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CHILD LANGUAGE AND HAPPINESS BEHAVIORS: EVALUATING THE EFFECTS OF CAREGIVER COACHING

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CHILD LANGUAGE AND HAPPINESS BEHAVIORS: EVALUATING THE

EFFECTS OF CAREGIVER COACHING

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THESIS

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A thesis submitted in partial fulfillment of the
requirements for the degree of Master of Science in Applied Behavior Analysis in the
College of Education
at the University of Kentucky

By

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Lexington, Kentucky

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ABSTRACT OF THESIS

CHILD LANGUAGE AND HAPPINESS BEHAVIORS: EVALUATING THE

EFFECTS OF CAREGIVER COACHING

Caregivers of young children who have or are at risk for disabilities may struggle supporting their child's language development. This study used a tailored rapid coaching intervention to teach a caregiver different naturalistic language interventions that can be used with their child during play. Evidence-based naturalistic skills for increasing child communication were chosen to teach the caregiver based on baseline levels of skills. The purpose of this study was to evaluate the effectiveness of a tailored RCI (training and coaching) with caregivers of children with developmental disabilities. Like other studies, this study involved evaluating child-level communication but extended child measures by including as assessment of happiness behaviors. Child happiness behaviors were recorded and assessed across the study to evaluate the social validity of the caregiver coaching intervention. In addition, a speech-language pathologist collaborated with the research team to assist in selecting instructional language targets for the child.

KEYWORDS: Naturalistic Language Intervention, Speech Language Pathologist, Narrating Play, Environmental Arrangement, Happiness

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Child Language and Happiness Behaviors: Evaluating the Effects of Caregiver Coaching

Caregivers often serve as their child's first teacher, creating opportunities for learning during interactions. Caregivers teach their infant how to communicate during these interactions by establishing joint attention (e.g., pointing at a toy), modeling (e.g., labeling toys during play), and providing feedback (e.g., responding to the child's interests) (Owens, 2019). For example, infants initially reflexively cry, which is followed by a response from their caregiver, such as a feeding or diaper change (Paul & Norbury, 2012). Over time, the infant begins to recognize that crying changes their caregiver's behavior, and in turn, they learn to communicate their needs (Lane & Brown, 2016). Thus, caregivers shape a child's short- and long-term communication. The transactional language model is one way we can describe this early reciprocal relationship. This model emphasizes the bidirectional nature of communication, meaning the adult and child directly influence each other (Camarata & Yonder, 2002). Relatedly, the science of behavior helps explain how behaviors continue or are extinguished by contexts. Essentially, this means that if the child responds to the caregiver's communication, then the caregiver's communication is reinforced, and their response back to the child will also reinforce the child's responding and/or initiating communication behaviors. Thus, when practicing language skills during play, ideally, children will be happier and more likely to reinforce their caregiver's teaching behaviors as well.

Language development, a communication component, typically emerges later and may be delayed for some children. Caregivers of children with expressive language delays may struggle with supporting their child's language development, especially when

children display difficulty reliably responding to their bids for attention. Caregiver initiations may subsequently decrease because the child responds infrequently, or they perceive that their child is disinterested. For example, parents and caregivers of children with autism spectrum disorder (ASD) reported higher levels of stress when attempting to address their child's communication and language (Alpern, 2012; Benson & Karlof, 2009; Estes et al., 2009; Hayes & Watson, 2013). When this occurs, caregivers may need support to know how to encourage their child to communicate using age-appropriate language (Ledford & Wolery, 2013).

The Individuals with Disabilities Education Act (IDEA, 2004) ensures that families with children at-risk for or with disabilities receive training, coaching, and related supports within a family-centered approach to service delivery. Relatedly, professional organizations recommend training caregivers to implement evidence-based interventions (e.g., Division for Early Childhood of the Council for Exceptional Children, 2014), which increases the likelihood that children will maintain and generalize what they learn (Sandall et al., 2005). However, caregivers may face barriers when securing services. Logistical barriers can include location (e.g., living in a rural area), transportation issues, and lack of childcare for other children. An access barrier is being on a waitlist for services, especially when caregivers seek behavioral services. Finally, a participation barrier may also hinder meaningful service delivery; some caregivers reported feeling like passive participants in their child's care (Brown et al., 2012; Farmer et al., 2014) and, as such, are potentially ill-equipped to address their child's communication. Potential barriers may decrease opportunities for learning, especially during critical developmental periods. For children with disabilities, it is crucial that

adults, including caregivers, provide an adequate dosage of opportunities to learn and practice skills within natural routines and activities (Ledford & Wolery, 2013; Warren et al., 2007). Thus, it is essential that professionals and caregivers collaborate and identify practical and evidence-based practices in a timely manner to maximize child learning opportunities (Dunst et al., 2000).

There is a breadth of research demonstrating practitioner success in training caregivers to implement evidence-based practices in both clinical and home-based settings (Rocha et al., 2007). Within this context, training refers to teaching a few skills to a set criterion. In contrast, coaching refers to a collaborative process of setting goals for practice implementation and a series of practice opportunities to implement procedures and receive feedback during guided reflection (Snyder et al., 2015). Numerous training and coaching interventions are available in published studies and related works (Brown & Woods, 2012; Friedman, et al., 2012; Marturana & Wood, 2012; Powell & Dunlap, 2010; Salisbury et al., 2018). These studies often include one or more of the following components: (a) direct instruction, (b) modeling, (c) role-playing, (d) written/typed scripts, and (e) feedback in-person or through video (Chaabane, et al., 2009; Cardon, 2012; Kaiser & Roberts, 2013, Lafasakis & Sturmey, 2007; Lane, et al., 2016; see Table 1 for detailed descriptions).

Table 1 *Training and Coaching Components*

Training Component	Definition	Source
Direct Instruction (AKA, Explicit Instruction)	Direct instruction means a trainer provides instruction over a specific skill or concept using a highly structured method. This typically involves teaching specific steps within a strategy and discussing when, how, where, and why to use the strategy.	How can teachers effectively teach study skills strategies?. IRIS Center. (n.d.). https://iris.peabody.vanderbilt.edu/module/ss1/cresource/q2/p03/ Chaabane, et al., 2009 Lane et al., 2016 Lafasakis & Sturmey, 2007
Modeling	Modeling means a trainer demonstrates how the strategy is used, often while verbally reviewing the steps.	How can teachers effectively teach study skills strategies?. IRIS Center. (n.d.). https://iris.peabody.vanderbilt.edu/module/ss1/cresource/q2/p03/ Chaabane, et al., 2009 Lane et al., 2016 Lafasakis & Sturmey, 2007
Role-Playing	Role-Playing means a trainer provides learners with opportunities to practice their skills in a low-stakes or faux-environment and receive feedback before attempting the skills alone.	How can teachers effectively teach study skills strategies?. IRIS Center. (n.d.). https://iris.peabody.vanderbilt.edu/module/ss1/cresource/q2/p03/ Chaabane, et al., 2009
Written/ Typed Scripts	A written/typed script is a description of a specific skill that functions as a model or demonstration of the correct response for the learner. These scripts are typically practices again and again until the skill is able to be used in-vivo.	How can teachers effectively teach study skills strategies?. IRIS Center. (n.d.). https://iris.peabody.vanderbilt.edu/module/ss1/cresource/q2/p03/ Chaabane, et al., 2009 Lane et al., 2016
Feedback in-person or through video	Feedback refers to either in-person or video-based responses from a trainer to a learner that describes the positive aspects of their behavior, as well as areas of improvement. Feedback is contingent upon the response provided by the learner.	How can teachers encourage and reinforce expected behaviors? IRIS Center. (n.d.) IRIS	Page 6: Providing Positive Feedback (vanderbilt.edu) Chaabane, et al., 2009 Lane et al., 2016 Lafasakis & Sturmey, 2007

There are a variety of multi-component coaching interventions for caregivers who want support for intervening on child communication (Ledford et al., 2019). The Family-

Guided Routines-based Intervention (FGRBI; Cripe & Venn, 1997; Woods et al., 2004),

Behavioral Skills Training (Shayne & Miltenberger, 2013), and Teach-Model-Coach-

Review (TMCR; Kaiser & Roberts, 2013) are all examples of packaged interventions for

families. FGRBI (Cripe & Venn, 1997; Woods et al., 2004) involves an intensive family-

centered approach (e.g., Problem Solving and Planning, Reflection and Review, etc.)

during weekly visits to help caregivers implement teaching opportunities in their natural

environment and daily family routines; the intervention may take up to 32 weeks for a

caregiver to reach mastery (Woods et al., 2004). BST is a widely used teaching

intervention and has been used to train caregivers to implement function-based

interventions (Shayne & Miltenberger, 2013). Although this training only included a

single instruction session (and maintenance sessions), the initial caregiver class lasted 3

hours (Shayne & Miltenberger, 2013). TMCR involves coaching caregivers to implement

enhanced milieu teaching language elicitation strategies (e.g., environmental

arrangement, responsive interaction, language modeling and expansion, etc.; Kaiser &

Roberts, 2013; Wright & Kaiser, 2017). TMCR involves an initial workshop, followed by

approximately 12 weeks (about 3 months) of training, twice a week and for 40 min per

visit (Roberts et al., 2014). Ideally, caregivers will receive coaching for an extended

period, but accessing specialized interventions, as well as barriers, may delay

implementation and be problematic, especially if caregivers lack foundational skills for

encouraging communication and teaching language.

Caregivers of children with delayed language need timely access to services and

supports that can help them provide their children with a rich environment for language

development. A potential option to fill this need is by conducting relatively brief coaching

interventions targeting caregivers' foundational skills. An example of this is the rapid coaching intervention (RCI) described by Lane and colleagues (2016), which found that a multi-component RCI was effective for teaching caregivers naturalistic language strategies to use with their child with ASD during play. Naturalistic language strategies refer to practices caregivers can use to promote language by altering their child's natural environment, such as the following skill sets: playing, noticing and responding, providing linguistic input, and planning communication opportunities. These skills are commonly recommended to caregivers because they are basic and foundational skills that may help the caregiver promote motivation and engagement from their child, while also providing models of new play routines and contrived opportunities for their child to practice communication. The RCI was originally developed to support families seeking additional support and services. The intervention includes a rationale for each caregiver behavior, in-vivo coaching during short sessions, and immediate feedback. Because of limited resources, the intervention was designed to help caregivers learn strategies they can use across contexts that may lead to long-term improvements in communication. This intervention has been utilized in homes (Zhu et al., 2022), online (Lane et al., 2023), and in community-based clinics, with support from a speech-language pathologist (Campbell, 2022; Reiss, 2023). In a recent study (Gullett, 2024), caregiver feedback (e.g., watching a feedback video was nonpreferred) highlighted the importance of potentially tailoring training and coaching by family instead of an identically packaged intervention. Previous literature also highlights the importance of tailoring performance feedback systems (Barton, et al., 2011). This is also an important consideration when further evaluating the proposed RCI.

An important aspect of caregiver-focused interventions, including the RCI, is considering the impact on the child. For example, communication and language interventions for young children often include measures of communication, such as nonverbal behaviors (e.g., gestures), linguistic competence (understanding language), or linguistic performance (using language) (Lane & Brown, 2016; Owens, 2019). Additional child behaviors may warrant attention in such studies. For example, child communication is often measured during play because the context is considered a natural part of early childhood and may increase a child's motivation to communicate. Ideally, we can expand our understanding of these underlying assumptions by including measurements of the child's happiness during play, especially when caregivers are coached by another adult on naturalistic strategies. Assessing child happiness can also allow researchers to observe if the children enjoy the intervention, an important but often overlooked aspect of an intervention's social validity. Historically, research in adults often uses self-report measures of emotions such as happiness (e.g., Logan et al., 1998). Self-reported happiness in adults is associated with increased productivity and social engagement (Diener & Seligman, 2002; Judge et al., 2001), as well as increased creativity and cognitive flexibility (Baas et al., 2008; Bless et al., 1992; Fredrickson & Branigan, 2005; Ritter & Ferguson, 2017). Given the potential benefits of happiness, expanding measures to early childhood research may be useful for professionals.

Regarding happiness, increased awareness of the lived experiences of neurodivergent individuals is important, especially when considering self-reports of what happiness looks like, which has direct implications for professionals. Happiness is often defined through either a self-report of well-being or observing a positive affect

(emotional) state (Haybron, 2020). Within relatively brief studies, it may be more feasible and practical to measure happiness as a positive emotional state of an individual, rather than "well-being" (i.e., long-term measure). Previous researchers have developed the *Indices of Happiness and Unhappiness Questionnaire* to assist in making treatment preference and decision-making for nonverbal and minimally verbal individuals (Parsons et. al., 2012, Ramey et al., 2023). Individualized indices were created by providing relevant adults (caregivers, teachers, etc.) with a brief questionnaire about the behaviors the child exhibits when happy and unhappy. Caregivers completed the questionnaire and reported behaviors representing happiness in their child. Operational definitions of happiness behaviors are then developed using the results.

Measures of happiness behaviors have informed assessments and interventions, including functional analyses and derived treatment plans (Dillon & Car, 2007; Thomas et al., 2021). Being able to analyze and identify happiness behaviors is thought to make an individual's preference indication more genuine and robust (Green et al., 1988, Parsons, et al., 2012, Smith et al., 2005). Therefore, analysis of happiness behaviors may improve language assessment and treatment by helping practitioners better understand their client's preferences.

Additionally, researchers have used measurements of happiness behavior to assist in determining which teaching interventions to use when working with children with ASD (Dunlap & Koegel, 1980). However, measuring the children's indices of happiness has not previously been used to evaluate the social validity of caregiver training and intervention services.

The purpose of this study was to evaluate the effectiveness of a tailored RCI (training and coaching) with caregivers of children with developmental disabilities. This study replicated Lane et al. (2016) and includes components from other studies (e.g., Campbell, 2022) and recommendations (Gullett, 2024; Lane, 2023). Like other studies, this study involved evaluating child-level communication but extended child measures by including an assessment of happiness behaviors to assess the social validity of caregiver coaching interventions.

Research Questions

1. **Primary research question**: When a tailored RCI is used during caregiver-child play sessions, will caregivers reliably implement naturalistic strategies with fidelity?

2. **Secondary research questions**: When a tailored RCI is used during caregiver-child play sessions, will child happiness behaviors increase? Furthermore, will children display increases in vocal communication in the form of responses and initiations after caregivers learn naturalistic strategies?

Method

Participants

One caregiver-child dyad was recruited for this study. The study-level inclusion criteria were that the caregiver was (a) at least 18 years of age, (b) the primary caregiver to a 1-4-year-old child with expressive language delays (defined as scoring below the 25th percentile on the MacArthur-Bates Communicative Development Inventories [MCDI]), and (c) fluent in written and spoken English. Participation also required that the caregiver have access to Wi-Fi and be able to join live online Zoom links for sessions. Potential participants were excluded from the study if their child recurrently demonstrated high-risk or dangerous challenging behaviors (e.g., physical aggression toward others, high-magnitude self-injury, etc.). A caregiver interview and pre-screening observation occurred to ensure that the caregiver and child met the inclusion criteria. The pre-screening also included administering the MCDI (Marchman et al., 2023) to the caregiver and collecting a language sample on the child's communication skills. The MCDI is a reporting instrument for caregivers to describe their child's early language abilities; caregiver ratings are converted to fitted percentiles. This informed the team on the frequency and type of words frequently used by the child.

The caregiver-child dyad consisted of Jordyn, an African-American female in her late 30's, and her biological son, August, an African-American, 32-month-old male. Jordyn and August's father also have three older daughters who live in their home with them. Jordyn found out about the study from recruitment efforts at August's preschool.

August has the following diagnoses: autism spectrum disorder, level three, global developmental delay, hypotonia, and expressive communication delay. Jordyn reported

that August used mostly gestures such as pointing or guiding another person's hand to communicate, as well as a handful of names (Mom, Dad, Gi-Gi, sister) and single-syllable babbling. August often babbled with a social function, trying to communicate, especially during back-and-forth exchanges with his mom. During play, August mostly engaged in physical activities and routines (tosses, tickles, clapping, etc.). Observations indicated that August's play was primarily sensorimotor (i.e., sensory exploration of toys) and relational (i.e., combining objects by grouping, building, or associating objects differently; Ledford et al., 2019) play. August attended preschool five days a week and received early intervention services, including speech therapy once a week.

The researcher was a 24-year-old White female graduate student. At the time of the study, she was enrolled in an Applied Behavior Analysis master's program. Previously, the researcher received her Bachelor of Science degree in Psychology and Applied Behavior Analysis. The researcher was also the primary interventionist and data collector and will be referred to as the researcher. Additional graduate students in the same Applied Behavior Analysis program served as secondary data collectors. Secondary data collectors had at least two years of experience teaching and/or working directly with individuals with disabilities.

Settings & Materials

This study was conducted through telehealth appointments using the web app Zoom Video Communications, Inc. (i.e., Zoom). All sessions took place via Zoom in a bedroom in the participants' homes, typically using the bed as a sitting/play area. The caregiver brought some play materials and toys into the room before the sessions began

and placed them within the sight of the child. Play materials were sometimes placed within the child's reach and sometimes out of reach.

All sessions were recorded via Zoom and using the researcher and data collector's computers. Data were collected by using the session recordings to track how many and when caregiver and child target behaviors occurred. Laptops were needed to provide the caregiver with training examples and feedback, as desired by the caregiver. The caregiver was trained and coached on 3-4 sets of behaviors or skills to promote communication in their child. The caregiver is currently being coached on the second set of skills. Each asynchronous skill training consisted of a training video and corresponding handout. Training videos described a naturalistic strategy, provided a rationale for using the strategy, and provided a video model/example of a research team member using the skill during a child play session. The training videos also demonstrated how these skills build on one another by incorporating the previously taught skills into new skill lessons to promote maintenance of old skills. During coaching sessions, the researcher briefly reviewed the training materials and answered any caregiver questions before beginning play sessions/observations. The researcher incorporated tailoring options into the caregiver training procedures including asking the caregiver their preferences on feedback level and methods (Appendix A)

Measurement System & Behaviors

Event recording with time stamps was utilized to record caregiver and child behaviors. Event recording with time stamps is more precise than count alone because it captures the exact moment each behavior occurred (Ledford et al., 2018). Data collectors had a list of target adult behaviors, which were recorded with a timestamp on data sheets

(Appendix B). For happiness behaviors, data collectors were provided individualized

indices of happiness and unhappiness to record target child behaviors, which were

recorded using momentary time sampling (10s intervals) on datasheets. Additional

secondary dependent variables were recorded using a pre-and post-test. These data were

collected using the baseline play samples (responding to caregiver, and child initiation).

Primary Dependent Variables – Adult

The primary dependent behaviors were first developed by Lane et al. (2016) and

further refined in an unpublished training guide developed by Lane (2023). The four skill

sets are summarized below; full definitions are attached in Appendix C.

Set 1: Playing

This set focused on teaching caregivers play skills targeted at promoting their

child's engagement. These skills let the child know that the adult is interested in what

they are playing with and to model new novel play skills and routines.

Imitation. The target behavior imitation included any instance where the

caregiver replicated the child's action on objects or play routines. The adult's imitation

must have occurred with the same, similar, or pretend play materials. For example, if the

child rocked a baby doll, then the caregiver should have picked up a doll or pretended to

have one and rocked it similarly to be considered imitation. However, adults could have

also pantomimed actions if no extra materials were available. Separate instances of

imitation were recorded when different toys were used, different actions occurred, or

more than 3 s passed in between actions.

Expansion. This skill included anytime the caregiver added new toys or actions

to the child's play to diversify or expand the child's play routines and behaviors.

Expansions had to happen within 3 s of the child engaging in the initial play behavior. Additions also to be thematically or contextually relevant to the child's current play behaviors and routines.

Set 2: Noticing and Responding

This behavior required the adult to notice all forms of their child's communication and respond meaningfully.

Responding to Communication. This behavior was defined as "caregiver vocally responding to the child's communication within 1-3 s [with a contextually relevant and grammatically correct sentence] and waiting up to 5 s for a child-level response" (Lane, 2023, p. 17). Examples included the child gesturing or verbalizing and the caregiver responding by providing language related to the child's gesture (e.g., pointing to a stuffed giraffe) or repeating and adding to the child's verbalization (e.g., the child said "car" and the caregiver responded with "roll the car").

Set 3: Providing Linguistic Input

Skill set 3 and subsequent skills have not been taught yet. The following behaviors will be targeted later, as the caregiver meets mastery criteria for each skill set. The unit 3 training materials were shared with the caregiver on April 8th and coaching sessions will begin this week. When the child is not communicating, the caregiver can provide input, or model language in the form of contextually relevant and grammatically correct sentences.

Describing the Child's Play. This behavior refers to the caregiver providing a verbal model in the form of a relatively brief and grammatically correct sentence that described the child's play actions and then waited up to 5 s for the child to respond.

Examples include a caregiver saying, "The baby is sleeping," while their child rocks a baby doll. Non-examples include the caregiver asking questions or making several comments successively, with little to no time for a response.

Caregiver Describing Their Own Play. This behavior refers to the caregiver using a verbal model, like above, to describe their own play and waiting up to 5 s for the child to respond. The caregiver's play must be contextually relevant, meaning that the caregiver should imitate the child's play or take a turn in the child's play routine, not doing and describing random independent activities. An example could be the caregiver saying, "I am drawing a flower," while taking a turn or simultaneously drawing with chalk with their child and then waiting.

Set 4: Planning Communication Opportunities

The primary focus of this skill is to teach the caregiver how to create opportunities for communication for their child.

Environmental Arrangement (EA). EA refers to the caregiver providing opportunities for communication (e.g., placing preferred objects in view but out of reach), specifically encouraging the child to use the target language, and waiting up to 5 s for a verbal response. If the child uses the target language, communicates otherwise, or displays sustained interest, the caregiver responds by providing the corresponding consequence (e.g., access to an item, social attention). If the child loses interest, the adult ends the trial and tries again later in the session.

Secondary Dependent Variables

Responding to Caregiver

Responding to a caregiver was operationally defined as any attempt by the child to communicate verbally or nonverbally (i.e., point, show, reach) within 5 s of a caregiver's question, cue, or prompt. Any verbalization, approximations, and non-word sounds were considered an attempt to communicate. Only the first instance was counted if a child repeated the same word or phrase repeatedly unless there was more than a 3-s delay between the ending of the first word and the beginning of the second one. Examples included the child imitating a caregiver modeling target language or reaching towards the item the caregiver modeled, the child saying or approximating the name of a toy the caregiver is holding, and the child saying "no" or using vocalizations. A non-example was if the child independently initiated communication.

Initiating to the Caregiver

Initiating to the caregiver was defined as any spontaneous verbal or nonverbal attempt to communicate, including any words, vocalizations, or gestures the child engaged in during sessions. Initiations were counted if more than 5 s had elapsed since the caregiver provided a question, cue, or prompt to communicate. Like responding, only the first vocalization was counted if the child repeated the same word or phrase over and over unless there were more than 3 s between the ending of one word and the beginning of another. Examples included the child giving the caregiver a toy to play with, guiding the caregiver to a toy they cannot reach, or asking to be tickled. Non-examples of initiation to a caregiver included a child approaching their caregiver after their caregiver spoke to them or a child handing something to their caregiver when their caregiver gestured for it.

Happiness Behaviors

Happiness behaviors were defined as observable facial or vocal responses, such as laughing and smiling, and are unique to all children. Happiness indices were defined individually for the child, corresponding to standards offered in previous literature (Dunlap & Koegel, 1989; Green & Reid, 1996; Parsons et al., 2012; Ramey et. al. 2023). The researcher administered an altered *Indices of Happiness and Unhappiness Questionnaire* (Appendix D) to the caregiver and developed an individualized list of happiness and unhappiness behaviors for the child. The researcher added additional questions to the questionnaire regarding the child's joint engagement. Engagement was added as a variable to account for times when the child may be happy or content, but not outwardly expressing it through their behavior. Even when we are feeling happy, we do not engage in happiness behaviors non-stop (e.g., people may laugh or smile for a few minutes of conversation, but also engage in neutral or focusing behaviors). Therefore, engagement was seen as a neutral or semi-positive state to reflect when the child was interested in play and accepted their caregiver playing with or near them. Each happiness and unhappiness behavior from the list was operationally defined and written out for data collectors (Appendix E). Happiness and Unhappiness behaviors were tracked separately using momentary time sampling (not mutually exclusive: could happen at different times, the same time, or neither could be happening).

Since outward expressions of happiness can be fleeting and difficult to capture, the researcher added a joint-engagement component to the indices of happiness. To better capture and conceptualize happiness, the researcher provided an operational definition of joint engagement and no joint engagement for August to the happiness/unhappiness datasheet (Appendix E). These definitions were created using information collected

during the interview and administration of the altered *Indices of Happiness and Unhappiness Questionnaire* (Appendix D). Data collectors used the same momentary time sampling datasheet to indicate happiness, unhappiness, and joint-engagement behaviors across all sessions.

Happiness, unhappiness, and joint engagement behaviors were collected and assessed across all baseline and intervention sessions. Intervals were 10 s long, and all 4-min sessions had a total of 24 intervals. Potential examples of happiness behavior included: smiling, laughing, hugging, jumping, giggling, or hand flapping. Potential examples of unhappiness behaviors include crying or property disruption.

Experimental Design

The RCI was evaluated using a multiple baseline across behaviors design (Gast et al., 2018). Multiple baseline designs involve a time-lagged introduction of the intervention at different points in time. Each tier represents a different caregiver behavior/skill they have learned, and the order of the tiers was established based on the complexity of the target behaviors (i.e., discrete skills first, chained skills last). To move from one tier to the next tier, (1) the adult must first meet the pre-determined criterion, and (2) baseline data for other skills shows a stable response pattern. Researchers only intervened on one skill/tier at a time, creating a time lag between intervening on skills based on the caregiver's behavior. This design was chosen because the research question for this study is a demonstration research question that investigated likely non-reversible behaviors (Lane et al., 2016; Ledford & Gast, 2018, p. 97-131). This design did not require removing an intervention to demonstrate a functional relation; the caregiver's performance was used to make experimental decisions. Additionally, this design allows

the research team to discover any covariation in untreated tiers by having continued baseline data collection. Since the caregiver was learning to implement various responsive interaction strategies, monitoring for potential changes to other behaviors/tiers was vital. Data were collected continuously throughout every session on caregiver and child behavior. Continuous measurement of pre-intervention behaviors allowed the research team to examine the data more regularly than a multiple-probe design (Gast et al., 2018). A multiple-baseline design was used to time-lag the introduction of the RCI across two caregiver behaviors, each at a different point in time. The researcher will continue to implement the RCI with the family across an additional two caregiver behaviors/tiers.

Since caregiver behavior, specifically meeting the mastery criterion for a behavior, determined when the intervention was introduced to other behaviors, adult behavior was the primary dependent variable. Changes in child behavior did not impact experimental decisions; therefore, child behaviors were considered secondary dependent variables. This design helped detect and control for maturation, history, testing, multi-treatment interference, and instability by continually collecting data in each condition until stability was observed in the data path. Secondary observer data collectors were trained until they reached a pre-determined criterion to control for threats to procedural infidelity and instrumentation. Functionally independent behaviors were selected to decrease the possibility of covariation (Gast et al., 2018).

Procedures

Screening & Baseline Condition

Before the first appointment, the caregiver completed the MCDI: Words &

Gestures, Third Edition, using the form corresponding to their child's age (Marchman et

al., 2023). The purpose of this form was for caregivers to indicate their child's vocabulary

and related age-expected language. During the initial meeting, the researcher interviewed

the caregiver and administered the altered *Indices of Happiness Questionnaire* (Appendix

D). Due to a scheduling conflict, the child was unable to attend the first meeting and the

remaining screening/baseline procedures were postponed until the second meeting.

At the beginning of the second meeting, the researcher asked the caregiver how

the child's day had been. This verbal caregiver report was collected across all baseline

and intervention meetings to account for any drastic variability in child behaviors across

different meeting sessions. During the second meeting, the researcher told the caregiver

to play with her child as she normally would. Then, the researcher started recording on

her computer, set a timer, and observed the caregiver conduct a 15-minute play session

with their child. This caregiver-child play session was utilized as a language sample to

assess how the child normally communicates. The recording of the language sample was

then transcribed and analyzed (see Appendix F). When measuring vocal communication,

approximations of words/language were included, and approximations were defined as

having at least one phoneme from a word(s) related to the referent (Paul & Norbury,

2012). Results of the language sample indicated that the child said 11 intelligible words

and 5 novel words during the sample. Additionally, the mean length of utterances in

morphemes (MLUm) and words (MLUw) were 1.08, respectively. This score fell into the

1.00-2.00 range and is correlated with the first of Brown's five stages of development

(Brown, 1973). Children scoring in the first stage of Brown's language development scale

indicate a child should have or be progressing toward a vocabulary of around 50-60 words (Brown, 1973).

Following the meeting, the implementor met with an SLP to discuss the assessment data and language sample and to identify child-level instructional targets. Before beginning coaching sessions, the caregiver was informed of the child's communication targets, the rationale behind each target, and how to promote and reinforce their child's target communication behaviors.

The 15-min play session was trimmed down to a 12-min sample (three 4-min sessions), which was coded and analyzed to assess the caregiver's existing skills/behaviors. Caregiver behaviors that occurred 25% or less of the session (no more than once every 4 min) were considered for the study. This screening session also served as the baseline condition (three 4-min sessions). Three baseline sessions were completed, and no further sessions were needed because data was stable. Procedures for the screening/baseline sessions were as follows:

1. Asked/Prompted the caregiver to set up the room/area with preferred toys.

2. Instructed the caregiver to play with their child like they normally would and to follow the child's lead.

3. Researcher provided no further instructions or prompts to the caregiver or child.

Intervention Condition

The implementor, caregiver, and child all met via Zoom together. RCI sessions occurred approximately once a week for 1-hr. The caregiver received and reviewed an asynchronous training module on each target behavior before beginning coaching

sessions on the corresponding behavior. At the beginning of the first intervention session, the researcher explained the child's language target and a rationale for each target. Additionally, the researcher asked the caregiver how the child's day had been. This verbal caregiver report was collected at the beginning of all intervention meetings to account for any drastic variability in child behaviors across different meeting sessions. This was important for happiness data stability because multiple sessions were completed within each meeting, which could lead to cyclical data or major differences in happiness behavior across different days.

During sessions, the implementor briefly reviewed the training materials (described below) with the caregiver, discussed the rationale for the target behavior, offered to show clips (examples) of how to engage in the behavior, offered to demonstrate or role play with the caregiver, and answered any caregiver questions. Following the review, the implementor asked the caregiver to practice the skill with her child and conducted multiple 4-min coaching sessions for the remaining duration of the visit. The implementor recorded each coaching session individually and provided live performance feedback on the caregiver implementing target behaviors (e.g., "Great job adding new actions to August's play!" "Awesome job waiting, that was perfect!"). After each session, the implementor offered to replay parts of the recording to provide positive feedback regarding the caregiver's use of the target behavior and identify times they could have used it. The learning criterion for each skill was the caregiver displaying the behavior at least four times per session and across three consecutive sessions.

Caregiver Training. The implementor sent an asynchronous training link to the caregiver via email a few days before the first coaching session for each tier. For each

skill, a link provided the caregiver with a handout about the skill and a short training video. Each training handout defined a target caregiver skill and provided guidelines for how often they should engage in the behavior (See Appendix G). Training videos were each between 5-8 minutes long (Lane 2023) and provided a definition of the skill, a rationale for using the skill, guidelines for how often to use the skill, and an example of a research team member modeling the skill with a child.

Coaching Sessions. Right after the implementor reviewed the training materials, the researcher and caregiver began coaching sessions. The researcher began each session by asking the caregiver to practice the target skill with their child. The researcher provided behavior-specific praise after each instance of caregiver target behavior. The session was recorded directly onto a computer by either the researcher or the secondary data collector. The researcher asked the caregiver at least once per meeting session about the frequency and type of feedback provided to her and her feedback preferences.

Post-session Feedback. Following each coaching session, the researcher immediately provided performance feedback. Performance feedback included praising specific instances of skills, summarizing the live coaching feedback, and providing any additional commentary (e.g., explaining why a specific instance did not count). An example of performance feedback included the researcher saying, "You did a great job noticing and responding when August gestured to go up- it's great that you're responding to all of his forms of communication!" (Specific praise), "I noticed that you used the new skill several times throughout- you did an amazing job!" (Summarizing live coaching feedback), "Don't forget to wait for five seconds after your sentence so he has a chance to respond or mimic you" (additional commentary). Next, the researcher asked the caregiver

how they felt the session went and if they had any questions during the post-session feedback. After answering any questions, the researcher offered to show the caregiver specific examples from the video recording. The researcher also offered to model the skill live and/or rewatch portions of the training video with the caregiver. Performance feedback is estimated to take 2-3 min (Lane et al., 2016).

Maintenance Condition

Maintenance sessions will occur one week after the caregiver has reached the mastery criterion for all target behaviors. Maintenance sessions will be conducted via Zoom and will be the same, procedurally and contextually (similar toys, arrangement, etc.), as baseline sessions. The researcher will not provide feedback during maintenance sessions. Additionally, the multiple-baseline design ensures that maintenance data is taken on all initial tiers while implementing the intervention in later tiers. Thus, the nature of the design will allow us to track maintenance data on early tiers throughout the study.

Social Validity

After the study concludes, social validity will be evaluated by conducting a caregiver interview. The interview will be conducted by someone unaffiliated with the intervention team to ensure that the caregiver is comfortable discussing their experiences in the study. Questions include:

1. Tell me about your experience with this study, such as your thoughts on the training videos, online coaching, feedback, etc.?

2. Given what we just discussed, how can we better support families in the future?

3. Tell me about [child's name]'s experience.

4. Can you tell me about any times you have been able to use these skills outside of our time together?

5. Will you continue to use any of these strategies after this study?

Reliability & Fidelity

Interobserver agreement (IOA) and procedural fidelity data were collected for at least 33% of sessions across every condition. Before assisting with the study, secondary data collectors were trained on relevant data collection procedures (procedural fidelity, caregiver behaviors, child happiness behaviors, and child communication behaviors). Data collectors were trained by being provided (a) definitions of target behaviors and procedures, (b) opportunities to practice, and (c) performance feedback. Training continued until data collectors had at least 90% agreement on target behaviors (Ledford et al., 2018).

Interobserver Agreement

Data collectors utilized datasheets and session recordings to rewatch and time-stamp video records on caregiver and child behavior. Video records was coded via time-stamps in an Excel spreadsheet or using datasheets. IOA was analyzed using point-by-point agreement with timestamps. Time stamps needed to be within 5 s of one another to count as an agreement for instances of target behavior. The IOA was calculated as the number of agreements within the time frame divided by the number of agreements plus disagreements, with the quotient multiplied by 100 (Campbell, 2022; Ledford et al., 2018). If IOA data had fallen below 80%, data collectors would have been retrained until they reached the criteria previously listed. IOA for caregiver behaviors was 100 % across all conditions (baseline and intervention). IOA for child happiness ranged from 94% to

97%, with an average of 96%. IOA for child communication behavior has not yet been calculated or analyzed.

Procedural Fidelity

Data collectors used data sheets and meeting recordings to collect procedural fidelity; copies of these data sheets are listed in Appendix H. The occurrence and nonoccurrence of the primary researcher's behavior was recorded as procedural fidelity. The researcher was scored on the following behaviors, as well as other behaviors across conditions: provide the caregiver with (a) the rationale, (b) a video model of the target behavior, (c) behavior-specific praise during coaching sessions, and (d) examples and realistic suggestions during feedback sessions (Appendix H). Procedural fidelity was calculated as the number of observed behaviors divided by the total number of planned behaviors multiplied by 100 (Ledford et al., 2018). Procedural fidelity across conditions ranged from 93-100% across all conditions (baseline, tier 1, and tier 2), with an average of 99% across conditions.

Results

All graphed data were visually inspected within and between conditions, with consideration of level, trend, stability/variability, overlap, immediacy of effect, and consistency of effect (Ledford & Gast, 2018). Stability within conditions and differences across conditions are essential aspects of visual analysis of time-lagged graphs. For the caregiver behavior, a functional relation is defined as at least three demonstrations of effect (i.e., therapeutic improvements in a target behavior in the intervention condition compared to performance in the baseline condition), with no more than one non-effect (Barton et al., 2018).

Caregiver Use of Naturalistic Strategies

The results of caregiver skills throughout the study are presented in Figure 1 and will be visually analyzed across all conditions. During the baseline condition, the parent only engaged in play expansion (Tier 1) once (across three sessions) before the training and coaching sessions. Analysis of the baseline data path demonstrated a low level of responding with a stable trend and low levels of variability. Data paths for all other tiers (2-4) were all stable, indicating a low level of responding with a zero-celerating trend and no variability in data. Since there were low levels of responding and stability across all tiers, the intervention for Tier 1 was introduced.

After introducing the intervention in Tier 1, improvements in play expansion were observed across the data path. The first datapoint intervention condition overlapped with the highest point along the ordinate in the baseline condition. For the second and third intervention sessions, an accelerating trend in a therapeutic direction was observed in the data path. During the four subsequent sessions the data were relatively stable at or near

the criterion. Because the caregiver met the criterion during Intervention Session 5, we considered this a basic demonstration of effect. Additional sessions were conducted during that visit because of the time scheduled with the family and because data are coded after visits. In addition, if we were collecting data live, we would have discontinued the remainder of the visit because the caregiver met the criterion. Thus, a basic demonstration of the effect was evident for play expansion. The caregiver coordinated play expansions when receiving the intervention in Tier 2. Still, data were lower when compared to the intervention condition, but at a higher level relative to performance in the baseline condition. Data remained stable in all untreated tiers.

The intervention was introduced in Tier 2, and an immediate and abrupt change in level was observed in the data path. Caregiver data were stable along the ordinate with a range of 4-5 occurrences, and no overlap between the baseline and intervention condition. There was no identifiable trend in the data path in the intervention condition. A basic demonstration of effect was displayed for the second target behavior of noticing and responding to the child's communication. Baseline data in Tier 3 and Tier 4 remained stable, occurring at a low level along the ordinate with a zero-celerating trend in the data paths. The intervention will be introduced in Tier 3 beginning on April 8th, 2024. Because only two basic demonstrations of effect at two different points in time have been observed in the data path, I cannot determine if a functional relation is present at this time.
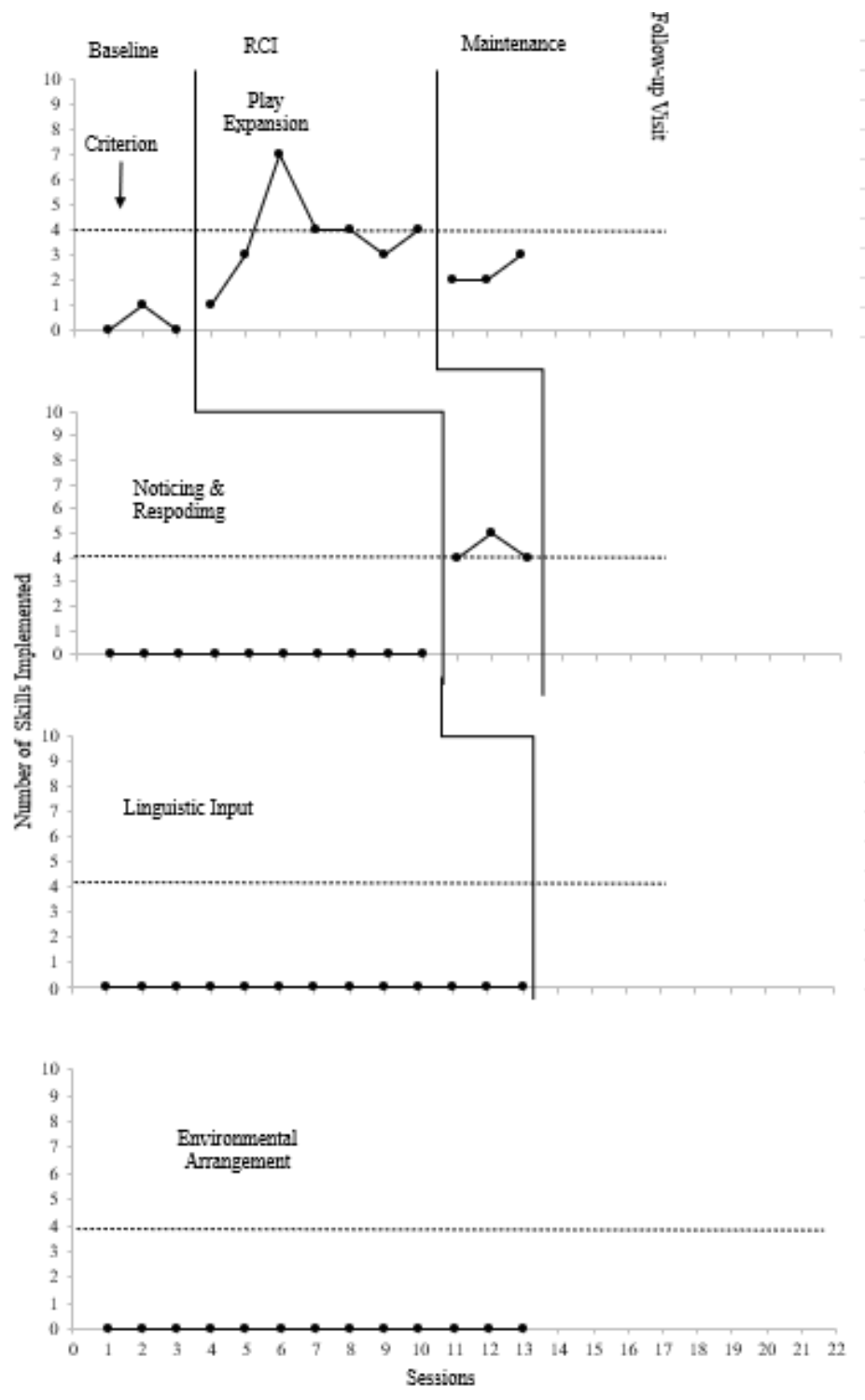
Figure 1 *Caregiver Behavior*

Child Behavior

Child Communication

The results of child communication behaviors during the baseline condition are presented in Figure 2 and will be visually analyzed across a pre and post-test condition. Baseline or pre-test results for child communication behaviors indicated highly variable levels of responding, ranging from 0-10 responses per session (4 min). There was no clear trend or level in child responding due to the high level of variability. There were no instances of the child engaging in spontaneous initiations during the pre-test sessions. Therefore, data indicate a low and stable level of spontaneous initiations, with a zero-celerating trend in the data path. At this time, formal data collection for the post-test on child communication behaviors has not yet occurred. Data analysis will occur and be evaluated across and within pre- and post-intervention conditions. Data collection for child communication behaviors is in progress, with an anticipated end-date of mid-May 2024.
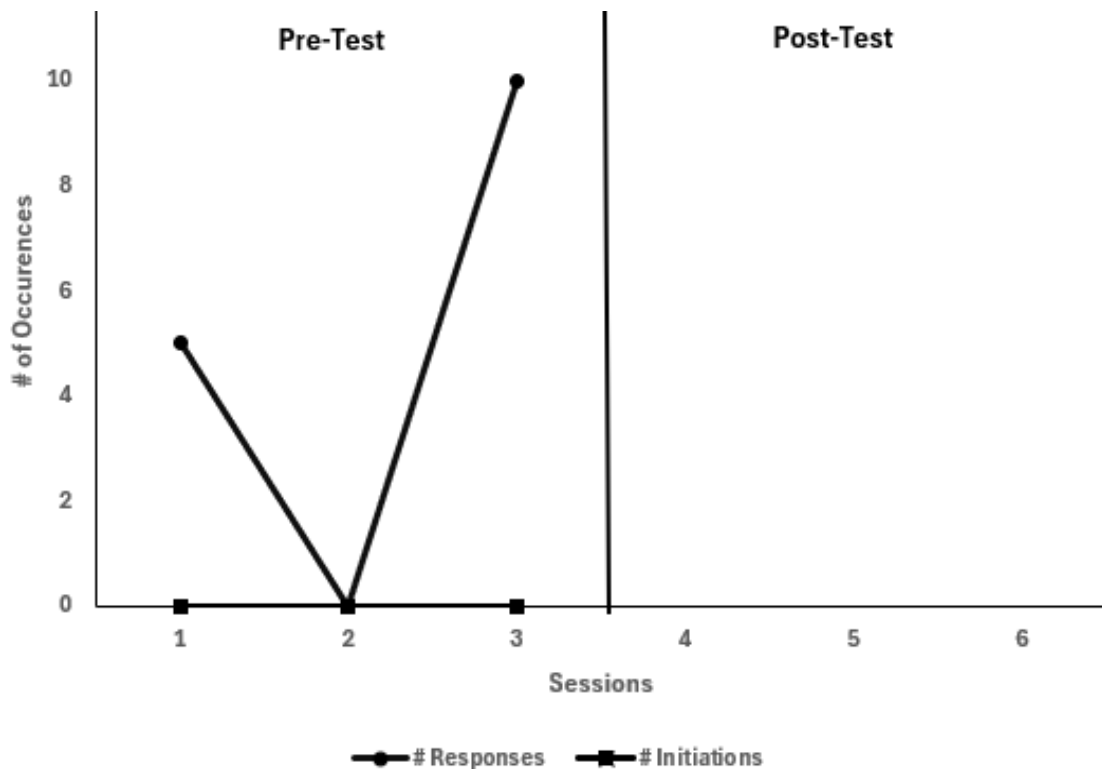
Figure 2 *Child Communication Behaviors*

Child Happiness

The results of child happiness behaviors are presented in Figure 3 and were visually analyzed across baseline and intervention conditions. Overall, data have remained relatively stable across conditions. Baseline-level results for child happiness behaviors indicated slightly variable levels of responding, with a range of 29-50% along the ordinate and a median value of 38%. During baseline sessions, there was a moderate level of response and a decelerating trend in happiness behaviors. Variables related to happiness behaviors included unhappiness behaviors and joint engagement with the caregiver. Baseline results for child engagement indicated stable and high levels of responding, with a range of 92-83% along the ordinate and a median value of 92%. There was also a zero-celerating trend for engagement during baseline sessions. Baseline results for child unhappiness behaviors indicated stable and very low levels of responding with a range of 0-4% along the ordinate, and a median value of 0%. There was a zero-celerating trend for unhappiness behaviors during baseline sessions.

Following the introduction of the intervention, there was no immediate effect on child happiness. During intervention (Tier 1), child happiness was at a relatively moderate but variable response level, ranging from 29-50% along the ordinate and a median value of 38%. Child happiness did not have a clear trend during the intervention condition. Intervention results for joint engagement indicated stable and high levels of responding, with a range of 79-100% along the ordinate and a median value of 92%. Intervention results for child unhappiness behaviors reflected stable and low levels of responding a range of 0-8% along the ordinate and a median value of 0%. At this time, formal data collection for happiness behaviors has only been completed for sessions 4-10

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or Tier 1 of the intervention. Data coding and analysis for additional tiers will be

completed as the project progresses.
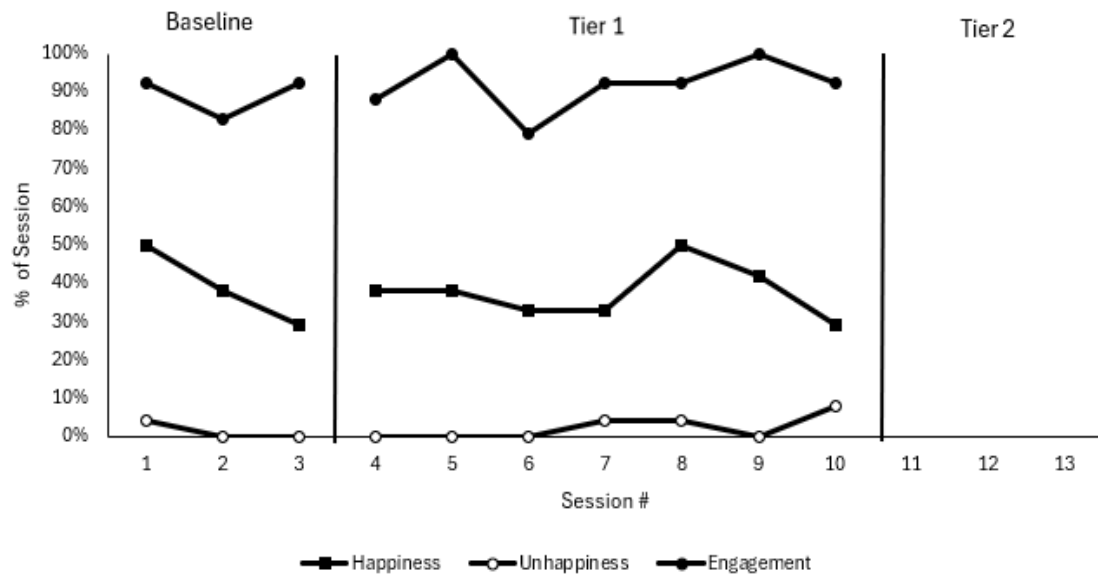
Figure 3 *Child Happiness and Engagement*

Discussion

The goal of this study was to replicate and expand the results of Lane et al. (2016) by evaluating the proposed RCI with a caregiver with a young child with a disability, as well as to investigate child happiness as a proxy for social validity of the intervention for the child. The intervention was a multi-component, rapid coaching intervention, which included an interventionist providing a caregiver with rationales, modeling opportunities, coaching throughout brief sessions, and performance-based feedback. The caregiver was trained and coached on naturalistic strategies associated with improved expressive communication in young children with disabilities who display difficulties verbally communicating with others. It is important to note that although the caregiver did not display target behaviors during baseline conditions, she was actively engaged with her child throughout all sessions. During baseline, the caregiver did not display the target skills, rather, caregiver play included asking multiple questions (e.g., "Do you want to play with me? What are you doing? Are you building a tower? etc.), singing, and imitating her child's play. Thus far, the intervention has led to improvements in two caregiver behaviors, with no changes observed in untreated tiers until the intervention was introduced. The caregiver was taught to expand her child's play behaviors and to notice and respond to her child's communication during play-based activities. Thus far, only one coaching prompt was needed for the caregiver during training sessions (e.g., researcher tells the parent, "Now would be a great time to expand on the play"). Next, the caregiver will be taught how to provide linguistic input (narrate her and her child's play) and arrange the environment to provide her child with opportunities to communicate.

Limitations

There were numerous limitations within this study that should be addressed. The first limitation of this study is that the study is ongoing. The extent to which this study replicates findings in previous studies will remain unknown until the study is complete. Improvements in two caregiver behaviors are promising, but no formal conclusions can be made regarding the presence or absence of a functional relation. Additionally, child-level data coding is not complete. Child communication data has not been coded or evaluated for the post-test condition, and child happiness has not been coded or evaluated for Tier 2. Once all training tiers and data collection have been completed, the results and implications of the study may be more significant.

The second limitation of this study was that results were based on the performance of one caregiver, allowing for only potential intra-participant replication. Thus, there was no inter-participant replication within this study. Another limitation was that the caregiver's generalization was not formally assessed. The caregiver verbally reported that she was practicing the strategies frequently with her child outside of coaching sessions. Further, social validity data have not been collected because the study is ongoing. However, the caregiver verbally reported that since beginning the training, she felt that her child was more willing to communicate and engage in play activities with her.

An additional limitation was conducting online sessions but formally coding data after the meeting with the caregiver. For example, as evidenced in Tier 1, the caregiver reached the criterion in Tier 1. Still, additional sessions within the same visit were conducted, with one of those additional sessions below the criterion (i.e., 3 occurrences instead of 4). Second, monitoring child behavior was especially difficult using the

online/recorded video format. Although the caregiver tried to stay in the camera frame, there were times that the child moved away from the camera or was at an angle where it was difficult to see either one or both participants (e.g., standing directly in front of the camera with only torso visible, sitting/laying parallel or perpendicular to the camera, etc.). This made coding happiness particularly difficult and caused the coding to be less sensitive to some behaviors. For example, one of the main happiness behaviors for the child was smiling, but there were many times when his face was off-camera completely or obscured by the angle he was facing. Thus, some happiness/unhappiness behaviors are likely under-represented in the data due to an inability to code some behaviors that potentially occurred off-camera. Future researchers should ensure they use various happiness behaviors, especially auditory behaviors that can be recorded on or off-camera (e.g., laughter).

Implications

The caregiver was taught naturalistic strategies, which were selected because they are commonly recommended for promoting early communication and language development in children (Schreibman et al., 2015). Teaching naturalistic strategies to caregivers has potential benefits over professional-only implemented interventions since families typically spend the most time with the children (i.e., outside of professional service settings). If implemented at fidelity and recommended dosages (Bailey, 2024; Lane et al., 2024; Warren et al., 2007), training caregivers to implement these strategies can be a time- and cost-effective strategy that can potentially benefit all involved parties.

Since replicating the RCI using an online format was successful, there are practical implications for practitioners providing online services or with large caseloads.

Families in rural or underserved areas may be more easily able to access services such as the RCI if they are offered online or remotely. Additionally, training families via video in their natural environment may be useful for generalization purposes (e.g., practice using their own toys/space) and be less intrusive than home-based sessions (this is dependent on family preferences). The results of this study add to existing literature on naturalistic strategies by demonstrating an online intervention that involves a team of people (i.e., different professionals and family members) collaborating to support a child's acquisition and generalization of language skills.

Previous caregiver training literature has not included a measure of child happiness to evaluate the social validity of these interventions. Given the history of psychology and applied behavior analysis (Bailey & Burch, 2019; Kirkman, 2017; Perone, et al., 2023), it is crucial that researchers and practitioners take the thoughts and feelings of their clients into consideration, especially when working with vulnerable populations such as those with disabilities or communication delays. Practitioners should consider the utility of including an assessment of happiness during interventions to assess social validity, especially when participants have limited vocal repertoires. Across all conditions, the interventionist asked the caregiver to describe the child's temperament or mood that day. Although this information was not formally evaluated, this narrative information informed our analysis of happiness behaviors and could have potentially explained potential variabilities if data were variable. Future researchers should consider methods of assessing happiness behavior and possibly ask the caregiver if the indices of happiness and unhappiness are representative of their child's most common behaviors.

Throughout this study, a new component was added to the procedures to tailor the coaching sessions to the caregiver by asking their feedback and training preferences. By individualizing the coaching sessions to include this feedback, we found anecdotal evidence that some families may want different levels of feedback and modeling. For example, previous iterations of the RCI required the interventionist to show the caregiver a recording of their implementation with their performance feedback, however, in this study the caregiver did not wish to review any recordings of her sessions. Individualization of training and coaching procedures may also help improve buy-in from caregivers by increasing rapport and their level of control in the process. This may also empower the caregivers we train to provide us with helpful feedback on the training process. Future research should consider formally evaluating using the tailored version of the RCI protocol.

Additionally, this research included previous studies (Cambell 2022; Reiss 2023), which focused on improving and adding to the literature on interdisciplinary collaboration between SLP's and behavior interventionists. Interdisciplinary collaboration helps focus all adult efforts on teaching important skills across developmental areas and is crucial for a child's developmental trajectory (Ronfeldt et al., 2015). This study contributes to the interdisciplinary literature by modeling a successful collaboration between a SLP and a behavior interventionist to train caregivers on strategies to promote expressive communication in their child. Currently, formal data collection of child communication behaviors is in progress. Communication data will be utilized to analyze relations between the caregiver's use of naturalistic strategies and concurrent child communication (in responses and spontaneous initiations). This data will be collected and

analyzed before, during, and after the collaboration and coaching occurred, to see if there was any change in the child's expressive communication.

Conclusion

The purpose of this study was to evaluate the effectiveness of a tailored RCI (training and coaching) with caregivers of children with developmental disabilities. This study replicated Lane et al. (2016) and included components from other studies (e.g., Campbell, 2022) and recommendations (Gullet, 2024; Lane, 2023). Additional data are needed to determine the effectiveness of the tailored RCI for teaching a caregiver to implement naturalistic language strategies during play. Additional data is also needed to determine the effect of collaboration and RCI on child communication and happiness behaviors. This study extends previous literature on caregiver coaching by evaluating child-level happiness to assess the social validity of caregiver coaching interventions. This can potentially serve as a model for future research on conducting caregiver coaching that includes evaluation of child happiness and social validity. It is recommended that future researchers continue to explore the effects of the RCI and how to accurately and meaningfully collect social validity data from participants with limited or no verbal repertoires.

Lane Research Lab Tailoring Options
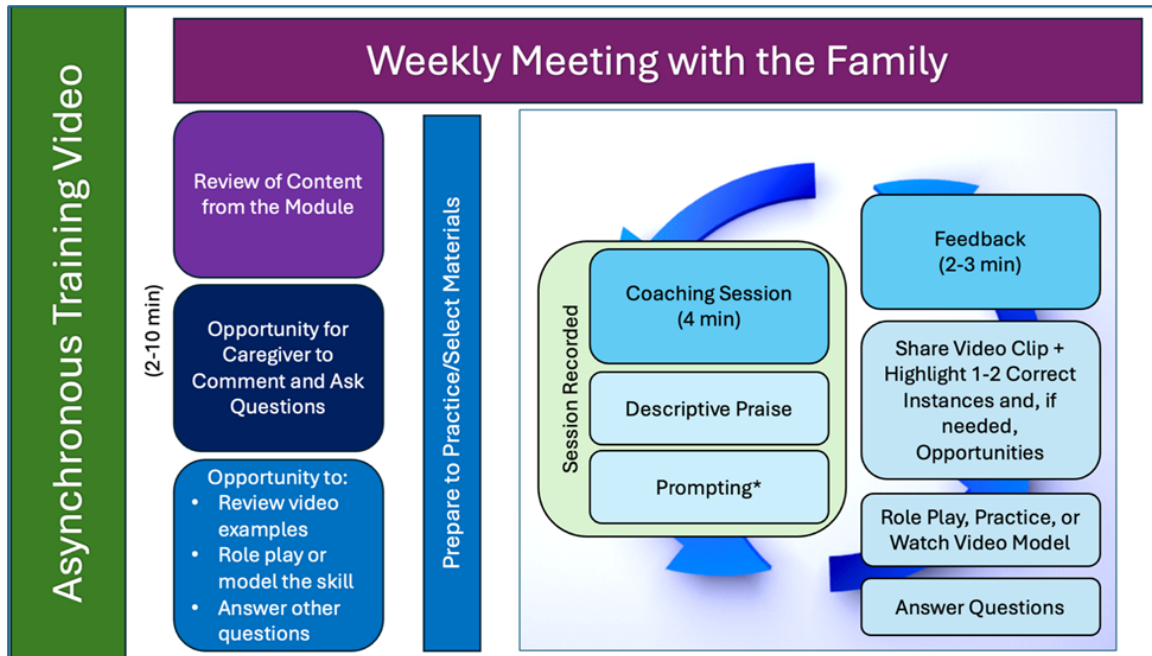
The above figure highlights our current model for training and coaching caregivers.

Tailoring the intervention moving forward:

During the initial visit, ask the caregiver what has traditionally worked well for them when learning new skills or using a skill in a new way.

- Standard Training Practices: Video models, visual supports (i.e., handouts), rationale/review of videos, Q & A
    o Tailoring options: Add live modeling and/or Role Playing
- Coaching Standard Practices: Descriptive praise and indicating when to display the behavior.
    o Tailoring options: To what extent do you prefer each of these?
- Performance Feedback Standard Practices: Review how the previous session went (given coaching performance), Q & A
    o Tailoring options: Review training materials, watch the video of the previous coaching session, model (live or video), and/or role-play procedures.

Appendix B

Data Sheet - Parent

Directions: Time stamp successes and attempts. For multi-step behaviors, mark time stamp at end.

Participant Initials: Condition: Session #:   Data Collector:

Occurrence of Behavior

Set 1										
Imitation: Engaged in the same or similar action as the child										
Time Stamp										
Expansion: Added toys or actions to the child's play within 1-3 s after the child engaged in a play behavior (related to the theme or context)										
Time Stamp										
Set 2										
Noticing and Responding										
Responded to communication within 1- 3 s										
Waited up to 5 s for a response										
Response was related to the context or activity										
Response was a grammatically correct sentence, unless responding to the child's question (could label)										
Time Stamp										
Set 3										
Describing the Child's Play										
Provided verbal model in the form of a relatively brief and grammatically correct sentence that described the child's play/actions										
Waited up to 5 s for the child to respond										
Time Stamp										
Describing Their Own Play										
Provided a verbal model in the form of a relatively brief and grammatically correct sentence that their own play/actions										
Waited up to 5 s for the child to respond										
The parent took a turn during the child's play										

routine, not simply did their own unrelated activity, and talked about it.										
NOTE: For both behaviors, we will accept anywhere between 3 and 5 s to allow for flexibility with how people count 5 s during a session.										
Time Stamp										
Set 4 Part 1 and 2										
EA (Part 1) & Teaching (Part 2)										
Provided appropriate EA										
If needed, provided a prompt (Part 2 only) - modeling procedure										
Waited up to 5 s for the child use target language										
If needed, provided a prompt after a delay (Part 2 only) - open-ended or time delay										
If needed, waited for the child to respond to the prompt (Part 2 only)										
Appropriate response - EA alone: Gave the child access to the item/activity or discontinued if the child lost interest (okay if they recast or give verbal feedback). EA + Prompt: See procedures for full details.										
Time Stamp										

Appendix C

Adult-level Behavior Definitions
Behavior management and material management are targeted outside of study-level
dependent variables.

Set 1: Playing

The following parent-level behaviors are focused on promoting child-level engagement.
The parent can engage in these behaviors interchangeably, as appropriate. If the child is
not engaged after 5-15 s (excludes the child looking for items or toys around the room),
the parent can demonstrate potential actions on objects or activities the child can play
with. This is allowed to create opportunities for imitation and expansion, and related
behaviors (Frey & Kaiser, 2007).

   Imitation. Refers to the parent to engaging in the same or similar actions as the
child. The adult can pantomime an action if only one item was available, and another was
out of reach. As specifically described in Lane et al. (2016), record separate instances of
imitation when at least 5 s elapse between actions, different materials are used, or
different actions occur (p. 5). If the adult and child engage in a back-and-forth activity, at
least 5 s must elapse before counting it as a separate instance. The exception is if the
child switches to a new activity and the parent joins the child.

   Expansion. Refers to the parent adding toys or actions to the child's play for
purposes of increasing diversity of play behaviors and extending play routines. The
addition should occur within 1-3 s after the child engages in a play behavior. The
additions or actions should be contextually or thematically-related to the child's play. The
parent must engage in imitation before expansion. That is, the parent must be doing what
the child is doing and then adding to the child's play.

Set 2: Noticing and Responding

The following behavior requires the parent notice and respond to all forms of child-level
communication.

   Responding to communication. Refers to the parent vocally responding to the
child's communication within 1-3 s and waits up to 5 s for a child-level response, plus the
following:

- The parent (a) expands (adds 1-2 relevant words) or (b) recasts (repeats what the
  child said) the child's speech or provides language for non-verbal communication
  and (c) the response includes the referent or is related to the current activity/item
  of interest and (d) is grammatically correct (one sentence that is non-telegraphic,

emphasis on promoting early noun and verb use, as well as modifiers, as appropriate).

- If the child asks for the name of an item (e.g., "That?") or shows it to the parent (no speech), the parent can label the item (e.g., "A ball" or "car" or "It is a ball."). ***Additional Notes***

  o Telegraphic speech= "car roll" or "want that"
  o Grammatically correct= "the car is rolling," or "a giraffe is on the tower," with an emphasis on promoting early noun and verb use (words that describe the subject/object and action [e.g., the car is rolling, you are driving]), with the addition of modifiers (as appropriate) that describes the child's play or related actions.

Set 3: Providing Linguistic Input

The following parent-level behaviors are outside of child-level initiations and responses. The focus is the parent providing high-quality linguistic input. The parent can engage in these behaviors interchangeably, as appropriate. For both behaviors, we will accept anywhere between 3 and 5 s to allow for flexibility with how people count 5 s during a session.

Describing the Child's Play. Refers to the parent using a verbal model in the form of a relatively brief and grammatically correct sentence, with an emphasis on promoting early noun and verb use that described the child's play/actions and the addition of modifiers (as appropriate) and waiting up to 5 s for the child to respond. Non-examples include asking open- or closed-ended questions or making multiple statements in a row with no time for the child to respond. We want the parent to follow a subject + verb or subject + verb + object sentence structure. Thus, the parent needs to name the object and the action with that object when providing input. Do not give credit for non-naming labels for objects, like "it" in place of the object name.

Parent Describing their own Play. Refers to the parent using a verbal model in the form of a relatively brief and grammatically correct sentence, with an emphasis on promoting early noun and verb use that described their own play actions and the addition of modifiers (as appropriate) and waiting up to 5 s for the child to respond. Context matters: To be counted as an occurrence, the parent should take a turn during the child's play routine, not simply doing their own unrelated activity, and talking about it. Non-examples include asking open- or closed-ended questions or making multiple statements in a row with no time for the child to respond. Questions should be reserved for planned teaching opportunities. We want the parent to follow a subject + verb or subject + verb + object sentence structure. Thus, the parent needs to name the object and the action with that object when providing input. Do not give credit for non-naming labels for objects, like "it" in place of the object name.

Set 4: Planning Communication Opportunities and Teaching Episodes

The following teaching procedures first involve teaching the parent to create opportunities for communication (based on the child's instructional targets) and adding prompting, as appropriate. The procedures are based on child-level language targets/needs and parent input. Ultimately, the goal is to balance Part 1 (creating opportunities) with Part 2 (teaching) throughout each session. Typically, a parent will only be taught one teaching procedure for Part 2. Regarding frequency, ideally, we would want the parent to complete planned teaching episodes at least half of the 4-min session. Thus, they would use EA at a rate of four times per minute but teaching episodes less.

Part 1: Planning Communication Opportunities
    Environmental arrangement (EA). The goal of this procedure is for the child to recognize when to communicate in response to environmental changes or cues for communication. EA refers to the adult arranging the environment (e.g., naturally maintaining access to materials while not taking materials directly from the child), waiting up to 5 s for the child to verbally communicate using the target language. We will accept anywhere between 3 and 5 s to allow for flexibility with how people count 5 s during a session. If the child verbally communicates, the parent should respond appropriately (dependent on the EA the parent selected) by giving them the toy/item/engaging in an activity (if access was restricted or sabotaged in some way, e.g., a pinch of Play-Doh instead of the whole container) and/or verbally responding to the child's comment/statement, as appropriate. If the child does not verbally communicate within 5 s, but is still interested, the parent provides the item/material. A correct response is counted if the parent completes all steps correctly.

    Additional Notes. If the goal of instruction is to promote responding, an EA in the form of an open-ended question can be used. All other procedures are the same.

Part 2: Teaching Episodes
    EA + Prompting/Modeling. The goal of this procedure is to promote verbal imitation at the child's target language level for purposes of expanding the child's vocabulary. A correct response is counted if the parent completes all steps correctly. Steps are as follows: The parent (a) uses an EA strategy (activated a toy of interest, gatekeeper) while not taking materials from child, (b) waits up to 5 s for the child to express interest, (c) provides a verbal model of what the child could say, and (d) waits up to 5 s for the child to imitate. Adult-level responses to the child can vary. If the child imitates within 5 s, the parent responds appropriately (e.g., gave the child access to a toy) while expanding the child's language. If the child does not imitate but is still interested in an item/material or activity, the parent provides access and repeats the previous verbal model. If the child loses interest or protests during the first 5 s (post EA) or the second 5 s (post model), the parent ends the trial and continues playing.

    Open-ended Questions (EA) + Prompting. The goal of this procedure is to promote verbal responding at the child's target language level to an adult's open-ended

question (non yes-no question). A correct response is counted if the parent completes all steps correctly. Steps are as follows: The parent (a) uses a verbal EA strategy in the form of an open-ended question, such as a choice, while not taking materials from the child, (b) waits up to 5 s for the child to respond using verbal communication, and (c) if the child verbally responds within 5 s, the parent responds appropriately while expanding the child's language (e.g., give the child access to the toy choice, continued activity). If the child does not verbally communicate, the parent provides a verbal model of what the child could say and waits up to 5 s for the child to imitate. If the child imitates within 5 s, the parent responds appropriately while expanding the child's language. If the child does not imitate but is still interested in an item/material or activity, the parent provides access and repeats the previous verbal model. If the child loses interest or protests during the 5 s, the parent ends the trial and continues playing.

EA + Time Delay with Prompting. The goal of this procedure is to promote independent, child-level verbal communication and, if needed, provide a verbal prompt to encourage imitation of language during play. A correct response is counted if the parent completes all steps correctly. Steps are as follows: The parent (a) uses an EA strategy while not taking materials from the child, (b) waits up to 5 s for the child to initiate independent verbal communication, and (c) if the child verbally communicates, the parent responds appropriately while expanding the child's language. If the child does not verbally communicate, the parent provides a verbal model of what the child could say and waits up to 5 s for the child to imitate. If the child imitates within 5 s, the parent responds appropriately while expanding the child's language. If the child does not imitate but is still interested in an item/material or activity, the parent provides access and repeats the previous verbal model. If the child loses interest or protests at any point, the parent ends the trial and continues playing.

Note. All definitions are from or based on those provided by Lane et al. (2016), Ledford et al., (2019), and Kaiser and Hampton (2017). A child's verbal approximations are reinforced whether independent, prompted, or spontaneous. In addition, child-level communication is individualized to the child's language targets (e.g., using noun and verb combinations). Thus, we are not focused on articulation as much as promoting communication during play. Articulation is outside of our current scope of competence and should be targeted and directed by a speech-language pathologist. Grammatically correct includes dialectal variations. All examples refer to the child using speech to communicate, but other modes of communication can be interchanged with speech, as appropriate (e.g., piloting the procedures with a child who mostly uses document signs or a speech-generating device).

Appendix D

<u>Indices of Happiness Questionnaire</u>

Please answer the following questions about your child to the best of your ability.

1. What specific behaviors does your child engage in when they are happy?

2. What specific behaviors does your child engage in when they are unhappy?

3. What type of setting or situation is your child most likely to feel happy in?

4. What type of setting or situation is your child most likely to feel unhappy in?

5. What does your child look like when they are engaged or paying attention to someone or thing?

6. What does your child look like when they are not engaged or paying attention to someone or something?

Appendix E

Indices of Happiness

Participant: August

Happiness	Unhappiness
★ **Smiling**- upward curvature of the mouth both with or without teeth ★ **Laughing**- respiratory pattern that causes an audible noise to create a giggle or chuckle ★ **Squealing**- loud high-pitched vocalization that is not a word or approximation ★ **Physical Affection**- hugging, cuddling, or giving kisses	★ **Stomping**- using one or both feet to forcefully strike the ground (Excluding jumping, running, or skipping) ★ **Hitting his legs**- using one or both hands to hit his own legs ★ **Eloping**- attempts or intentionally leaves the designated play area and activity, unless to retrieve item ★ **Kicking**- using one or both feet to forcefully strike or attempt to strike a caregiver

[Joint] Engagement- anytime August acts on objects in his environment or engages in actions related to the current activity with his caregiver, meaning they are oriented towards one another or positioned in a manner where they are involved in the same activity (e.g., can sit side-by-side for some activities). Some examples include:

- ★ Taking turns building blocks beside/near each other
- ★ Engaging in physical-play with the caregiver such as getting tosses or tickles
- ★ August attempts to communicate with his caregivers (pointing, gestures, verbalizations, etc.)
- ★ Sharing/handing items/toys to caregiver

Unengaged- August is not paying attention to his caregiver and/or the activity. This includes anytime the child does not hit at least one of the two "engagement" criteria (see above). Some examples include:

- ★ August wandering around or moving out of designated area
- ★ August passively watching his caregiver play without playing themselves
- ★ August engages in Interfering behaviors (unhappy bx)
- ★ August avoids caregiver by intentionally orienting away from them or "hoarding" toys

Appendix F

Language Sample Guidelines

Implementation

General: Conduct the language sample for 15-minutes. Record the language sample. The language sample should begin once the child is engaged and interested in playing with you. Provide descriptive praise every 1-2 minutes to encourage continued engagement. Rotate materials as needed.

Part 1: Provide 3-5 sets of age-appropriate materials (e.g., blocks, books) and activities (e.g., set up game) around the room (based on family input and/or observations). Allow the child to engage with any materials/items. Follow the child's lead (no demands and engage in the same or similar behaviors as the child). The goal of is to learn how the child typically communicates without adult support or prompts. Respond to all attempts to communicate by repeating the child and any other communicative behavior the child displayed. This portion should last approximately 5 minutes dependent on the child's interest.

Part 2: Repeat above steps – during play model language the child can use during play. Use words, gestures, body orientation (and AAC if used by the child). Respond to all attempts to communicate by repeating the child and any other communicative behavior the child displayed. This portion should last approximately 5 minutes.

Part 3: Repeat above steps – during play 3-5 opportunities for the child to communicate using

environmental arrangement strategies and wait up to 5 s for the child to communicate (longer if needed). This portion should last approximately 5 minutes. Respond to all attempts to communicate by repeating the child and any other communicative behavior the child displayed.

Transcription

When transcribing a language sample, record all verbal behaviors displayed by the child. In addition, transcribe the adult's verbal behavior too. Prior to recording child- and adult-level verbal behavior, record the context/activity (e.g., building blocks) then record what occurred during that interaction. If/when the activity shifts, record the new context/activity. Repeat this throughout. Using an Excel file or Word table, on each line for each utterance or sentence record the verbal behavior of the child or adult. Note "C" for child and "A" for adult before each utterance. When you cannot understand what was said record "xx" or if you only hear part of what was said and cannot understand the rest, write what you heard and use xx for any other part of the utterance or sentence. Record intelligible words or phrases/sentences (includes phonetic approximations of words). Thus, if a word contains at least one sound or multiple sounds and you understand what the child said, record that word. Next to each child utterance or sentence, note the social purpose of their language: initiate or respond to greeting, request (attention, assistance, information, objects), comment, protest, share emotions, or tell a story. If unclear, note that. Also note if the child imitated (used part or all a contextually-relevant word or phrase/sentence), echoed (repeated exactly, with no modifications [e.g., "I'm Justin" and child echo's the exact same sentence and says "Imjustin"]), or scripted

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(e.g., phrase or sentence that is from some form of media) to communicate. Any singing, animal sounds, or other environmental sounds should be noted but bracketed.

Analysis of Transcription

Use the transcription to gather relevant assessment information for the child.

- Total number of words that were intelligible.
- From that total, record the number of different words said (the first time a word is used).
- Calculate the mean length of utterance in morphemes and in words.
    - Morphemes: Total number of morphemes divided by the total number of utterances/sentences during the language sample.
    - Words: Total number of words divided by the total number of utterances/sentences during the language sample.
- Hadley and colleagues (2018, 2020, 2022, 2023) and Kaiser (2023) recommended recording the number of subjects, verbs, nouns, descriptive words, and other words (e.g., articles, conjunctions), as well as different early sentence combinations (i.e., subject + main verb and subject + main verb + object). Such information can influence our understanding of diversity of a child's language.

Appendix G

UNIT 1 PLAYING

Two strategies:

1 *Imitating* or *mirroring* your child's play:
- Copy, or mirror, your child when they are playing with toys or doing an activity. This communicates to your child that you are interested in their play.

2 *Expanding* or *adding* to your child's play:
- After you have joined in your child's play, from time to time, add a different item or action to the play. This encourages your child to keep playing with you.

Imitating

Your child is playing...

1. Join in and copy your child's play by using similar items or doing the same actions.

2. Wait a few seconds to see how your child responds. It's okay if they do not respond!

Your child is leading the activity and that's great!

Expanding

You and your child are playing together....

1. If the play starts to slow or you have been doing the same action over an over for a while, considering adding to the play by introducing a different action or toy.

2. Wait a few seconds to see how your child responds. It's okay if they do not respond!

During focused practice sessions, we would like to see one or both of these strategies occur about once per minute.

1 x 🕐

UNIT 2 NOTICING & RESPONDING

A child can communicate in a variety of ways, such as pointing, reaching, using words, making sounds, taking you by the hand, and more.

First, *notice* how your child communicates with you and others. Second, *respond* with language that builds on your child's interests in that moment.

👁 & 🧑‍🤝‍🧒 • By doing this, your child can hear and learn a variety of words!

How to Notice and Respond

When your child communicates, respond within 1-3 seconds. Respond by using words related to your child's communication-related goals.

o If your child communicates without words, respond with a sentence that names and describes their toy or their actions with the toy. You can also name and describe play without toys.
o If you child communicates with words, respond by repeating what they said or by adding to what they said.

• After you respond, wait up to 5 seconds before saying anything else. Why? This gives your child time to process what you said and, if they want, to respond to you.
• Like always, it's okay if they do not respond to you.

This can be combined with Unit 1 strategies, imitating and expanding. When playing together, practice looking for and, as you can, responding to your child's communication. Try this once per minute.

UNIT 3 PROVIDING INPUT DURING PLAY

Two strategies: *Describing* (1) your child's play and (2) *your own play.*

• Use these strategies when your child is playing with you but not communicating.
• No one communicates 100% of the time, but we can still encourage communication during play.

DESCRIBING...

Your Child's Play

• Your child is playing.

• If playing with a toy or other item, name it and then describe what your child is doing with the toy/item. If your child is playing without a toy or other item, describe what they are doing.

• Wait up to 5 seconds for your child to respond.

• As always, it is okay if your child does not respond to your input during play.

Your Play

• You are playing with your child. You take a turn during the shared play activity.

• If playing with a toy or other item, name it and then describe what you are doing with the toy/item. If you are playing without a toy or other item, describe what you are doing.

• Wait up to 5 seconds for your child to respond. As always, it is okay if your child does not respond to your input during play.

Continue using strategies from Units 1 and 2. Also, during focused practice sessions, we would like to see one or both of these strategies about once per minute.

1 x 🕐

UNIT 4, PART 1 PLANNING COMMUNICATION OPPORTUNITIES

Why create opportunities for communication?
Sometimes we need to offer extra support to help children notice when to communicate their needs, wants, interests, etc.

Strategies to Encourage Communication

PROVIDE A CHOICE

PROVIDE MATERIALS THAT REQUIRE SUPPORT

PLACE AN ITEM IN VIEW BUT OUT OF REACH

INTRODUCE AN UNEXPECTED CHANGE OR BE SILLY

• **Overview**: Look for a time during play when your child will likely be motivated to communicate. Use one of these strategies and wait up to 5 seconds for your child to respond using goal-related words. If they do, respond by repeating or adding to what they said and provide the item, action, activity, attention, etc. If they do not, that's okay too!
• All types of communication are important!
• Continue to use what you have learned in previous units. Try to create opportunities for communication about once per minute.

1 x 🕐

Appendix H

Online Parent Data and Fidelity of Sessions: Baseline and Maintenance

Preparation (check box to indicate this occurred)	
Started recording session via Zoom.	

Parent/Caregiver & Child: _____
Date: _____ Time of Session: ___ to ___

Adult Response Codes	
Trainer	+ implemented, - did not implement

Condition: _____ Session #: _____

Trainer Fidelity	Correct Implementation				
Baseline Sessions					
Trainer explains that they want to see the parent play with the child as they normally would (or some variation of the phrase).					
Trainer provides no prompts or support to engage in target behaviors.					
Trainer answers any questions (outside of how to engage in behaviors) the parent asks.					
Parent engages with the child for 4 minutes.					
Number of training steps performed by trainer:					
Number of training steps not performed by trainer:					
Percentage of training implementation fidelity:	__ steps performed/__ total steps= ___% fidelity				

Caregiver Data and Fidelity of Coaching Sessions: Asynchronous Training and Online Coaching

Caregiver & Child: _____

Preparation (check box to indicate this occurred)	
Ensured family had room/toys arranged for the session.	
Started recording session via Zoom.	
Caregiver confirmed they watched the training and reviewed materials	

Coach: _____
Date: _____ Time of Session: _____ to _____
Condition: _____ Session #: _____

Adult Response Codes	
Coach	+ implemented, - did not implement

Coach Fidelity	Correct Implementation					
Initial Introduction/Training/Review						
Coach briefly reviewed the content of the asynchronous module.						
If teaching Set 2-4, reminded the caregiver to combine what they have learned with what they are learning (if this is Set 1, then write N/A).						
Coach asked the caregiver what questions they had before getting started.						
At any point during this initial introduction, the coach offered the caregiver an opportunity to watch examples from the training, to see a live (in-person) example, or to practice together. The wording does not have to be exact, but instead the coach offered multiple ways to learn more about the content.						
Caregiver practices procedures with the child for 4 minutes – this process repeats for the remainder of the visit. Another team member records the session and noting successes and areas of growth (can occur on MacBook, iPhone, or iPad) - will share their screen in step two, if needed, below.						
Coach informed the caregiver that they will mention successes (i.e., praise) and point out moments when to display the target behavior (i.e., prompt).						
Coach asked the caregiver if they were comfortable with this and if they prefer more or less of each.						
Another team member screen recorded the session.						
After the session, the coach provided performance feedback in the form of summarizing the session						

(based on coaching feedback) and offered the caregiver an opportunity to ask questions.						
Coach offered the caregiver an opportunity to watch clips from the previous coaching session, as well as an opportunity to watch examples from the training, to see a live (in-person) example, or to practice together. The wording does not have to be exact, but instead the coach offered multiple ways to learn more about the content.						
If the caregiver wanted to see the video of themselves, the other team member who screen recorded shared the recording and toggled to examples(s) of what went well and/or area(s) of improvement.						
Coach told the caregiver to practice again.						

End of Visit/Wrap Up - Primary Coach			
Coach discussed the caregiver's progress.			
Coach discussed next steps with caregiver.			
Number of training steps performed by coach:			
Number of training steps not performed by coach:			
Percentage of training implementation fidelity:			

Parent Data and Fidelity of Sessions: Coordination of Skills

Preparation (check box to indicate this occurred)	
Started recording session.	

Parent/Caregiver & Child: _____

Date: _____ Time of Session: ___ to _____

Adult Response Codes	
Trainer	+ implemented, - did not implement

Condition: _____ Session #: _____

Trainer Fidelity	Correct Implementation					
Parent practices procedures with child (4 minutes) – this process repeats for the remainder of the visit. Record the session and note successes and areas of growth (can occur on MacBook, iPhone, or iPad). Also, can provide parent a handout they can refer to during the session.						
No coaching provided during the 4-min session.						
At end of session, the trainer shows the parent the video and, if needed, provides 1-2 examples of what went well (adhered to plan) and 1-2 examples of areas for improvement (2-3 minutes max).						
The trainer asks if the parent would like to see a live or video model (brief; 1 min max) and if they have any questions (answer based on plan, as needed) (1-2 minutes max).						
Primary trainer tells parent to practice again (if needed).						
End of Visit/Wrap Up - Primary Trainer						
Discuss parent's progress.						
Discuss next steps with parent.						
Number of training steps performed by trainer:						
Number of training steps not performed by trainer:						
Percentage of training implementation fidelity:						

Generalization: Fidelity of Implementation

Parent/Caregiver & Child: _____
Date: _____
Time of Session: _____
Condition (Circle): Pre-Test or Post-Test
Context/Activity (note if more than one): _____

Trainer Fidelity	Correct Implementation				
Baseline Sessions					
Trainer explains that they want to see the parent play with the child as they normally would (or some variation of the phrase).					
Trainer provides no prompts or support to engage in target behaviors.					
Parent engages with the child for at least 12 minutes.					
Number of training steps performed by trainer:					
Number of training steps not performed by trainer:					
Percentage of training implementation fidelity:					

Notes:

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