index (APSI; Silvia & Schalock, 2012) and child participants engaged in the Communication and Symbolic Behavior Scale (CSBS; Wetherby & Prizant, 2002).

3.3.1 Child assessment

The assessment was given by the PI as a pre- and post- intervention measure and provided information on child communication, word/sound use, social interaction, symbolic play, and constructive play skills. Administration of the CSBS (Wetherby & Prizant, 2002) occurred prior to intervention and again after follow-up. The CSBS is a standardized tool that evaluates communication and symbolic behaviors in children up to age two and is appropriate for individuals with developmental function around 24 months. During a 30-minute behavior sample, the PI used assessment-specific strategies to target communication and symbolic behaviors such as communicative temptations, sharing books, pretend play, and constructive play. Communication is assessed across three domains: 1) social, 2) speech, and 3) symbolic. In addition, spontaneous language is also recorded to provide a well-rounded collection of the

individual's communication in terms of both form and function. Previous validity and reliability studies on the CSBS found that scores were predictive for samples of typically developing young children and those at risk for developmental delay (Wetherby, Allen, Cleary, Kublin & Goldstein, 2002). Component scores were collected for social, speech and symbolic behaviors and combine to form a total standard score which was converted into a percentile rank.

3.3.2 Caregiver assessment

To assess caregiver participants prior to and after intervention, caregiver's will complete the APSI (Silvia & Schalock, 2012). The assessment was conducted before baseline sessions commence and again during the last follow-up session. Information from the APSI includes the caregiver's perception of their own stress level relating to their child and services rendered. The APSI was developed based on interviews with parents of children with autism compared to those with typically developing children, and children with developmental delays. Mean score for caregivers of children with ASD is 23 (SD 10.4). This compares to caregivers of children with developmental delays who had a mean score of 11.7 (SD 6.7) and caregivers of typically developing children who had a mean score of 5.4 (SD 5.1) in a validation study of the APSI (Silvia, et al., 2015).

In addition, the caregiver completed a demographic questionnaire to ascertain background information on the caregiver and child participant. This information includes the caregiver's level of education, family composition, age, and cultural background as well as the child's current services, diagnosis, and age. The demographic questionnaire can be found in Appendix A.

3.3.3 Participant dyad 1

The first participant dyad consisted of a mother and son. Caregiver participant 1 identified as a White female. She was 29-years-old at the onset of the study and worked as a stay-at-home mother. She lived at home with her husband and two sons. Her highest level of education achieved was a Master's degree in a human services related field.

Child participant 1 was identified as a White male and was 4-years-old at the onset of the study. He is the younger of two children, by 18 months, and was diagnosed with ASD according to the DSM-V criteria in January of 2017. Both children in the household have ASD diagnoses. According to the CARS criteria (Schopler et al., 1986), child participant 1 presented with severe symptoms of ASD, receiving a score of 41. Previously, he received infant/toddler services under Part C of IDEA including speech, special instruction and occupational therapy (OT). At the time of the study, he was receiving ABA services at home and was enrolled in an inclusive pre-school as part of his EI services. Throughout the duration of the study, he attended preschool day sessions, receiving speech and OT services.

3.3.4 Participant dyad 2

The second participant dyad consisted of a mother and daughter. Caregiver participant 2 identified as a White/Hispanic female. She was 33-years-old at the onset of the study and was self-employed with a part-time job as an outpatient mental health provider. She lived at home with her husband, daughter, and son. Her highest level of education received was a Master's degree in a human services related field.

Child participant 2 was identified as a White/Hispanic female and was 4-years-old at the onset of the study. She is the older of two children, by a two years, and was diagnosed with ASD according to the DSM-V criteria in July 2016. She received a score of 36.5 on the CARS (Schopler et al., 1986) indicating mild-to-moderate symptoms of ASD. Previously, she received infant/toddler services under Part C of IDEA including a special instruction, speech and OT. At the time of the study, she was receiving ABA therapy within their home and enrolled in an inclusive pre-school, as part of her EI services, where she also participated in speech and physical therapy (PT).

3.4 SETTING

All sessions during baseline, performance based supports, and follow-up took place in the participants' homes in a small, contained space identified by the PI and caregiver as conducive to the intervention. Throughout all phases, 5-7 sets of toys where made accessible to the participants. A "set" of toys includes those that are similar but not necessarily identical. For example, a truck and a car are both toys with wheels.

3.4.1 Participant dyad 1

All sessions for the first participant dyad were conducted within their home, in a contained room where toys were stored and play typically occurred each day. This location was also used for the other services the child received. The room had two entrances, one leading into the entry way of the house, which was kept closed and locked, and the second leading into the kitchen, which was

gated during each session. During each session, the same sets of toys were made available to the child (two puzzles, a large truck and plane, two sets of stacking cups, two books, and two shape sorters). Additional items present during each session were a couch, chair, toy storage, and television. The child and caregiver had access to the other toys stored in the room, though they were not presented with the other toys used for intervention.

3.4.2 Participant dyad 2

All sessions for the second participant dyad were conducted within their home, in a contained play-room where toys were stored and play typically occurred each day. This location was also used for the other services the child received. The room had one entrance, leading into the hallway. During each session, the same sets of toys were made available (several small animal figure toys, a basket of small play food, two plush bird toys, and a tea set) Additional items present during each session were a child-sized table and two chairs, child sized plush chair, and toy storage. The child and caregiver had access to the other toys stored in the room, though they were not presented with the other toys used for intervention.

3.5 RESEARCH DESIGN

A single subject, multiple baseline design across behaviors (i.e., three different RII strategies) was used to evaluate the performance-based supports each participant received. Each caregiver was taught, in the same sequence, three RII strategies corresponding to three curricular lessons (CL): CL1: imitating and following the child, CL2: commenting on child behavior, CL3:

modeling and expanding language. CLs will consist of three conditions: 1) baseline, 2) performance-based supports, 3) follow-up.

Participants entered the performance-based support condition for the first CL after a minimum of five consecutive stable data points (Cooper et al., 2007). For each CL, all participants received an initial delivery of information in the form of a didactic training session. Supports were then delivered based on performance. During each session, a 10-minute data collection play sample took place. Performance level was determined based on the data collected during the 10-minutes and dictated when and how supports were provided during the next session. Four levels of supports were possible for the caregiver participants to access based on performance: level 1: no supports, level 2: after practice supports, level 3: after practice supports and prior to practice supports, level 4: after practice supports, prior to practice supports, and during practice supports. For each session that the caregiver fell below the target fidelity criteria established for the CL, she moved to a higher support level. Criteria to begin successive CLs for each caregiver participant was attaining a target frequency of accurate behaviors and inaccurate instances per session and maintaining across five consecutive sessions.

3.6 INDEPENDENT VARIABLE

Levels of support varied based on when and how each support was delivered. Based on the previous literature review, three types of supports in RII studies were identified in relationship to practice: 1) Prior to practice supports, 2) during practice supports, and 3) after practice supports. The independent variable (i.e., a system of four performance-based support levels) is based on this conceptualization. Each level of support is made up of one or more of the following

components: after practice supports, prior to practice supports, and during practice supports. Once the caregiver meets fidelity, regardless of the current level of support they are receiving, the following session returned to level 1 supports and they were given the opportunity to meet fidelity criteria across 5 consecutive sessions. If at any point the participant fell below fidelity, once again, they started over in the sequence and level 2 supports were initiated. See Appendix B for a flow-chart of the progression of supports.

3.6.1 Didactic lesson

At the onset of each CL, all participants received a didactic lesson to outline the targeted RII strategy. During the didactic lesson, the PI, caregiver, and child were present. The information and activities provided to the caregiver included: 1) setting up the environment to prepare for the session, 2) an overview of what will take place during the current session, 3) the RII strategy of interest with an explanation of the key points of the technique, 4) a rationale for strategy use, 5) examples of how and when to use the strategy specific to the child participant's interest and observed play routines; 6) an opportunity for the caregiver to ask any initial questions or express concerns. The PI also provided the caregiver with handouts that outlined the rationale, key components, and target performance for each CL (Appendix C). The didactic lesson will be followed by a 10-minute data collection play sample in order to determine the level of supports necessary for the next session.

3.6.2 After practice supports

After practice supports are a component of Level 2-4 supports. After practice supports consist of delivering delayed feedback. Delayed feedback will be delivered via email, approximately 6-9 hours after the session of interest. The essential components of delayed feedback include: 1) a post-session report with frequency of correct and incorrect implementation of target behaviors, 2) a minimum of four behavior specific comments based on the 10-minute data collection play sample and including both praise and constructive feedback, and 3) a request for the caregiver to reply to the email indicating they have received the email. If a participant, reaches fidelity on a session, they will only receive a post-session report.

3.6.3 Prior to practice supports

Prior to practice supports are a component of Level 3 and 4 supports. During prior to practice supports, the PI will engage in a 5-minute modeling sample with the child participant. During this time, the PI will model the RII strategies relevant to the current CL. Following the 5-minute modeling sample, the PI will deliver strategy reminders to the caregiver participant. Strategy reminders will include: 1) the names of the target strategy within the current CL, 2) the key elements of each strategy, and 3) the desired frequency of strategy use. Upon completion of the modeling session and the strategy reminders the 10-minute data collection play sample will commence.

3.6.4 During practice supports

During practice supports are a component of Level 4 supports. During practice supports consist of a 10-minute coaching session in which the PI provides immediate feedback based on caregiver implementation of the strategies in the current CL. Elements of coaching include: 1) praise and constructive feedback delivered approximately every 30-seconds, 2) a 3:1 ratio of praise and constructive comments, 3) behavior specific comments. During practice supports will occur after the delivery of the prior to practice modeling session. Upon completion of the 10-minute coaching session, strategy reminders (a component of prior to practice supports) will be delivered to the caregiver and the 10-minute data collection sample will commence.

3.7 DEPENDENT VARIABLES

The primary dependent variable is caregiver fidelity. Fidelity criteria is based on two major components: 1) a pre-determined minimum frequency of accurate strategy use, during the 10-minute data collection play sample, and 2) a pre-determined maximum frequency of inaccurate strategy use within the 10-minute data collection play sample.

3.7.1 Caregiver fidelity

Caregiver fidelity is the dependent variable that drives the progression of the multiple baseline design across behaviors. Target behaviors have been identified for each CL and each will be

measured using a frequency count. Fidelity criteria is set based on a desired frequency of accurate strategy usage as well as a desired minimum of inaccurate responding. Criteria for each CL has been based on previous research conducted using the same or similar applications of the RII strategies. Previous research (Ingersoll & Gergans, 2007; Kashinath et al.,2006; Kaiser et al., 2000) identified imitation and commenting as behaviors that are intended to occur approximately once every 20-30 seconds. Implementation of modeling and expanding language is contingent upon instances of child vocal verbal behavior. To determine a desired frequency of accurate responding, an average of child utterances (words spoken during the 10-minute data collection play sample) will be generated from baseline data. Averages that exceed the fidelity criteria for CL1 and CL2 (40 instances within a 10-minute period) will default to two-thirds the frequency set for these other strategies (i.e., fidelity criteria will be set at 27 instances across a 10-minute period with 80% of instances being accurately implemented). In addition to accurate implementation of the targeted strategies, inaccurate implementation will also be included in the fidelity criteria set for each CL. To meet criteria, inaccurate strategy usage cannot exceed 20% of the total targeted number of behaviors during a 10-minute data collection play sample. Inaccurate strategy criteria does not change if the number of attempted behaviors exceeds the target frequency. See Table 3 for behavior definitions and fidelity criteria per CL.

3.7.2 Child communicative acts

Child communicative acts were measured throughout the study. Communicative acts were identified across four, mutually exclusive categories: 1) regulatory, 2) social, 3) imitative, (all of which are considered functional social communication) and 4) stereotypy.

3.7.2.1 Regulatory

Any communicative act (verbal or non-verbal) used to regulate the behavior of another person to produce a specific result (Wetherby & Prizant, 2002). Examples include requesting an object or activity or protesting.

3.7.2.2 Social

Any communicative act (verbal or non-verbal) used to draw attention to oneself or direct another's attention towards an object or event. Examples include, calling someone's name, expressing interest, commenting on items or actions, requesting information or sharing information (Wetherby & Prizant, 2002).

3.7.2.3 Imitative

Any replication of caregiver verbal communication emitted within 3-seconds of caregiver behavior. The imitation may not be identical, but should be similar enough to identify the act as an imitative attempt (i.e., must contain either the same number of syllables, or the same starting or ending sound). For example, if the caregiver says "ball" and the child says "ba" within 3-seconds.

3.7.2.4 Stereotypy

Any communicative act (verbal or non-verbal) that cannot be designated into the regulatory, social, or imitation category. Stereotypy definitions will be specific to each child participant: Participant 1: Any vocalization that does not have a clear function and/or contain all or part of a contextually appropriate word. Participant 2: Scripting behavior that contains repetitive words or

statements that are not contextually appropriate OR any vocalization that does not have a clear function or contextual purpose.

Table 3. Behavior Definitions and Fidelity Criteria per CL

	Target Behavior Definition	Fidelity Criteria
CL1	Anchor Behavior (must occur for the behavior to be counted as either correct OR incorrect): *Direct Imitation of the child's physical movements, toy manipulations, and/or vocalizations.* Imitation has four key elements that must be exhibited to count as an correct instance of the behavior: 1) The caregiver must directly imitate the child's toy manipulations, physical movements, and/or vocalizations within 3-seconds of child behavior. 2) The caregiver and child must be face to face 3) The caregiver must be within an arms-length of the child 4) The caregiver must not deliver a physical prompt that redirects the child's focus of play or interest	Minimum of 40 instances per 10-minute data collection play sample. A minimum of 80% accurate responses (32 instances) and a maximum of 20% inaccurate responding (8 instances).
CL2	Anchor Behavior: *Caregiver spoken language including any words or sounds (non-contingent on child vocal verbal behavior).* Modeling Language has four key elements that must be exhibited to count as an accurate instance of behavior: 1) The caregiver's words must be relevant to the child's actions 2) The model must be simplified to 1-2 words 3) The language must occur in a timely manner, within 3-seconds of the child's actions 4) The caregiver may not include questions or prompts within the model.	Minimum of 40 instances per 10-minute data collection play sample. A minimum of 80% accurate responses (32 instances) and a maximum of 20% inaccurate responding (8 instances).
CL3	Anchor Behavior: Any vocal response contingent upon child vocal verbal behavior. Expanding Language has four key elements that must be exhibited to count as an accurate instance of behavior: 1) The caregiver must first repeat OR rephrase the child's utterance/word(s) 2) The caregiver must follow the repeated utterance with an expansion of 1-2 words 3) The repeat and expand must be conducted in a timely manner, occurring no more than 3 seconds after the child's initial utterance 4) The expansion must be relevant to the child's utterance/word(s) or physical movements/play	Participant 1: Minimum of 13 instances per 10-minute play sample. A minimum of 80% accurate responses (11 responses) and a maximum of 20% inaccurate instances (2 responses) Participant 2: Minimum of 27 instances per 10-minute play sample. A minimum of 80% accurate instances (22 instances) and a maximum of 20% inaccurate instances (5 instances)

3.8 DATA COLLECTION

Caregiver fidelity (i.e., accurate and inaccurate instances of caregiver targeted strategy use) was collected during each CL. Each target behavior was identified as having four major components. All four components must be demonstrated for the instance to be counted as accurate. Example data collection sheets can be found in Appendix D. All data, for child and caregiver participants, were collected from video-taped, 10-minute data collection play samples. Data are displayed on a line graph and were subjected to visual analysis.

3.9 PROCEDURES

3.9.1 Baseline

Baseline consisted of 10-minute sessions observing the caregiver interact with their child in a typical play space in the home, this setting was the same used during the performance based feedback and follow-up conditions. In all baseline sessions, the PI instructed the caregiver to interact with their child as they normally would. No additional instruction was delivered regarding child interaction, environmental arrangement, or toy manipulation. Data were collected on all caregiver and child dependent variables.

3.9.2 Performance-based supports

Once in the performance based support condition and after the initial delivery of the didactic lesson, sessions consisted of three components: 1) 10-minute data collection play sample, 2) session wrap-up, and 3) a post-session report.

3.9.2.1 Session wrap-up

At the end of each sessions the PI followed a script containing directions for at home practice to wrap-up the session. Session wrap-up occurred after the 10-minute data collection play sample. The script included three elements: 1) instructions regarding home practice (i.e., "let's talk about your goals for practicing at home"); 2) an opportunity for the caregiver to ask questions specific to practice at home only (questions will not be answered relating to the current session's practice), and 3) a reminder of the next scheduled visit. During the session wrap-up, no praise or constructive comments were made regarding current practice.

3.9.2.2 Post session summative report

The post session report was sent to caregiver participants, via email, after each session, regardless of performance. The post session report contained three elements, 1) a statement regarding whether the caregiver met fidelity criteria or not (i.e., "during our last session you met your target" or "during our last session you were under your target"); 2) the caregiver participant's current frequency of accurate strategy implementation, and 3) the caregiver participant's current frequency of inaccurate strategy use.

3.9.3 Follow-up

Follow-up data were collected for one session no sooner than 7 days after the final CL concluded. The follow-up session consisted of the caregiver playing with the child during a 10-minute play session in the agreed upon play space with no PI interference. Prior to play session, the PI instructed the caregiver to play with their child using the strategies previously learned to the best of their ability. Once data collection concluded for the follow-up session, the PI re-administered the CSBS (Wetherby & Prizant, 2002) and had the caregiver fill out a post-intervention PSI. Both followed procedures identical to pre-intervention evaluation.

3.10 INTER-OBSERVER AGREEMENT AND IMPLEMENTATION FIDELITY

A trained second observer collected IOA for the duration of the study. Training of the secondary observer occurred prior to data collection and included: a) a review of definitions of each DV for adult participant fidelity coding and child participant communicative act coding, b) practice sessions scoring videos of an unknown child- caregiver dyad, not participating in the study, but engaging in the same intervention strategies with the PI present, and c) a comparison of the practice coding session scores gathered by the PI and secondary observer. When the PI and the second observer attained a score of 90% agreement for 3 consecutive sessions for each coding system, the observer mastered the codes.

The secondary observer took data on the videoed sessions independently. IOA was taken for at least 30% of sessions within each stage of the study (i.e., 30% of baseline and 30% of

CLs). IOA was calculated by dividing agreements/agreements + non-agreements x 100% (Kennedy, 2005).

Implementation fidelity was collected to examine whether the PI follows the correct procedures during each session throughout the study. Data were collected by the secondary observer using the video-taped sessions. A checklist was used to evaluate the accuracy of the PI's implementation the teaching procedures during the three initial didactic training sessions and the provision of support strategies before, during, and following practice.

3.11 SOCIAL VALIDTY

Social validity was collected using a parent questionnaire to examine parental preference and perception of the intervention. Nine questions were examined using a 5-point Likert Scale system ranging from *strongly disagree* to *strongly agree*. Three open ended response questions were also presented along with an opportunity to leave additional comments of their choosing.

3.12 VISUAL ANALYSIS

All data for child and caregiver measures were subjected to visual analysis. To answer the research questions, the PI identified level, trend, and variability across conditions. To determine the effects of performance based caregiver supports on fidelity of implementation, data were compared between baseline and the performance-based feedback condition across all three CLs.

These data were also compared across participants. The level of supports necessary to achieve and maintain fidelity for caregiver participants were established within the performance based feedback condition. Data that fall below fidelity levels initiated the next most intrusive level of supports, but caregivers could achieve and maintain fidelity without supports at any given time throughout the study. By systematically adding in supports, based on performance, the least amount of support needed to achieve and maintain fidelity was identified. To determine if the effects of caregiver fidelity are associated with child communicative acts, frequency of child communicative acts were measured during the same 10-minte data collection play sample as caregiver fidelity. Data were then compared to see if increased fidelity aligned with increased child behaviors.

4.0 RESULTS

4.1 CAREGIVER PARTICIPANT 1

4.1.1 Baseline

Frequency of accurate and inaccurate responding, per CL, are presented in Figure 1. During baseline, accurate responding across all three CLs was low and stable. Accurate instances of commenting on child behavior (CL1) were higher in baseline but maintained below fidelity criteria at an average of 15 instances (range of 7-27) prior to following and imitation (CL1) being taught to the caregiver. Once following and imitation (CL1) was initiated accurate instances of commenting (CL2) decreased to zero. In addition, there were more instances of inaccurate responses demonstrated for commenting than all other behaviors. In the first five baseline sessions, average inaccurate responding for CL2 behaviors was 66 instances (range of 36-97). Inaccurate responding also dropped drastically once CL1 began with average responding at approximately 1 instances (range of 0-6).

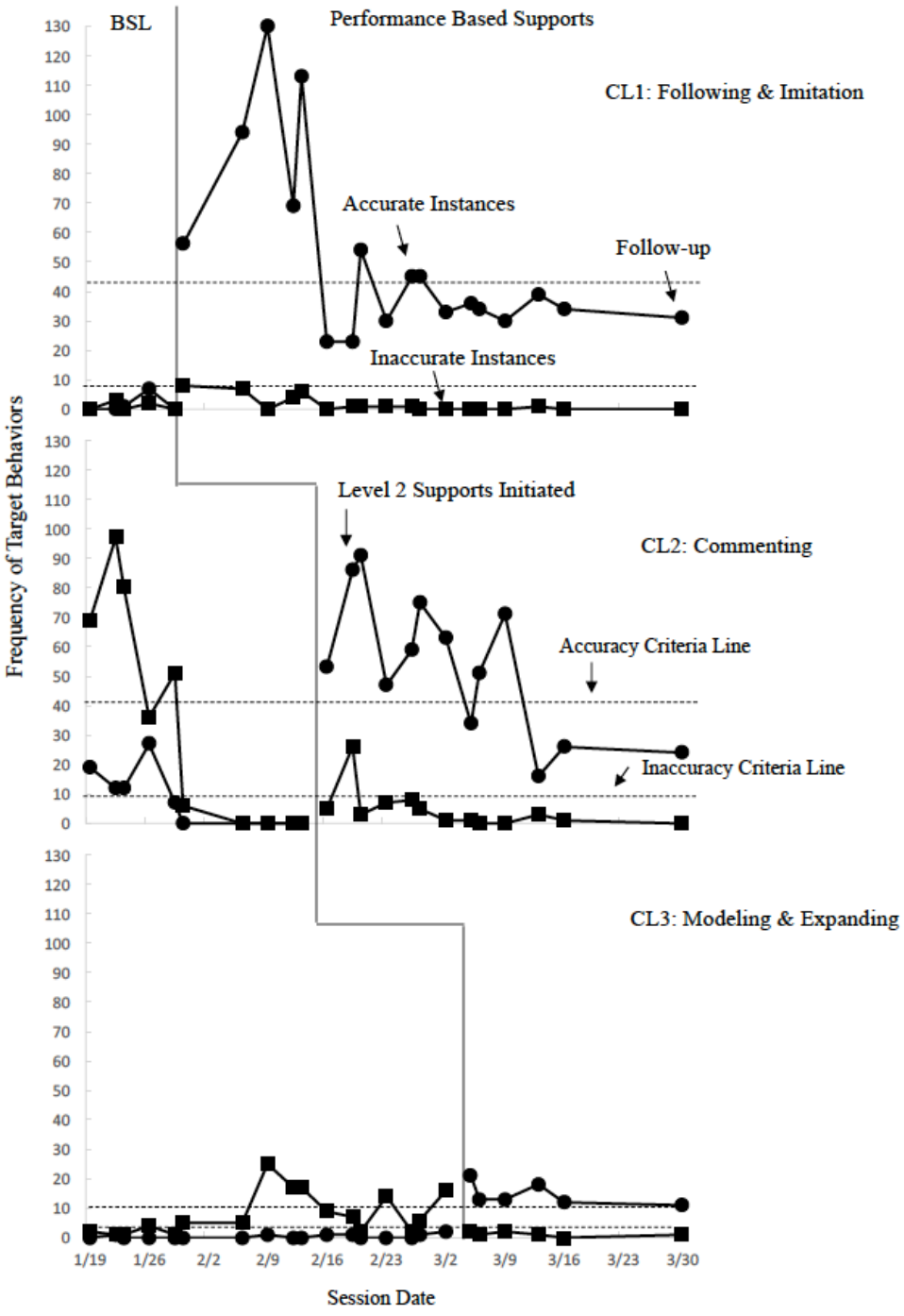


Figure 1. *Frequency of accurate and inaccurate instances of target behavior for caregiver participant 1 across each CL.*

4.1.2 Performance-based Supports

Caregiver participant 1 met fidelity criteria within the first 5 to 7 sessions for all three strategies. For following and imitation (CL1) and modeling and expanding language (CL3), she met fidelity within the first five consecutive sessions and did not require additional supports beyond level 1, the didactic lesson and delivery of post-session reports. The second session within CL2 initiated level 2 supports, delayed feedback, due to accurate instances of commenting being below the target frequency and inaccurate responding exceeding 20% of the target 40 instances within the 10-minute play sample. Commenting was then mastered within the next five consecutive sessions (seven sessions in total).

Upon teaching following and imitation (CL1) accurate responding had a clear level change from an average of approximately 1 in baseline (range of 0-7) to an average of approximately 92 (range of 56-130). Accurate responding was variable within the first CL, but maintained above fidelity criteria for the first five data points. Once fidelity was met, responding decreased but did not return to baseline levels. Accurate responding for following and imitation (CL1) would remain close to, but below fidelity levels for the remainder of the study. Inaccurate responding increased during intervention from an average of 33% of responding during baseline (range of 0-100%) to an average of 6% of responding during the performance based feedback condition (range of 0-14%). Inaccurate instances of CL1 behaviors remained low and stable across the first five sessions and did not exceed the maximum percent allotted to reach fidelity.

Once commenting (CL2) behaviors were taught there was a clear level change in accurate instances. Initially, as accurate responding increased, the percent of inaccurate responding also increased. This increase in inaccurate responding was above 20% and therefore initiated level 2 supports and delayed feedback was delivered 6-9 hours after the second session concluded.

Responding then increased in accurate instances and decreased in inaccurate instances for the next five consecutive data points. Responding maintained to consistently meet fidelity criteria. Average accurate responding across CL2 was approximately 79 instances (range of 47-91). Inaccurate responding across CL2 was approximately 10% of instances (range of 1-30%). The caregiver met fidelity criteria in all but one session making CL2 consist of seven sessions. When in CL2, the participant's use of the previous behaviors, following and imitation changed. The first two sessions in CL2 saw accurate responding of following and imitation (CL1) drop to the lowest point throughout the study. Subsequently, inaccurate responding did not change and remained at zero to near zero levels for the remainder of the study.

During CL1 and CL2, modeling and expanding (CL3) behaviors maintained near zero levels for both accurate and inaccurate responding (while still in baseline). After providing the caregiver with the didactic lesson on modeling and expanding language (CL3), target behaviors increased to a higher level where they remained stable for five consecutive sessions. Inaccurate responding maintained stability at near zero levels. Caregiver participant 1 did not require additional supports in order to meet fidelity criteria for five consecutive sessions. Average instances of target behavior per phase can be found in Table 4.1.

Table 4.1. Caregiver Participant 1 Average Target Behavior per Session

	Baseline	CL1	CL2	CL3
Imitation				
Accurate Resp.	1.6 (2.7)	92.4 (27.2)	42.1 (2.9)	34.6 (2.9)
Inaccurate Resp.	1.0 (1.26)	5.0 (2.8)	0.5 (0.5)	0.2 (0.4)
Commenting				
Accurate Resp.	15.4 (6.9)	0.0 (0.0)	79 (15.4)*	22.1 (19.4)
Inaccurate Resp.	66.6 (21.3)	1.2 (5.7)	7.8 (7.7)	2.6 (1.0)
Modeling & Expanding				
Accurate Resp.	0.2 (0.4)	0.2 (0.4)	0.83 (0.7)	15.4 (3.5)
Inaccurate Resp.	1.8 (1.1)	13.8 (7.7)	9.3 (5.0)	1.2 (0.7)

*Notes: *- additional supports requires within this phase*

Pre-training Training Post-training

4.1.3 Follow-up

Participant 1 maintained fidelity for two of the three CLs, falling below the target minimum for accurate responding for following and imitation (CL1) behaviors by 1 instance. Although she did not meet the target minimum, responding was still well above baseline levels. Responding for commenting (CL2) and modeling and expanding language (CL3) behaviors were within fidelity criteria for both accurate and inaccurate responding. Inaccurate instances across all three strategies were between zero and one in follow-up.

4.1.4 Error analysis

An error analysis was conducted on inaccurate commenting behavior for both caregiver participants. Inaccurate commenting behavior was broken down into two categories: 1) questions and 2) all other inaccurate responding. A comparison of caregiver 1 questions vs other inaccurate

commenting responses can be found in figure 2. During the initial baseline date points participant 1 emitted a high level of questions as compared to other types of commenting errors. Questions were on a downward trend for the first four data points and then increased back upward until the initiation of CL1 (following and imitation). At the onset of CL1, while commenting was still in baseline, there was a drastic decrease in both questions and other errors. This low level of inaccurate responding maintained throughout the remainder of the study.

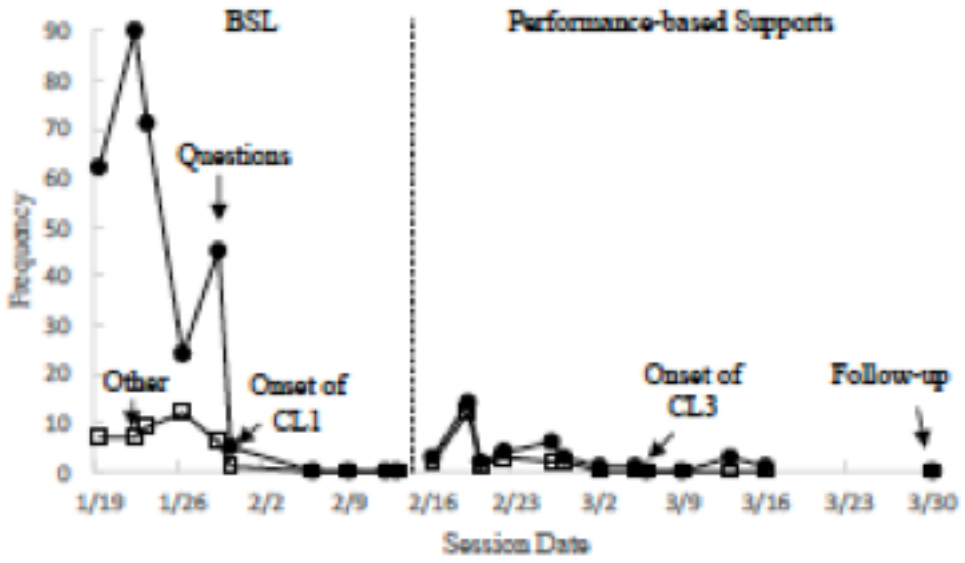


Figure 2. *Caregiver Participant 1: Error Analysis on Commenting Behavior*

4.2 CAREGIVER PARTICIPANT 2

4.2.1 Baseline

Frequency of accurate and inaccurate responding, per CL, are presented in Figure 3. During baseline, accurate responding for following and imitation (CL1) and modeling and expanding language (CL3) was low and stable. Baseline data for commenting (CL2) included the highest level of accurate responding with an average of 19 instances across a 10-minute play sample (range of 4-26 instances). Inaccurate responding during baseline was clearly higher than accurate responding across all behaviors during the performance based feedback condition. At no point, did responding meet fidelity criteria during baseline.

4.2.2 Performance-based supports

Caregiver participant 2 met fidelity criteria for following and imitation (CL1) and commenting (CL2) within the first five session and did not require additional supports beyond the didactic lesson and the post-session reports. The first session within CL3 initiated after-practice supports in the form of delayed feedback. CL3 was then mastered within the next five session (six sessions total).

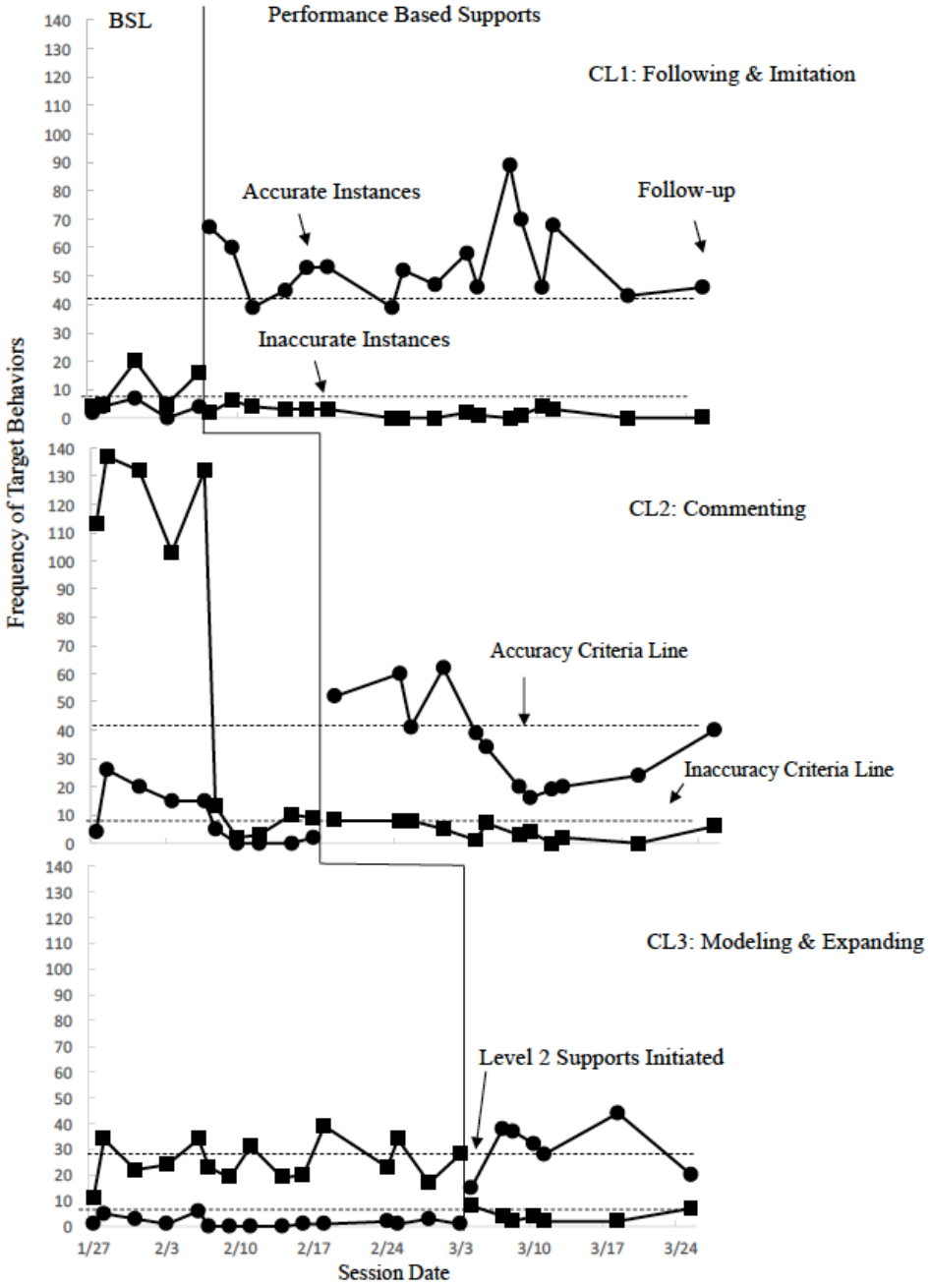


Figure 3. *Frequency of accurate and inaccurate instances of target behavior for caregiver participant 2 across each CL.*

At the onset of CL1 there was an immediate level change for both accurate and inaccurate responses of following and imitation. Fidelity criteria was met within the first five

data points with an average of 44 instances across a 10-minute play sample (range of 39-67 instances). Average percent of inaccurate responses was 6% (range of 2-10%). Participant 2 maintained fidelity criteria for following and imitation (CL1) behaviors across the duration of the study. Similar to participant 1, once the performance based feedback condition for the first CL began, inaccurate instances of commenting (CL2) behaviors decreased to near zero levels. Accurate instances of commenting behaviors remained low and stable until CL2 was initiated. Both accurate and inaccurate instances of modeling and expanding language (CL3) behaviors remained stable, with accurate responding at a low, near zero level, and inaccurate responding at mid-level.

When CL2 began, following and imitation (CL1), commenting (CL2), and modeling and expanding language (CL3) behaviors were all stable. Accurate instances of commenting had an immediate level change to well above fidelity criteria. Average accurate instances were approximately 50 per 10-munute play sample (range of 39-60). Inaccurate responding, which had dropped to near zero levels in baseline, maintained at low to near zero levels with an average of approximately 11% of responses (range of 2-19%). Inaccurate responding maintained at the same level and stability throughout the remainder of the study. Accurate responding for commenting (CL2) only maintained above fidelity criteria for the first session after CL3 was initiated. For the remaining five sessions, accurate instances of commenting behaviors dropped below fidelity criteria. CL2 was mastered within the first five consecutive data points.

Modeling and expanding language, was initiated when following and imitation (CL1), commenting (CL2), and modeling and expanding language (CL3) behaviors were all stable. In the first session, accurate responding increased, but did not meet fidelity criteria and inaccurate responding increased to approximately 53% of instances. At this time, level 2 supports were

initiated and delayed feedback was delivered 6-9 hours after the session. In the session following the delivery of level 2 supports there was a clear and immediate level change in accurate responding and modeling and expanding (CL3) was mastered within the next five consecutive sessions. Average responding for modeling and expanding was approximately 32 instances (range of 15-44). Inaccurate responding decreased and maintained at a low, stable level for the remainder of the study. Average percent of inaccurate responses was approximately 15% (range of 4-53%). Average instances of target behavior per phase can be found in Table 4.2.

Table 4.2. Caregiver Participant 2 Average Target Behavior per Session

	Baseline	CL1	CL2	CL3
Imitation				
Accurate Resp.	3.4 (2.3)	52.8 (10.0)	49.8 (6.4)	60.3 (16.7)
Inaccurate Resp.	50.0 (6.6)	3.6 (1.3)	1.0 (1.2)	1.5 (1.5)
Commenting				
Accurate Resp.	16.0 (7.2)	1.4, 1.9	50.8 (9.4)	23.6 (8.9)
Inaccurate Resp.	123.4 (13.0)	7.4, 4.2	6.0, 2.7	2.6 (2.4)
Modeling & Expanding				
Accurate Resp.	3.2,(2.0)	0.2 (0.4)	1.6 (0.8)	32.3 (9.2)*
Inaccurate Resp.	25.0 (8.5)	22.4 (4.5)	28.4 (7.7)	3.6 (2.1)

*Notes: *- additional supports requires within this phase*

Pre-training Training Post-training

4.2.3 Follow-up

Participant two maintained fidelity criteria for two of the three strategies during the follow-up session. Accurate instances of following and imitation (CL1) and commenting (CL2) increased in follow-up from the final performance based supports session. Inaccurate instances for following and imitation (CL1) behaviors maintained at zero while inaccurate instances of commenting increased but maintained below the target maximum percent for fidelity criteria.

Modeling and expanding language (CL3) fell below the minimum fidelity criteria, 27 instances, to 20 instances. Inaccurate instances increased, but maintained below the target maximum percent for fidelity criteria.

4.2.4 Error analysis

An error analysis was conducted on inaccurate commenting behavior for both caregiver participants. Inaccurate commenting behavior was broken down into two categories: 1) questions and 2) all other inaccurate responding. A comparison of caregiver 2 questions vs other inaccurate commenting responses can be found in figure 4. Caregiver participant 2 emitted a steady and high level of questions during the first five data points in baseline. Other types of inaccurate responding were relatively high but variable and well below the level of questions. At the onset of CL1 (following and imitation), the level of questions and other inaccurate responding decreased to near zero levels. Instances of both categories of inaccurate responding maintained at low levels throughout the remainder of the study.

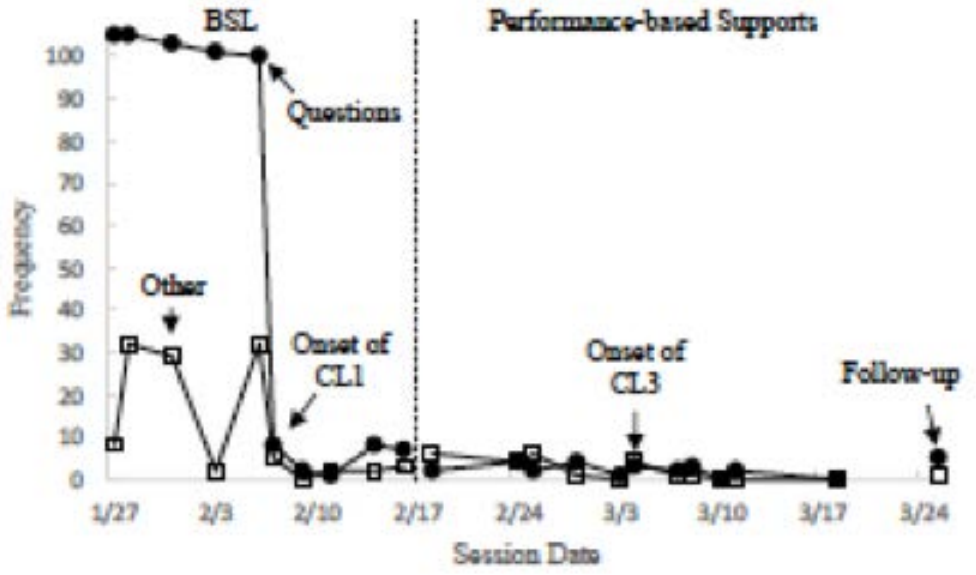


Figure 4. *Child Participant 1: Frequency of Stereotypic and Functional Social Communication*

4.3 CHILD PARTICIPANT 1

Frequency of stereotypic and functional social communication for child participant 1 can be found in Figure 4. Data were collected across four functions: 1) regulatory, 2) social, 3) imitative (all being considered as functional social communication; FSC), and 4) stereotypy. Child participant 1 had a limited vocal verbal repertoire at the onset of the study. The majority of vocal verbal output consisted on single and multiple syllable sounds and word approximations. In addition, he had a 3-word signing repertoire (more, all done, and bubbles). For the purposes of this study, utterances for child participant 1 consisted of single word

utterances or approximations, sign language, and stereotypy. Each instance was designated to one of the four mutually exclusive functions listed above.

4.3.1 Baseline

During baseline, child participant one demonstrated low levels of functional social communication. Most utterances were stereotypic in nature, an average of approximately nine instances per 10-minute play sample (range 0-36).

4.3.2 Performance-based supports

Once CL1 began, instances of stereotypy increased and were variable across the first five sessions. Initially, FSC maintained at zero level. During the third session within CL1, FSC utterances increased to 12 instances and continued increasing to 17 instances, the highest point throughout the study, in the next session. This increase was followed by variability across the next two sessions and then a downward trend throughout CL1+CL2. FSC were low for the remainder of the study. In the final session within CL1+CL2, and for all of CL1+CL2+CL3, responding was stable at above baseline levels. Within CL1 instances of FSC were higher, but most communicative behaviors were sign language. Moving into CL1+CL2 and CL1+CL2+CL3 instances were lower, but all communicative behaviors were words or word approximations.

Stereotypic utterances were the most frequent throughout the study. However, limited utterances were emitted, in general, during baseline. There was a clear level change in stereotypic utterances once CL1 began. An average of approximately 40 instances per 10-minute play sample. Responding was also variable throughout this first phase of the

performance-based supports condition (CL1). Stereotypy continued to be variable into CL2, however, about half as many instances were emitted, an average of approximately 21. Responding became stable into the final phase (CL1+CL2+CL3) at an average of about 24 instances across the phase and finally increased during the follow-up session. See Table 5.1 for mean utterances and standard deviations per function across each CL.

Table 5.1. Child Participant 1 Mean Utterances per Session (Standard Deviation)

	Baseline	CL1	CL2	CL3
Regulatory	0.2 (0.4)	6.1 (6.7)	1.5 (1.8)	0.3 (0.5)
Social	0.3 (0.5)	0.2 (0.4)	1.7 (1.9)	2.8 (1.3)
Imitative	0 (0)	0 (0)	0.6 (0.7)	1.6 (0.5)
Stereotypy	9.4 (13.4)	40.8 (18.6)	21.5 (10.02)	24.6 (7.28)

4.4 CHILD PARTICIPANT 2

Frequency of stereotypic and functional social communication (FSC) for child participant 2 can be found in Figure 5. Identical to child participant 1, data were collected across four functions: 1) regulatory, 2) social, 3) imitative, (all being considered functional social communication; FSC) and 4) stereotypy. Child participant 2 had an expansive vocal verbal repertoire and used words and word combinations regularly. For the purposes of this study, utterances for child participant 2 consisted of single words or statements (word combinations emitted as full statements were counted as one instance). Each instance was designated to one of the four mutually exclusive functions listed above.

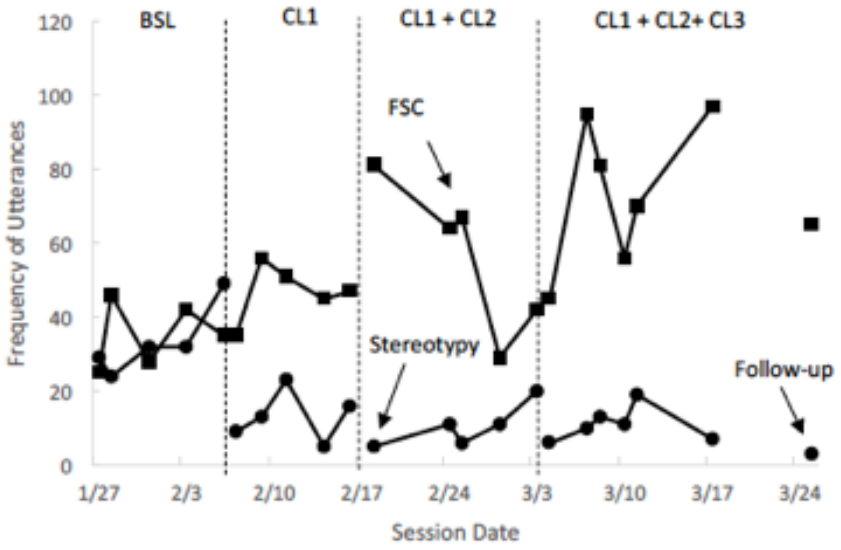


Figure 5. *Child Participant 2: Frequency of Stereotypic and Functional Social Communication*

4.4.1 Baseline

During baseline, child participant 2 emitted high levels of stereotypic and functional social communication (FSC) utterances. All FSC utterances were relatively stable in baseline. The majority of utterances observed during baseline were stereotypic.

4.4.2 Performance-based supports

A clear level change can be seen in stereotypy once CL1 was initiated. Average stereotypic utterances decreased to approximately 13 during CL1. FSC utterances were on an upward trend from baseline into CL1. A level change in FSC was seen at the start of CL1+CL2 followed by a downward trend throughout the rest of the phase. Responding would not increase until the end of

CL1+CL2 and was on an upward trend into the final phase (CL1+CL2+CL3). FSC were variable throughout the study but remained well above stereotypic utterances once the intervention was initiated. By the end of the study FSC were consistently above baseline levels.

Stereotypy would not return to the level observed in baseline. Rather, stereotypic utterances would remain at a low and somewhat stable level for the remainder of the study. During follow-up, social utterances remained at a high level while all other functions were low at near zero levels. See Table 5.2 for mean utterances and standard deviations per function across each CL.

Table 5.2. Child Participant 1 Mean Utterances per Session (Standard Deviation)

	Baseline	CL1	CL2	CL3
Regulatory	9 (5.2)	4.2 (2.5)	6.4 (6.7)	4.3 (2.4)
Social	18.2 (7.9)	36.6 (5.7)	41.8 (14.9)	60 (14.6)
Imitative	8 (3.5)	5.8 (0.97)	8.4 (2.57)	9.66 (4.26)
Stereotypy	33.2 (8.4)	13.2 (6.1)	10.6 (5.3)	11 (4.3)

4.5 PRE- AND POST INTERVENTION ASSESSMENTS

Both caregiver and child pairs participated in pre- and post-intervention assessments. Each caregiver filled out the APSI (Silvia & Schalock, 2012) and each child participated in the CSBS (Wetherby & Prizant, 2002). Results from the pre- and post-intervention assessments can be found in Table 6. Both caregivers scored higher on their pre-intervention APSI indicating that stress decreased at post-intervention. Child participants both scored higher across all domains on

their post-intervention CSBS percentile ranks. Child participant 1made gains across each domain on the assessment with an overall increase from the first percentile to the second percentile. Child participant 2 also made gains across all domains measured on the CSBS. Her overall percentile change was an increase from the 18 percentile to the 40 percentile.

Table 6. APSI Raw Scores and CSBS Percentile Scores, Pre- and Post-intervention

Domains	Participant Dyad 1		Participant Dyad 2	
	Pre	Post	Pre	Post
APSI Raw Scores	24	12	20	17
CSBS Percentile Scores				
Social	1	2	1	5
Speech	9	16	95	99
Symbolic	1	2	5	16
Total	1	2	18	40

4.6 INTER-OBSERVER AGREEMENT

Inter-observer agreement (IOA) was collected by two separate observers. One observer collected IOA on caregiver behaviors and the second on child behaviors. IOA was split between two different observers in order to maintain a blind observer when possible. Observer 1, who collected IOA for caregiver behaviors (fidelity) was not blind to independent variables of the study due to the nature of the data collected. However, observer 1 was blind to the criteria set for caregiver fidelity and the teaching and caregiver supports procedures. The secondary observer was blind to all aspects of the study accept the definitions for child target behavior. IOA was collected for 40% of sessions for participant dyad 1 and 38% of sessions for participant dyad 2. Play-samples were randomly selected separately for caregiver and child data. A break-

down of IOA averages and ranges for each target behavior, per participant as well as child utterances can be found in Table 7.

Table 7. Average IOA (Range) for Caregiver and Child Target Behaviors

Behavior	Participant 1	Participant 2
Caregiver		
Imitation	94.2% (88-100%)	90.3% (81-100%)
Commenting	92.4% (81-100%)	95% (90-100%)
Modeling & Expanding	89% (77.7-100%)	91.3% (89-95%)
Child Utterances	90% (83-100%)	90.5% (80-95%)

4.7 IMPLEMENTATION FIDELITY

The extent to which the PI accurately followed the procedures for each training session and implementation of caregiver supports, when necessary, were measured using a check list system. A master check-list was used during baseline and play samples and an adapted checklist was used to evaluate each post-session report and the use of delayed feedback (which was the only additional caregiver support initiated throughout the course of the study). Items on the checklist varied based on the type of session to encompass the specific items necessary for each different component of the study. Implementation fidelity was conducted by the secondary observer and included six didactic sessions (three per participant), 31 post-session reports (all those that were sent without delayed feedback as an additive component), two delayed feedback emails, and five play-sample sessions per participant (dispersed across baseline and each CL). Fidelity of

implementation scores ranged from an average of 99.2-100%. One instance was noted of the procedures not being accurately implemented. This instance consisted of a post-session report not being sent within the 6-9 hour time frame allocated.

4.8 SOCIAL VALIDITY

Both caregivers reported strong satisfaction with the techniques and found the CL1 behaviors (following and imitation) the most beneficial. Both *strongly agreed* that the strategies were enjoyable, understandable, and valuable. In addition, both *strongly agreed* that they understood the rationale behind implementing the techniques incorporated into the study and found value in the post-session reports which outlined frequency count of accurate and inaccurate responding. Caregiver participant 1 *somewhat agreed* and caregiver participant 2 *agreed* that they would have liked more information (outside of the post-session report) regarding their ability to implement the strategies with their children. Caregiver participant 1 added a comment on this issue stating that she, "wished I had known what specific things I had done wrong."

Both participants also listed specific gains they believed they observed in their children. Caregiver participant 1 believed her son "was more verbal and engaged." Caregiver participant 2 reported that her daughter had "greater eye contact and emotional connection" and mentioned that she believed they were "building a story together." When asked to comment on the greatest challenge in implementing the strategies, caregiver participant 1 mentioned that she enjoyed implementing the strategies but had a hard time avoiding questions and limiting her language. Caregiver participant 2 commented that she had a tough time knowing when it was appropriate

to use this type of intervention over others she and her daughter were using through other services.

5.0 DISCUSSION

This study sought to address three main questions: 1) What effect do specific caregiver support strategies have on caregiver fidelity of implementation? 2) What types of supports do caregivers require to establish and maintain fidelity of implementation across the duration of the study using three different RII strategies? 3) How does the frequency of child utterances vary with changes in caregiver fidelity? The results of the current study showed that caregiver participants could acquire fidelity for three different RII strategies with minimal supports. Levels of responding maintained above baseline during all three CLs and in follow-up. As new strategies were acquired, instances of previously learned strategies decreased but remained above baseline levels. Inaccurate instances of behavior were maintained at or below the minimum criteria set for each regardless of the acquisition of new strategies. Similar to the study conducted by Prelock et al. (2011), both child participants showed gains on the post-assessment administration of the CSBS. Child utterances also changed across the course of the study, demonstrating that there may be a connection between accurate implementation of the strategies and the functions of communication used by the child participants.

To identify what effect specific caregiver supports have on fidelity of implementation, frequency data were collected on caregiver use of each RII strategy. As the primary independent variable, caregiver fidelity measures were used to determine the degree of support needed for both caregivers to learn how to implement the selected RII. For both caregiver participants, the

delivery of a didactic lesson initiated an immediate level change for accurate and inaccurate responding. There was only one instance in which the didactic lesson did not immediately result in the caregiver achieving fidelity (modeling and expanding language for caregiver participant 2). It is important to note, however, that both caregiver participants had master's level education in the human services field. It may be that their education and experiences providing services to other increased the likelihood for success implementing the given intervention. Future research should explore what different types of caregiver demographics are best suited for successful implementation of RII strategies.

Caregiver fidelity data were coded and analyzed after each session to identify what types of supports both caregivers require to establish and maintain fidelity of implementation. When caregivers met their goals (fidelity criteria), they were moved to the next session without additional supports. When caregivers did not meet their goals, additional supports were initiated. Only minimal supports were necessary for caregivers to establish fidelity for all three strategies. The only support provided, outside of the delivery of the didactic lesson and post-session report, was delayed feedback. Caregiver participant 1 required delayed feedback due to increased inaccurate responding in commenting in her second session of CL2. Delayed feedback for caregiver participant 2 was initiated after inadequate accurate and excessive inaccurate responding was observed during her first session in CL3, modeling and expanding language. Both participants immediately acquired fidelity following the delivery of delayed feedback.

Based on the information provided on the social validity questionnaire, both caregivers found the post-session report to be valuable. While these reports were not intended to act as reinforcement, it may be that by simply receiving information on the number of accurate and inaccurate instances of behavior accurate responding was reinforced and inaccurate responding

was punished. Overall, minimal support was needed to acquire fidelity but maintaining fidelity became an issue as participants progressed through each of the three CLs. As new strategies were taught, responding for previously taught target behaviors decreased. This has been seen in other examples within the literature on caregiver implemented RIIs (Ingersoll & Gergans, 2007; Ingersoll & Wainer, 2013). The decrease in previously taught strategies did not, however, always result in the caregiver dropping below fidelity criteria. Accurate responding decreased but inaccurate responding did not increase. It is possible that the minimal supports provided were enough to correct inaccurate responding and maintain low levels of inaccurate responses over time, but were not able to maintain accurate responding at the initial high levels seen during training on a specific strategy.

Another consideration is the fidelity criteria set for accurate and inaccurate responding. While the current study set accurate and inaccurate responding criteria based on previous literature, it is helpful to understand that had the criteria been stricter, caregivers would have accessed supports more often. For example, the current study sought for caregivers to demonstrate inaccurate strategy use no more than 20% of their total attempts, making the target for accurate implementation 80%. Had criteria been set for 100% accuracy, more supports would have been needed throughout and this may result in better maintenance of strategy use as new strategies were taught.

Previous literature on caregiver implementation of RIIs demonstrates the use of supports at all three stages of practice: 1) prior to practice, 2) during practice, and 3) after practice (Ingersoll & Gergans, 2007; Ingersoll & Wainer, 2011; Ingersoll & Wainer 2013; Kaiser et al, 2000; Kaiser et al., 2015; Kasinath et al, 2006; Siller et al, 2013; Solomon et al, 2014; Vismara et al, 2009). While this system of supports has been shown to produce caregiver fidelity, the use of

a combination of supports has not allowed for identification of active ingredients in changing caregiver behavior. The current study demonstrated that the use of supports at all three stages of practice may not be necessary for achieving fidelity. By employing the use of a "least to most" method for supports caregivers were able to demonstrate when and how they needed support to achieve fidelity. It may be valuable, however, to investigate a "most to least" approach to identify the effects of the approach on maintenance. Those studies in the literature that included supports for caregiver participants at all three stages of practice (similar to a "most to least" method in that the maximum support was immediately available) demonstrated higher levels of maintenance of strategy use, for most if not all participants, than the current study (Ingersoll & Gergans, 2007; Kashinath et al., 2006; Kaiser et al., 2000; Vismara et al, 2009).

The inability for both caregivers to maintain strategy use throughout thestudy may also relate back to the criteria set for accurate and inaccurate responding. It is important to consider different levels of learning when setting criteria for fidelity or mastery. Acquisition, fluency, maintenance, and generalization have been identified in the literature as the four different levels of learning (Alberto & Troutman, 2003). As outlined by Kubina and Wolfe (2005) it is important to not only identify what portion of correct responding has been achieved but also how fast or dispersed those responses occurred over time. It may be beneficial to set fidelity criteria higher at the onset of the study in anticipation of strategy use dropping as each new strategy is taught. With a stricter criterion, the drop in responding during maintenance may still fall in acceptable range.

A recent study conducted by Ingersoll and colleagues (2016) compared the effectiveness of self-directed and therapist-assisted telehealth for a caregiver implemented intervention. The authors noted that while both methods increased caregiver fidelity, greater gains were identified

in the therapist-assisted group which may contribute to the literature supporting coaching as a key support for caregivers. The group receiving more supports, via therapist, demonstrated more rapid improvement and higher rates of engagement with the intervention. Caregivers participating in the current study expressed a desire to receive more information and detail on the skills they were and were not implementing correctly. Both are characteristics of feedback delivered as during practice supports, such as coaching. Given the results of the current study, telepractice may be a worthy of investigation for teaching these strategies to caregivers.

To assess how the frequency of child utterances varied with changes in caregiver fidelity, child utterances were measured throughout the study and compared to caregiver fidelity data. Because there were limited examples of caregivers not meeting fidelity, it is hard to assess if poor caregiver performance would have correlated to less frequent utterances or utterances of different functions. Results varied for both child participants. Child participant 1, who began the study with a limited vocal verbal repertoire, increased in both stereotypy and in the three functional social communication categories measured (regulatory, imitation, and social). The increase in stereotypy fits with the intervention and how it was individualized for each participant. Due to the child's limited vocal verbal repertoire the caregiver was instructed to treat each example, regardless of function, as a communicative attempt. It may be that the caregiver's responding to stereotypy reinforced the behavior. A change was also seen in the topography of communication emitted. Child participant one transitioned from using sign language to vocalizations throughout the study.

Child participant 2 began the study with an expansive and sophisticated vocal verbal repertoire. She also demonstrated the use of stereotypy in the form of non-contextual vocalizations and scripting. Throughout the study, stereotypy decreased to below baseline levels

and functional social communication increased, returning to baseline levels only once and then continuing on an upward trend for the remainder of the study. Unlike child participant 1, she exhibited appropriate FSC from the onset, this provided the caregiver with the opportunity to select which utterances she would respond to during following and imitation (CL1) and modeling and expanding language (CL3). It may be that caregiver responding to FSC was reinforcing while stereotypy was ignored.

Ingersoll and Gergans (2007) identified that spontaneous utterances increased as a result of similarly implemented RII strategies. Within their study, it was noted that modeling and expanding language may not be an active ingredient, when implemented alone, on spontaneous child utterances. In the current study, utterances increased for both child participants once modeling and expanding (CL3) was taught and used in combination with following and imitation (CL1) and commenting (CL2). When caregiver participants used following and imitation alone and demonstrated fidelity child utterances increased. For child participant 1 this increase was seen across all four functions of communication. Once commenting was introduced to the caregiver participant 1, responding for following and imitation dropped to below fidelity levels as did child utterances. Child participant 2 had an initial increase is FSC during CL2, however these utterances were on a downward trend throughout this phase of the study ultimately returning to baseline levels and stereotypy was on a slight upward trend. Unlike caregiver participant 1, caregiver participant 2 maintained fidelity for following and imitation behaviors while in CL2. Child participant 2 demonstrated her highest level of FSC during the final phase of the study when the caregiver was instructed to implementing following and imitation, commenting, and modeling and expanding language simultaneously. However, only following

and imitation and modeling and expanding were implemented at fidelity criteria for the majority of this final phase.

This study contributes to the current literature of caregiver-implemented RII strategies. First, it provides the basis for identifying both accurate and inaccurate implementation that gives a better-rounded picture of both *how much* and *how well* caregivers implement the intervention. To identify accurate and inaccurate responding in relationship to each RII strategies, skills taught were broken down into component behaviors that combine to form a behavioral compound (Kubina & Yurich, 2007). Previous literature using concrete observational measurement methods focused solely on how often the behavior occurred correctly but did not measure instances of inaccurate implementation (Ingersoll & Gergans, 2007; Kashinath et al, 2006; Kaiser et al., 2000). Second, it demonstrates that with minimal supports caregivers can establish fidelity of implementation, additional supports may be necessary for fidelity to maintain over time and to establish better rapport with caregivers. Finally, both child participants had notable changes in the function of utterances used from start to finish. Though these changes varied between the two child participants, both increased in FSC to some degree throughout the study.

5.1 LIMITATIONS

There are a few notable limitations to the current study. Participant recruitment, scheduling, and cancelations were a problem. Several prospective participants were unwilling to take on the time constraints of three sessions per week. For the two caregivers who participated in the study, scheduling was often a challenge and several changes were made to session dates throughout the study. Due to these changes, sessions were not equally dispersed across a week which may

affect the potency of the post-session report and delayed feedback as it changes when these items were delivered in respect to the following session.

Additionally, while there are similarities between participant dyads, there are several differences that make it hard to compare data between both caregiver and child participants. Most salient differences are between the child participants who had drastically different verbal repertoires at the onset of the study. The intervention was adjusted to meet the needs of the child's vocal verbal repertoire altering the level of difficulty of implementation for each caregiver. There were also clear environmental differences including siblings, dogs, and the presence of other family members not participating in the study. Both child participants had siblings who were often present but not a part of intervention sessions and interference, though infrequent, did occur. These variables make it difficult to compare results from participant dyad 1 and participant dyad 2.

Maintenance was also a limitation of the current study. While the research questions sought to address whether strategy use could be maintained throughout the duration of the study (mainly as new strategies were added into the intervention), it was unclear how well caregivers would have maintained strategy use after the study had concluded. There was only one data point taken after the intervention and the time that laps between the final day of intervention and the follow-up data point was twice as long for participant dyad 1 as it was for participant dyad 2.

Lastly, there was an overlap in the definitions of target behaviors for following and imitation (CL1) and modeling and expanding language (CL3). Caregiver participants were taught to imitate motor and vocal responses within CL1 when working on following and imitating. In the final CL, modeling and expanding language, caregivers were taught to first imitate the child's vocal verbal behavior and then expand by providing additional, relevant

language. This meant that implementing following and imitation correctly could lead to inaccurate responding for modeling and expanding (only providing the vocal imitation without the expansion resulted in an inaccurate instance). To avoid penalizing caregivers for accurate implementation of following and imitation, an allowance was provided for direct imitation of vocal verbal behavior in data collection for modeling and expanding. Direct vocal verbal imitation was not counted as inaccurate for the first 1/3 of total responses. Future research should investigate altering the definitions to remove vocalizations from the initial intervention phase (following and imitating) to get a better picture of the change in caregiver behavior across each phase and maintain better internal validity.

Similarly, and perhaps also a result of the overlap in definitions, the intervention affected change outside of the condition in intervention. Commenting behaviors decreased while still in baseline when CL1 (following and imitation) was initiated. This change in commenting may have been a result of teaching vocal imitation within CL1. Once caregivers were taught to imitate vocal and motor behaviors, all other commenting behaviors decreased to near zero levels. Had CL1 not included any caregiver vocal behavior there may have been a different result. It may also be valuable for future research to investigate the elimination of questions and demands separate from commenting behaviors.

5.2 CONCLUSION

Providing caregivers with the tools necessary to work with their young child with ASD creates an opportunity to increase the child's access to quality interventions and an enhanced relationship with their caregiver (Mahoney & Perales, 2003; Kenny & Winick, 2000).

Specifically, RIIs have been shown to be effective in targeting social communication deficits present in young children with ASD and were created with caregiver-implementation in mind. The literature provides examples of caregivers effectively implementing RIIs and meeting fidelity criteria to ensure that the intervention is being implemented as intended (Ingersoll & Gergans, 2007; Ingersoll & Wainer, 2013; Kashinath et al., 2006; Kaiser et al., 2000; Vismara et al., 2009). However, few of the examples within the literature use concrete direct observational methods or clear rationales behind fidelity criteria in order to truly address both *how much* and *how well* an intervention has been implemented (Dunst et al., 2013).

The present study lays a foundation for using concrete direct observational methods (frequency of strategy use) for collecting fidelity data and creating/setting clear fidelity criteria. By identifying component skills, accurate and inaccurate instances of strategy implementation can be measured and fidelity criteria can be based on not only administering the intervention correctly but also limiting inaccurate instances of strategy use. This study outlines the potential and capability of caregivers to learn and implement strategies with their children with ASD with minimal supports. Though it is not recommended to withhold feedback in practice, it shows that in necessary situations, a little can go a long way to helping caregivers increase their child's access to quality interventions. Further investigation into the effects that specific caregiver supports have on the trainer/trainee relationship may help to add to the literature on what supports should be used within any given intervention. In addition, continued investigation into the effects RII strategies, implemented with fidelity, have on child social communication, specifically functions of communication is necessary.

The current study demonstrates the effectiveness of the delivery of didactic lessons, post-session reports, and in limited instances delayed feedback on caregiver fidelity of

implementation for three RII strategies. Given these results, it may be possible to provide effective training for caregivers under restricted condition while maintaining quality implementation.

APPENDIX A

DEMOGRAPHIC QUESTIONNAIRE

Demographic Questionnaire

Please answer the following questions about yourself and your child to the best of your ability. If you have any questions or concerns relating to any of the items, please contact Rachel Gwin at (609) 213-2816.

Caregiver Questions:

1) Name: What is your full name

2) DOB: When were you born?

3) Ethnicity Origin (or Race): What is your ethnicity?

4) Education: What is the highest degree or level of school you have completed?
   1) No schooling completed
   2) Nursery school to 8th grade
   3) Some high school
   4) High school graduate
   5) Some college credit
   6) Trade/technical/vocational training
   7) Associates degree
   8) Bachelor's degree
   9) Master's degree
   10) Professional degree
   11) Doctorate degree

5) Household composition: what is you marital status?
   a) Single, never married
   b) Married or domestic partnership
   c) Widowed
   d) Divorced
   e) Separated

6) Household composition: who currently shares your home with you?

7) Professional or Employment status: Are you currently....?
   a) Employed
   b) Self-employed
   c) A homemaker
   d) A student
   e) Military
   f) Retired
   g) Other:_____.

Child Questions:

1) Name: What is your child's full name?

2) DOB: When was your child born?

3) Current diagnosis:
   a) What is your child's current diagnosis?

   b) Where was this diagnosis obtained and by whom?

   c) When was this diagnosis obtained?

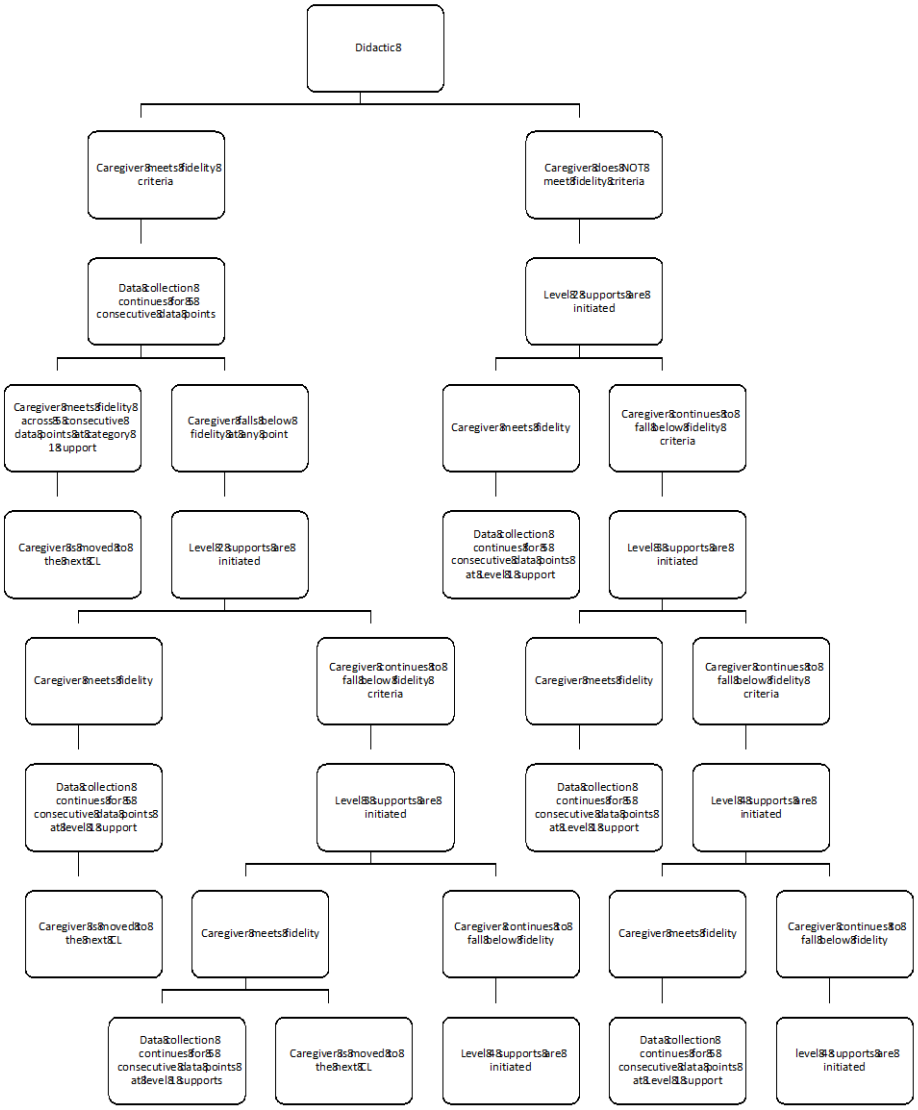
4) What services has your child previously received?

5) What services does your child currently receive?

.

APPENDIX B

FLOW CHART OF SUPPORT PROGRESSION BASED ON PERFORMANCE



APPENDIX C

SAMPLE HANDOUTS

Following and Imitating Your Child

Rationale:

- The purpose of following and imitating your child is to increase motivation during play and create opportunities for engagement

Key Points:

- Remain face-to-face
- Stay within an arms length away
- Move with your child (from activity to activity or item to item)
- Imitating their play
  - Directly mirror their actions with objects
- Imitate their sounds and words
  - Direct mirror their sounds and word
- Imitate their physical movement
  - Directly mirror their movements
- Avoid providing directions or prompting

Target:

- Following and imitation should be continuous
- Try to imitate every play action, sound/word, and movement
- Your target is to imitate approximately 3 times every minute

Commenting on Your Childs Behavior

Rationale:

- The purpose of commenting is to provide examples of appropriate language during appropriate contexts

Key Points:

- Continue to follow and imitate your child
- Narrate play and physical movements
  - Act as though all of their play actions and physical movements are intentional by giving them meaning through your descriptions
- Simplify your language
  - Use short, 2-3 word statements
- Use self-talk or parallel talk
- Avoid asking questions or placing demands

Target:

- Commenting should be done continuously
- Try to narrate your child's play and actions throughout your play sessions (think "sports announcer!")
- Your target is for modeling is approximately 3 times every minute

Modeling & Expanding Language For Your Child

Rationale:

- The purpose of modeling and expanding language is to provide a clear model for more advanced communication.

Key Points:

- Continue to follow, imitate, and comment for your child
- Once your child says a word or sound you want to:
  - Repeat and expand OR rephrase and expand
  - Repeat the word or sound by directly imitating their language
  - Expand by adding an additional 1-2 words (a verb, adverb, or adjective)
  - You may expand to correct grammar, provide examples of new words such as verbs, adjectives, or prepositions.
  - Rephrase words that you do not understand in order to provide a clear example of the correct language appropriate for the given context

Target:

- Modeling and expanding language should occur during every instance your child uses clear, functional words or sounds.
- You can also expand on sounds or words that are unclear by rephrasing those words to suit the context
- Your target for expanding is approximately 2 times per minute

APPENDIX D

SAMPLE DATE SHEET, CAREGIVER BEHAVIOR

PARTICIPANT: 1 2 3
Session Date:

Coded by:
Coded date:

Min	IMITATION				TS	Min	IMITATION				TS
0-1	FF	AL	DI	NP			FF	AL	DI	NP	
	FF	AL	DI	NP			FF	AL	DI	NP	
	FF	AL	DI	NP			FF	AL	DI	NP	
	FF	AL	DI	NP			FF	AL	DI	NP	
	FF	AL	DI	NP			FF	AL	DI	NP	
	FF	AL	DI	NP			FF	AL	DI	NP	
	FF	AL	DI	NP			FF	AL	DI	NP	
	FF	AL	DI	NP			FF	AL	DI	NP	
	FF	AL	DI	NP			FF	AL	DI	NP	
	FF	AL	DI	NP			FF	AL	DI	NP	
	FF	AL	DI	NP			FF	AL	DI	NP	
	FF	AL	DI	NP			FF	AL	DI	NP	
	FF	AL	DI	NP			FF	AL	DI	NP	
	FF	AL	DI	NP			FF	AL	DI	NP	
	FF	AL	DI	NP			FF	AL	DI	NP	

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