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Teaching Caregivers to Integrate Four Play-Based Instructional Strategies Without Decrements in Child Play and Preference

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TEACHING CAREGIVERS TO INTEGRATE FOUR PLAY-BASED INSTRUCTIONAL STRATEGIES WITHOUT DECREMENTS IN CHILD PLAY AND PREFERENCE

by

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Young children diagnosed with autism spectrum disorder (ASD) often require systematic teaching to learn new skills, and caregivers can teach their children by embedding learning opportunities in a play-based context. However, researchers have not evaluated procedures to train caregivers to implement a combination of strategies designed to establish rapport and early language skills while maintaining play as a preferred context. We recruited two caregiver-child dyads composed of two mothers and their sons (3 and 4 years old). We used a multiple-probe design across strategies to demonstrate the efficacy of behavioral skills training on the mothers' integration of parallel play, child-directed interaction, teaching requests (mands), and teaching labels (tacts). Both children acquired the target requests and labels as a function of their mothers' teaching. By also assessing the children's preference, we confirmed the teaching strategies did not decrease the children's play or the value of playing with their mother. We obtained stimulus generalization and maintenance of the mothers' implementation of the strategies from a clinic to their home. The outcomes serve as preliminary support for a caregiver-implemented intervention that composed of four embedded-teaching strategies while maintaining high levels of play and child preference for playing with their caregiver.

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Introduction

Caregivers of children diagnosed with autism spectrum disorder (ASD) are often trained to implement strategies to increase imitation, communication, or play (Meadan, Ostrosky, Zaghlawan, & Yu, 2009; Patterson, Smith, & Mirenda, 2011). Training caregivers should be a priority because no other individual has the same opportunities to teach throughout the day and across contexts (National Autism Center, 2009; National Research Council, 2001) and waitlists for receiving early intensive behavioral intervention (EIBI) are unfortunately common (Rivard et al., 2017). Moreover, although the recommended dose of EIBI is 25 to 40 hours per week, many families do not receive this level of service due to limitations imposed by insurance companies, the scarcity of credentialed professionals to implement services, or both. Thus, training caregivers in skill-acquisition and behavior-reduction procedures prior to, or in conjunction with, EIBI services is recommended (McConachie & Diggle, 2007; Rivard et al., 2017).

Unstructured and semi-structured play with developmentally-appropriate activities is a common context in which typically-developing children learn (Bricker, Pretti-Frontczak, & McComas, 1998; National Association for the Education of Young Children, 2009). Play is a meaningful context in which learning occurs because of the natural consequences related to their actions toward toys or activities, and social opportunities with caregivers and peers during play (Schreibman et al., 2015). Children with ASD also can learn through play but systematically programming teaching opportunities may be necessary. For example, children with ASD have been taught to imitate actions with objects (Ingersoll & Gergans, 2007) and engage in joint attention (Kasari, Gulsrud, Wong, Kwon, & Locke, 2010) with their caregivers during play. In addition, caregivers have taught communication skills such as requesting toys, labeling toys, and labeling forms of play by embedding teaching procedures during play (Allen & Cowan, 2008; Charlop-Christy & Carpenter, 2000; Heal, Hanley, & Layer, 2009; Hemmeter & Kaiser, 1994; Ingersoll, 2010; Lane, Leiberman-Betz, & Gast, 2016; Schreibman et al., 2015). For these

reasons, researchers have been interested in training caregivers of young children with ASD to implement a variety of play-based teaching strategies (Matson, Mahan, & Matson, 2009).

The directedness of teaching varies along a continuum from exclusively child-led to exclusively adult-led (Wolery & Wilbers, 1994). One aspect of adult directedness is whether the teaching strategy requires active child responding toward the caregiver. Researchers have introduced strategies with minimal or no requirements of active child responding as a starting point toward creating a preferred play-based context with a caregiver. For instance, Parent-Child Interaction Therapy is a treatment commonly used to address noncompliance and disruptive behaviors by children diagnosed with disruptive behavior disorders or attention-deficit hyperactivity disorder (e.g., see McNeil & Hembree-Kigin, 2010). A primary aspect of the therapy involves associating the caregiver with materials and interactions that are preferred by the child while minimizing potentially aversive interactions. In line with this goal, *parallel play* is one form of child-led teaching that does not require active responding. It entails the caregiver describing their toys (e.g., names, colors, sounds, shapes) and their play actions (e.g., "I'm building a tower," "I put vegetables in the pot") without initiating interactions with their child. For example, the child may observe and then imitate the caregiver's novel play actions and utterances that match the child's interests. Furthermore, caregivers are trained to withhold giving commands, asking questions, guiding play, and providing criticism given the potential aversive properties of these behaviors, hereafter described as less-desirable behaviors (Shillingsburg, 2005). *Child-directed interaction* is a strategy that entails delivering specified forms of attention dependent on the child's appropriate engagement with toys and vocalizations about toys. For example, the caregiver may deliver enthusiastic descriptive praise for novel forms of play, elaborate on spontaneous vocalizations, imitate appropriate play actions, or describe the child's ongoing play (Hansen & Shillingsburg, 2016; Hemmeter & Kaiser, 1994; Ingersoll, 2010; Ingersoll & Gergans, 2007). Researchers have taught caregivers to implement aspects of child-

directed interaction to reduce problem behavior (McLaughlin & Carr, 2005) and build rapport (Shireman, Lerman, & Hillman, 2016) in a play-based context. For these reasons, we trained caregivers to implement parallel play and child-directed interaction as our first and second strategies, respectively.

However, a limitation of both parallel play and child-directed interaction is that active responding by the child is not required and repeated teaching opportunities of a given skill are not ensured. Children with ASD often do not learn communication skills, such as labeling toys or requesting toys, through only exposure to items or indirect teaching (LaFrance & Miguel, 2014) and, as a result, training their caregivers to implement play-based strategies alone may not lead to the learning of labels of actions or toys. Kaiser and Hancock (2003) recommended including a small number of teaching opportunities after establishing rapport to teach children important early-learner skills but also maintain the reinforcing value of interaction with caregivers.

Teaching labels, which are technically described as a tact by Skinner (1957), are fundamental to the development of complex verbal repertoires, and teaching of labels should include objects commonly encountered and talked about in the natural environment (LaFrance & Miguel, 2014; LeBlanc, Dillon, & Sautter, 2009). In response, strategies that involve active responding have been embedded during play as a means to expand children's language. Heal, Hanley, and Layer (2009) taught children to label toys using play-based procedures. Specifically, after the child initially touched a target toy during a play activity within a specified period, the experimenter prompted the child to label its color or to name the item. The results showed moderate improvements in acquired labels across children; however, this strategy was least preferred by all participants and, in a follow-up study, Heal and Hanley (2011) showed that toy play decreased when teachers prompted the child to label toys contingent on the child touching these toys.

We trained caregivers to teach their child toy labels using procedures that were informed

by the outcomes in Heal, Hanley, and Layer (2009; described as Strategy 2), as our third strategy. First, instead of implementing teaching contingent on a child touching specific toys, we taught the caregiver to momentarily interrupt play by placing a hand over the toys, pointing to a target toy, and saying, "What is this?" This approach eliminated the contingency between a child touching a different toy and the implementation of teaching; instead, the timing of teaching opportunities was unpredictable because they could be programmed whenever the child played with any toy. Second, we trained the caregiver to implement a lower frequency of interruptions to teach labels relative to number of opportunities, as recommended by Heal and Hanley and Kaiser and Hancock (2003). Heal et al. programmed approximately 2 opportunities per min and we programmed 0.5 opportunities per min. Third, we trained the caregivers to intersperse the teaching opportunities during play, such that two teaching trials did not occur without parallel play or child-directed interaction between them and two teaching trials of the same type (i.e., request versus label) were not programmed consecutively. In terms of directedness, our embedded teaching strategy for toy labels is more toward the adult-led end of the continuum, but Daugherty, Grisham-Brown, and Hemmeter (2001) considered this type of teaching child-initiated, in part, because teaching remains dependent on play and the reinforcing consequence is access to continued play.

Teaching requests (technically described as mands by Skinner, 1957) to children at a young age is also critical because the outcomes from hundreds of functional analyses have shown that access to preferred items contributes to the maintenance of problem behavior (Carr & Durand, 1985; Beavers et al., 2013) and research has shown that teaching alternative requests, in part, prevents the development of problem behavior (Luczynski & Hanley, 2013). For these reasons, teaching requests as part of establishing a communication repertoire is typically prioritized in EIBI (LaFrance & Miguel, 2014; LeBlanc, Dillon, & Sautter; 2009; Sundberg & Michael, 2001). Charlop-Christy and Carpenter (2000) trained caregivers to implement three

instructional procedures to teach verbal responses, including requests, to their children with ASD across different, naturally-occurring scenarios or in the same location using structured teaching opportunities. We trained caregivers to implement the most efficacious strategy from their study to teach requests for preferred toys during play. Similar to our strategy for teaching labels, we minimized the number of instructional interruptions to reduce potential aversive properties of implementing the strategy in a play context.

Despite the literature on naturalistic developmental behavioral interventions (Schreibman et al., 2015), researchers have not evaluated a program to train caregivers to integrate parallel play and child-directed interaction with teaching labels and requests. Argued differently, when visually inspecting the list of teaching procedures and child skills across the studies reviewed by Lane et al. (2016), no study has trained caregivers to implement procedures toward enhancing play and rapport while integrating procedures for two types of communication skills.

In response, we designed a program for training caregivers to serve as the primary interventionist for their child in their home by integrating four play-based instructional strategies to promote consistent play, teach toy requests, and teach toy labels. Given the potential of teaching requests and labels to decrease play and preference for the play context (Heal & Hanley, 2011), we measured play and assessed child preference using a concurrent-chains preference assessment at several points throughout the program (Hanley, Piazza, Fisher, Contrucci, & Maglieri, 1997). We also assessed child preference to determine whether training the caregiver to implement parallel play, child-directed interaction, and delivery of an additional preferred toy following requests (via teaching requests) would enhance the reinforcing features of a play context. Given that the potential long-term benefits of a training program will be realized in the family's home, we collected direct-observation measures on the generalization and maintenance of the caregivers' implementation of the strategies and the children's acquisition of novel toy requests and labels over one month. We assessed the caregivers' satisfaction with the

improvements in the child's performance and our training program (Fawcett, 1991; Kennedy, 2002; Odom & Strain, 2002; Schwartz, 1999; Schwartz & Baer, 1991; Wolf, 1978).

Chapter 1: Method

Participants

We enrolled two parent-child dyads, each consisting of a mother and her son who was diagnosed with ASD. Mrs. Sharma and her four-year-old son, Aziz, had never received applied behavior analytic services. Ms. Whittaker and her three-year-old son, Owen, were receiving outpatient visits for problem behavior about once per month or on an as-needed basis. She attended two courses, two years prior, on the basics of functional behavior assessment and classroom management as part of additional training in her position as a community support provider. Both caregivers requested help with increasing their level of comfort playing with their child as well as capitalizing on teaching opportunities during play.

Children who reliably engaged in echoic responses, independently played with toys (engagement with a toy for at least 5 s across a minimum of 70% of 10-s intervals in a 2-min period; described below) and had a diagnosis of ASD given by an interdisciplinary diagnostic team participated. We did not enroll children who exhibited notable concerns with vocal and motor stereotypy as well as severe problem behavior (e.g., aggression, disruption, or self-injury) based on caregiver reports via the Repetitive Behavior Scale-Revised or via direct observation during an activity preference assessment (more than 30% of intervals; see below).

Child Preassessments

Toy Preference Assessment. We conducted a paired-item preference assessment with toys as described by Fisher et al. (1992). We included at least eight toys that were nominated by the caregiver or we selected from our toy inventory based on the caregiver's responses on a structured interview called the Reinforcer Assessment for Individuals with Severe Disabilities (RAISD; Fisher, Piazza, Bowman, & Amari, 1996). We used the preference hierarchy generated

by the paired-item preference assessment in two ways. First, we used the third- and fourth-ranked toys as reinforcers during the echoic and tact assessments. Before each session in both assessments, the two toys were presented and the child was instructed to pick one (i.e., single-selection opportunity); we delivered the selected toy as the reinforcer for correct responses in the following session (Hoerger & Mace, 2006). Second, the first- and second-ranked toys were used as target-request toys when the caregivers taught requests. Aziz's target-request toys were a tool playset (used during training; in-clinic) and instruments (used during generalization; in-home). Owen's target-request toys were a Thomas the Tank Engine Percy push-and-go train (in-clinic) and a dump truck (in-home).

Activity preference assessment. We conducted this assessment, first, to identify activities with manipulatives (toys) that would evoke consistent engagement, which was necessary for the caregiver to implement three of the four teaching strategies. Second, based on engagement with the particular toys, we selected one toy from each of the two top-ranked activities to use as the target-label toys. We purchased 10 activities that included sets of various materials, such as dolls and furniture, Play-Doh, and cars. We asked the caregivers to rate whether their child would prefer to play with each of the activities on a seven-point Likert scale (1 = highly dislike, 4 = neutral, 7 = highly prefer, or "don't know"). Next, we conducted a multiple-stimulus-without-replacement (MSWO) assessment with activities rated $\geq$ 4 across three stimulus-presentation arrays (administrations; Carr, Nicholson, & Higbee, 2000). We provided 2 min of access to an activity after each selection, rather than a shorter duration such as 30 s, in case the reinforcing value of an activity was influenced by temporally-extended engagement with the materials (e.g., building a house with the Lincoln logs; Bukala, Ward-Horner, & Fienup, 2015; DeLeon, Frank-Crawford, Carreau-Webster, Triggs, Bullock, & Jennett, 2014). Each time an activity was selected, we presented the activity in the same form as the end of the previous selection (e.g., we presented the Lincoln Logs with the house that the child previously built;

Deleon et al., 2014). During the 2-min reinforcement period, we measured engagement (play), vocal or motor stereotypy, and problem behavior using a 10-s partial-interval measurement system and analyzed the data as a percentage of intervals per session. The first-ranked activity was present during all in-clinic sessions, whereas the second-ranked activity was present during all baseline and generalization in-home sessions. One toy from each activity was used as the target-label toy when the caregivers taught requests.

Aziz's first-ranked activity was a cookware set, and we used the stockpot as the target-label toy (in-clinic); Aziz's second-ranked activity was a Play-Doh tool set, and we used a Play-Doh cutout (i.e., a stamp) as target-label toy (in-home). Aziz did not exhibit stereotypy or problem behavior and engaged with toys for 100% of the time in all but one session. Owen's first-ranked activity was the train set, and we used the caboose as the target-label toy (in-clinic); Owen's second-ranked activity was the cookware set, and we used the stockpot as the target-label toy (in-home). Owen did not exhibit stereotypy or problem behavior and engaged with the toys at least 50% of the time in every session.

Echoic assessment. Because we trained caregivers to use an echoic prompt (i.e., vocal model) during teaching requests and teaching labels, we verified that the children could echo spoken words in a similar manner to Carp, Peterson, Arkel, Petursdottir, and Ingvarsson's (2012) procedures. The assessment included echoics of the requests and labels the caregivers' taught during play-based sessions in our clinic and in their home. For each trial, we said the target echoic (e.g., "Say, tool kit") and measured correct and incorrect responses. We randomly said the four names of the four toys across trials until each was presented twice. We stopped assessing a name if the child echoed it correctly on both trials, and we replaced it with a new name for the toy or replaced the toy if the child incorrectly echoed the name twice. If the latter was necessary, we chose a new toy from the toy-preference assessment or another toy within the same activity identified via activity-preference assessment. We provided enthusiastic praise and a preferred toy

for 20 s following a correct response. We did not respond to an incorrect response (i.e., an error or no response) within 5 s of the spoken word; instead, we initiated the next trial after 3 s. Both children echoed the full word or engaged in an approximation on 100% of trials; approximations that were discriminable to two independent observers were scored as correct.

Request (mand) and label (tact) assessments. We confirmed that the children did not exhibit the target requests and labels prior to teaching. Sessions were comprised of two targets (request or label taught in clinic, request or label taught in home), each were presented three times across three 6-trial sessions. For each request trial, we provided access to the toy for 20 s and then removed the toy out of the child's reach; contingent on any response toward the toy, we delivered the toy back for 20 s. If there was no response within 10 s, the trial ended. For each label trial, we showed a toy to the child and said, "What is this?" Following any vocal response (e.g., reaching for the toy did not produce reinforcement), we delivered the third- or fourth-ranked toy for 20 s (i.e., nonspecific reinforcement). If there was no response within 10 s, the trial ended. Both Aziz and Owen did not emit the target requests and labels prior to in-clinic teaching. We conducted the assessments a second time following the in-clinic evaluation to confirm (a) that the child acquired the target request and label that were taught by his mother and (b) the child had not learned the second target request and label, which the mother subsequently taught during the generalization test (in-home evaluation). Both children demonstrated the target request and label from the in-clinic training and did not emit the correct request or label of the in-home targets.

Table 1. Displays the operational definitions of each dependent variable.

Dependent Measures	Operational Definition	Scoring	Example
Child behavior			
1. Play	Vocalizations about the toys and functional actions with toys that do not include repetitive actions using only one part of a toy (e.g., spinning wheels of a car, moving a toy back-and-forth in front of their eyes) or destructive behavior toward a toy (e.g., banging toys, throwing toys). 5-s onset and offset scoring.	10-s partial interval; % of intervals	Pushing a car across the floor
2. Skill	Independent target request or label following the initial instruction within 5 s	Number of correct responses divided by total number of opportunities	Saying "Tool kit" in response to the caregiver holding the tool kit on the first trial
Caregiver behavior			
Parallel play			
1. Parallel Play	Playing with a toy and describing their behavior beside their child without initiating interactions; describes the name, look, sound, or actions of the toy; scored each time play and a new vocal response occur together	10-s partial interval; % of intervals	The caregiver builds a house and says "I built a big house!"
Less Desirable Behaviors			
2. Commands	Statements that instruct the child to engage in a behavior	10-s partial interval; % of intervals	"Hand me the red block."

3. Questions	Vocalizations that end in an inflection	10-s partial interval; % of intervals	"What did you do at school today?"
4. Correcting Play	Statements regarding the child's mistakes or undesirable behaviors	10-s partial interval; % of intervals	"Don't smash the cars into each other!"
5. Redirecting play	Attempts to change the child's play behavior by switching toys without their child's request to do so, changing the activity, or physically guiding the child to engage with toys or their caregiver	10-s partial interval; % of intervals	The caregiver hands their child a toy to play with or takes the current toy their child is playing with
Child-Directed Interaction			
6. Descriptive Praise	Providing a statement of approval that includes a specific description of the child's action(s)	% of opportunities	"Great job stacking those blocks!"
7. Reflection	Repeating their child's appropriate vocalizations with a different frame	% of opportunities	The child says "black cat," and the caregiver says "It is a black cat!"
8. Motor Imitation	Repeating their child's appropriate play actions	% of opportunities	The child flies a car in the air and the caregiver also picks up their car to fly it
9. Behavioral Description	Labeling their child's appropriate play actions	% of opportunities	The child builds a log cabin, and the caregiver says, "You're building a house!"
Teaching Requests			
10. Request Opportunities	Presents the toy at the child's eye level within arm's reach, or toy is within sight and the child initiates. The caregiver (a) waits 5 s for an independent request (c) following a correct response, the caregiver provides praise and	% of opportunities	The caregiver places the tool kit near the child, and a reach by the child is followed by the caregiver holding up the toy; the child says "Tool kit"

	access to the target toy for 30 – 90 s, (d) provides an echoic prompt following an incorrect or no response within 5 s, and (e) provides up to two remedial opportunities following an incorrect or no response after the echoic prompt		
Teaching Labels			
11. Label Opportunities	The caregiver (a) gains the child's attention by placing their hand over the child's hands or toy (b) provides the prompt, "What is it?" while pointing to the target toy, (c) following a correct response, the caregiver provides praise and access to continued play, (d) provides an echoic prompt following an incorrect or no response within 5 s, and (e) provides up to two remedial opportunities following an incorrect or no response after the echoic prompt	% of opportunities	The caregiver interrupts the child's play and says, "What is it?" while pointing to the stockpot; the child says "Stockpot"

Measurement, Data Analysis, Interobserver Agreement, and Procedural Integrity

We measured the caregiver's implementation of four strategies and their level of engaging in four less desirable behaviors, and we measured four child skills (see Table 1). First, we trained the caregiver to implement parallel play and child-directed interaction and reported the implementation of both strategies as the percentage of 10-s partial intervals. We also measured the less desirable behaviors using the same partial-interval system. Finally, we reported the child's engagement (hereafter described as play) as the percentage of 10-s intervals with play. Next, we trained the caregiver to teach requests, which took the form of one- or two-word request for a preferred toy. We reported this strategy as the percentage of opportunities with correct implementation. In the same strategy-specific situation, we reported the child's performance as the percentage of opportunities with the correct request. The final strategy we trained the caregiver was teaching labels, which took the form of a one- to two-word label of a specific toy; we reported the caregiver's and child's performance as the percentage of opportunities.

In summary, we used a time-based measure for parallel play because the caregiver could engage in this strategy at any point in a session; although child-directed interaction required the child to be playing with toys for the caregiver to implement this strategy, we used a time-based measure because we expected a high level of play throughout each session given our inclusion criteria and use of highly preferred activities. We measured teaching requests and teaching labels based on specified opportunities because this strategy required the caregiver to arrange a specific situation for the skills. When necessary, we extended session duration to score implementation of a strategy (e.g., a teaching opportunity began at 9 min 58 s and ended at 10 min 21 s).

For the partial-interval measurement system, we used proportional reliability of occurrence agreement (i.e., reliability analyses were restricted to intervals for which at least one observer scored one or more responses) to calculate IOA instead of including occurrences and nonoccurrences to eliminate concerns regarding artificially inflated IOA scores for sessions with

a large number of intervals without a response. For an interval in which at least one observer scored one or more responses, the smaller number of responses scored by either the primary or secondary observer was divided by the larger number of responses scored and the quotient was converted to a percentage for that interval, which served an interval-agreement percentage. The mean percentage across all (occurrence) intervals was calculated for each session. For the opportunity-by-opportunity measurement system, we used a ± 5-s time-window analysis (Mudford, Taylor, & Martin, 2009) and scored an agreement if the secondary observer recorded the same response within 5 s of the primary observer's timestamp. We calculated IOA by dividing the number of agreements by the number of agreements plus disagreements and converted the quotient to a percentage. A total of 36% of sessions were assessed and the session percentages were averaged to yield a single IOA percentage for each dependent variable. The results were: parallel play 82% (range, 67% to 100%), less desirable behaviors 93% (range, 51% to 100%), correct child-directed interaction 84% (range, 66% to 100%), incorrect child-directed interaction 94% (range, 71% to 100%), correct teaching requests 100%, incorrect teaching requests 94%, correct teaching labels 100%, incorrect teaching labels 96%, correct requests 100%, and correct labels 100%.

We calculated fidelity on the training provided by the experimenter for at least 20% of sessions in each caregiver-training phase. We trained caregivers using BST and in-vivo training. For BST, which was trial based, we measured whether the experimenter provided (a) a description, rationale, and model of the strategy; (b) a description and model of the correct strategy within 10 s of each error; (c) did not provide feedback when an error was not made; (d) praise within 10 s of each correct strategy implementation; and (e) programmed the specified number of teaching opportunities for a given strategy. For in-vivo training, we measured whether the experimenter did *(b)* and *(c)* as described for BST and praise was provided following a correct strategy on an intermittent schedule (approximately a variable-ratio 4). We reported procedural

integrity as the percentage of opportunities with correct implementation for all procedures in each session. The number of opportunities with correct implementation was divided by the total number of opportunities, and the quotient was converted to a percentage. The session percentages were averaged to yield a single integrity percentage for each training phase and caregiver. For Mrs. Sharma and Aziz, the results were 100% for BST and 94% (range, 71% to 100%) for in-vivo training. For Ms. Whittaker and Owen, the results were 92% (range, 80% to 100%) for BST and 100% for in-vivo training.

General Procedures

All sessions consisted of unstructured play, and the activities with the target-request toys and target-label toys were always present. We also included a second activity, which did not include any target toys, to promote consistent toy engagement and we rotated six playsets as the second activity across sessions. In addition, the activities included various manipulatives that were not associated with teaching requests or labels (i.e., non-target toys). Within the farm playset, for example, there were animals, farming equipment, a barn, plants, and fencing. For the in-clinic evaluation, caregivers visited the clinic 3 to 4 days per week for 1 to 2 hr per day.

In-Clinic Evaluation: Training the Caregiver and Assessing Child Preference

Concurrent-chains preference assessment. We used a type of situational preference assessment to assess each child's preference for two unstructured play contexts (described as terminal links), both of which included continuous, noncontingent access to the two top-ranked activities for 5 min. In technical terms, we used a concurrent-chains preference assessment (Luczynski & Hanley, 2009; 2010) to identify a rank order for contexts composed of toys alone, toys with caregiver, and no toys and no caregiver. One play context included only the activities (toys alone); the other context was identical except the caregiver was present (toys with caregiver). The control context included the child alone in the room (no toys and no caregiver), and this context aided interpretation of results because it was presumably less preferred than the

play contexts such that if a child selected both play contexts equally, but avoided the control context, this pattern of selections would indicate equal preference (or indifference) rather than indiscriminate selections.

The instructions provided to the caregiver in the toys-and-caregiver context depended on which point during the evaluation the assessment was conducted. To assess whether the child's selections may shift as a function of caregiver's implementation of trained strategies, we administered the assessment (a) prior to pretraining, (b) after training the caregiver to implement parallel play and child-directed interaction, and (c) after training the caregiver to teach requests and labels. For the first administration, we asked the caregiver to, "Interact with your child as you normally would when playing with these toys." For the latter two administrations, we asked the caregiver to, "Interact with your child using the strategies learned during our training." We modified our instructions so the caregiver's behavior reflected the questions of interest. That is, for the first administration, we were interested in the child's preference when the caregiver interacted as they normally did prior to our training. For the latter two administrations, by contrast, we were interested in whether the child's preference would be influenced by the caregiver implementing particular strategies. For instance, a child may not prefer to play with his or her caregiver if the caregiver momentarily interrupts their play to teach (Heal et al., 2009; Heal & Hanley, 2011). The repeated administrations of the concurrent-chains preference assessment at these time points allowed us to detect such potential effects of our training.

Pictures (10 x 15 cm) with and without the caregiver sitting next to the activities and a picture of an empty room served as initial-link stimuli for the play contexts and control context, respectively. During the first appointment, we conducted four, forced-choice sessions of each context (12 total sessions) in a random and counterbalanced manner. During all subsequent appointments until we completed the concurrent-chains preference assessment, we conducted one forced-choice session of each context followed by continuous free-choice selections until the

preference criterion was met or until the end of the appointment; we never ended an appointment, except for the first one, on a forced-choice selection. We defined a preferred context as one picture selected on four more sessions than the other pictures; we discontinued the assessment if the preference criterion was not met in 20 sessions (Luczynski & Hanley, 2014).

In forced-choice sessions, one picture was affixed with Velcro to one of three horizontal positions on the door of the room, and the picture position was rotated randomly across sessions. For Aziz's forced-choice sessions, we affixed all three pictures to the door and randomly rotated the picture of the forced context. We prompted the child to hand over the picture and escorted the child into the room to experience the associated context in the presence of an enlarged version of the selected picture (30 x 45 cm). In free-choice sessions, the procedures were identical except that all three pictures were affixed to a position on the door, the child was prompted to select a picture, and we rotated the pictures clockwise following each selection. There was a short break between sessions (i.e., caregiver and child walked around the clinic). We scored which picture the child chose following each selection during the free-choice selections using paper and pencil data. We used exact (trial-by-trial) agreement to calculate IOA for picture selection on 100% of sessions; agreement was 100% for all sessions.

Pretraining with child. Sessions were 10 min. Our instructions before every session were similar to those used by Laski, Charlop, and Schreibman (1988), "Interact with (child's name) while teaching (him or her) how to play with and talk about the toys and teaching (him or her) to independently request the (target-request toy) by saying '(target request)' (we showed the toy to caregiver) and to label the (target-label toy) by saying '(target label)' (we showed the toy to caregiver)." After delivering the instructions, we left the room and observed the caregiver and child through a one-way mirror. We did not provide consequences following correct and incorrect responses. We used visual inspection to determine when to end pretraining.

Pretraining with experimenter. We also conducted pretraining with the experimenter to

demonstrate experimental control over the training procedures in the presence of both the child and experimenter. We exhibited a variety of child-like behaviors, including playing appropriately with toys, staring at toys without play, engaging in disruptions with the toys, and repeatedly engaging in the same play action (e.g., spinning wheels, tapping blocks on surfaces). Sessions were 10 min, and, for the purposes of programming the experimenter behaviors, we considered each minute as an opportunity to program one or more of them. We programmed each behavior in two of the 10, 1-min intervals (i.e., twice) except playing appropriately, which was programmed in four intervals. We created three versions for when we programmed the behaviors in a session to minimize the predictability of their occurrence. We did not independently engage in the target requests and labels. However, if the caregiver correctly arranged an opportunity to teach a request or label, we alternated between engaging in a correct response (saying the target request or label) and an incorrect response (saying an incorrect request or label or not responding).

Behavioral skills training (trial-based). BST was used to train one strategy at a time following pretraining with the experimenter (see operational definitions in Table 1). We described the strategy, provided rationale for its importance, and modeled the strategy, which was followed by answering questions from the caregiver. Next, the caregiver practiced the strategy during scripted role-play trials. All trials began with the caregiver and experimenter playing with toys. Descriptive praise was provided for a correct response. Feedback for an incorrect response included describing the error, providing rationale for the part of the strategy that was implemented incorrectly, and describing the part of the strategy to implement correctly during the trial. For example, following an error during teaching requests, we stated, “You immediately said the name of the toy after presenting it to (child’s name). We need to ensure that you give (child’s name) an opportunity to respond so that you can determine if (she or he) has learned how to request the toy. On the next trial, please wait 5 s before saying the name of the toy.” We provided briefer feedback in the form of stating the error without the corresponding rationale for repeated

errors of the same type. BST ended after two sessions with 8 of 10 or 4 of 5 trials with the correct strategy, depending on the strategy. Trials were defined based on the strategy (see below).

Parallel play. Sessions were composed of ten 1-min trials. We began each trial with the experimenter appropriately playing (i.e., functionally playing with toys and emitting functional or descriptive vocalizations with toys). In six trials, after playing with the toys for approximately 5 s to 15 s, we either engaged in disruptions with the toys, stopped playing, or played repetitively; unsystematically, we returned to playing appropriately at the end of the trial for approximately 5 to 15 s. In four trials, the experimenter appropriately played for the entire minute. Note that the experimenter's behavior across trials was the same as those programmed during pretraining (with experimenter). During every trial, we trained the caregiver to engage in continuous parallel play and, while doing so, ignore problem behavior and avoid interrupting play by not delivering commands, asking questions, correcting play, and redirecting play, which we named *less desirable behaviors*. In other words, the caregiver was trained to play with toys next to her child without directly interacting with her child or her child's toys. Parallel play consisted of the caregiver labeling toys and actions while interacting with her toys. Praise or feedback was provided after the trial was complete, and the next trial was initiated.

Child-directed interaction. Sessions were composed of ten 1-min trials. The trials were programmed as described for parallel play. Four components comprised the strategy, which included descriptive praise (referred to as *descriptive praise*), imitating and expanding on appropriate vocalizations (referred to as *reflection*), imitating appropriate play (referred to as *motor imitation*), and describing appropriate play (referred to as *behavioral description*). In every trial, there were multiple opportunities for the caregiver to engage in a strategy component because we played appropriately in different ways at the start and end of a trial or throughout an entire trial. We provided descriptive praise or feedback at the end of the trial (as described for parallel play). Because the strategy components were discrete, the caregiver did not engage in

them continuously throughout a trial; rather, the caregiver engaged in parallel play during periods of the trial when the opportunity to engage in child-directed interaction was absent (e.g., the experimenter was throwing toys). In this way, the caregiver practiced the previously trained strategy of parallel play while learning to integrate the strategy components of child-directed interaction.

Teaching requests (mands). Sessions were composed of five trials. Each trial began with 5 s to 15 s of the caregiver engaging in parallel play (as during the training of parallel play and child-directed interaction) and then the caregiver taught a request. The caregiver was trained to show the target-request toy to the experimenter at eye level, place the toy on the ground slightly beyond the experimenter's reach, and wait for the experimenter to respond toward the toy. If the experimenter engaged in a response other than the target request, the caregiver gently blocked access to the toy and waited up to 5 s to determine whether the experimenter would exhibit the target request. Following an incorrect response or no response, the caregiver provided an echoic prompt (e.g., "tool kit"); if a prompted-correct request was not observed within 5 s, the caregiver conducted a maximum of two remedial trials (i.e., reset the opportunity to practice following an error). If a prompted-correct request was not observed on the second remedial trial, the toy was not delivered and placed out of view, which ended the trial. Following a correct or prompted-correct response, the caregiver immediately provided access to the target toy and descriptive praise. The caregiver allowed access to the toy for at least 30 s but no more than 60 s; thereafter, the toy was removed and placed out of view, which ended the trial.

After appropriately playing for 5 s to 15 s, we programmed a correct request or an incorrect response following the caregiver's presentation of the toy. On two trials, we engaged in the correct request; on one of the other three trials, we engaged in an incorrect response in the form of reaching for the toy without a correct request, continued play (i.e., no response), or a non-target vocal request. In addition, for the three trials with an initial incorrect response, we engaged

in a prompted-correct request following the caregiver's echoic prompt during a remedial trial.

Teaching labels (tacts). Sessions were composed of five trials. Each trial began with 5 s to 15 s of the caregiver engaging in parallel play and then the caregiver initiated an opportunity to teach the target label. The caregiver was trained to interrupt play by gently placing one hand over the toys, experimenter's hands, or both. Next, the caregiver pointed to the target-label toy and said, "What is it?" If the experimenter engaged in an incorrect response, the caregiver provided an echoic prompt. If a prompted-correct label was not observed within 5 s, the caregiver conducted a maximum of two remedial trials. If a prompted-correct label was not observed on the second remedial trial, the teaching trial ended and the caregiver allowed the experimenter to continue playing. Following a correct or prompted-correct response, the caregiver provided descriptive praise and then allowed continued play, which ended the trial.

After appropriately playing for 5 s to 15 s, we programmed a correct label or an incorrect response when the caregiver said, "What is it?" On two trials, we engaged in the correct label; on the other three trials, we engaged in an incorrect response in the form of attempting to continue playing (i.e., no response) or a non-target vocal request. In addition, for the three trials with an initial incorrect response, we engaged in a prompted-correct request following the caregiver's echoic prompt during a remedial trial.

In-vivo training with experimenter (session-based). We included this part of our training to teach the caregiver to (a) implement the strategy recently acquired during BST throughout a 10-min session and (b) integrate the recently acquired strategy with those previously trained during BST throughout a 10-min session. We engaged in the same programmed behaviors as described in pretraining. Before every session, we instructed the caregiver to, "Interact with your child using the strategies learned throughout your training."

Following BST of parallel play, the only difference from the trial-based training was that the caregiver implemented parallel play for 10 consecutive minutes, and training continued until

the strategy was implemented at least once every minute with a near-zero level of less desirable behaviors. That is, we provided feedback if the caregiver did not implement parallel play at least once in each minute of the 10-min session (e.g., "You went the last minute without engaging in parallel play. Please make sure to implement parallel play at least once per minute). Brief praise was provided for correct strategies on an intermittent schedule (approximately variable-ratio 4). After BST of child-directed interaction, we trained the caregiver to flexibly integrate parallel play and child-directed interaction by engaging in both strategies at least once during each minute. We did not provide feedback on the frequency of alternating between these two strategies. After BST of teaching requests, we trained the caregiver to engage in parallel play, child-direct interaction, or both between arranging opportunities for teaching a request. We provided feedback if the caregiver taught requests successively.

After BST of teaching labels, which was the final strategy, we instructed the caregiver to (a) engage in parallel play, child-directed interaction, or both between teaching requests and labels and (b) alternate between arranging opportunities for teaching requests and teaching labels (i.e., avoiding consecutive opportunities). In addition to these two implementation rules, we instructed the caregiver to arrange no more than five opportunities for teaching requests and teaching labels (10 total). We trained caregivers to integrate all four strategies using these three rules toward the goals of (a) minimizing the potential aversiveness of embedding teaching during play (in particular with respect to teaching labels; Heal & Hanley, 2011), (b) allowing the caregiver to relax (via parallel play) and re-establish play as a primary aspect of the session, and (c) maintaining the child's motivation (establishing operation) for the target-request toy by including periods when it was not present in the session. Note that we did not train the caregiver to keep track of time via timer or record the number of times each strategy was implemented to minimize self-management and to prioritize flexibility when integrating the strategies. The mastery criteria were two consecutive sessions at 80% or greater correct implementation of each

strategy and integration of all the strategies that had been trained at the given point of the evaluation.

In-vivo training with child (session-based). The mastery criteria for implementing the strategies were identical to those described with the experimenter. We used bug-in-the-ear technology (i.e., discreet earbuds with a microphone attached to their personal phone) to provide brief praise and feedback until we observed two consecutive sessions at 80% or greater. For teaching requests and labels, there was more variability in the number of programmed opportunities, and, when there was four or less, the caregiver could only meet the 80% accuracy criteria if implementation was perfect. Therefore, we expanded our mastery criterion to allow one error. It should be noted that the mastery criteria were not influenced by the child's acquisition of the target request and target label.

Posttraining with child. We assessed the caregiver's implementation of the strategies in the absence of in-vivo training. That is, there was no interaction between the experimenter and caregiver in these sessions; the experimenter observed behind the one-way mirror. All trained strategies meet the mastery criteria before we trained additional strategies. We continued posttraining, however, if the child had not yet mastered the target request and label.

In-Home Evaluation: Testing for Generality and Maintenance

We provided the caregivers with a video camera, tripod, and the activities identified via the activity preference assessment. The caregiver transferred the videos to a secure web-based server (i.e., Box) each week for the experimenter to download and score.

Baseline. Following preassessments but before in-clinic pretraining, the caregiver conducted three 10-min sessions in the family's home where the child typically played. We used the same instructions as those described above for in-clinic pretraining. Sessions were conducted across at least two days.

Generalization. Following in-clinic posttraining, we replicated the procedures described

in baseline with the exception that we asked the caregiver to teach the second target request and label as a generalization test teaching requests and labels across activity toys, which were not associated with our training.

Maintenance. We asked the caregiver to conduct at least three sessions per week. At the end of the week, we sent an email with a neutral acknowledgement of receiving recorded sessions (e.g., "Hello Ms. Whittaker, we have received [number of videos] videos from you dated [mm/dd], [mm/dd], and [mm/dd]"). If the caregiver had not conducted at least one session in a week, we sent a follow-up email encouraging them to conduct three sessions in the upcoming week. If three sessions had not been conducted for two weeks over a month, we asked the caregivers to, "Please describe the barriers to implementing the play-based teaching sessions during the last month."

Social Validity

We developed a questionnaire that contained 7-point Likert scales (1 = No improvement, 4 = No opinion, 7 = Highly improved or highly acceptable) with corresponding open-ended questions. We asked caregivers to report their degree of satisfaction interacting with their child in a play-based context (see Supporting Information). We also asked them to provide rationale for their ratings.

Experimental Design

We used a concurrent multiple-probe design across behaviors (in-clinic evaluation with child and experimenter) and a nonconcurrent multiple-baseline design across participants (in-clinic evaluation with child) to evaluate the efficacy of our training on caregiver implementation of the strategies and child's acquisition of the target requests and labels. We used a nonconcurrent pretest-posttest design, with repeated measures, across the caregiver-child dyads to assess the effects of our training resulting in generalization of the trained strategies to the caregiver's home in which different activities were present and a different target request and label were taught.

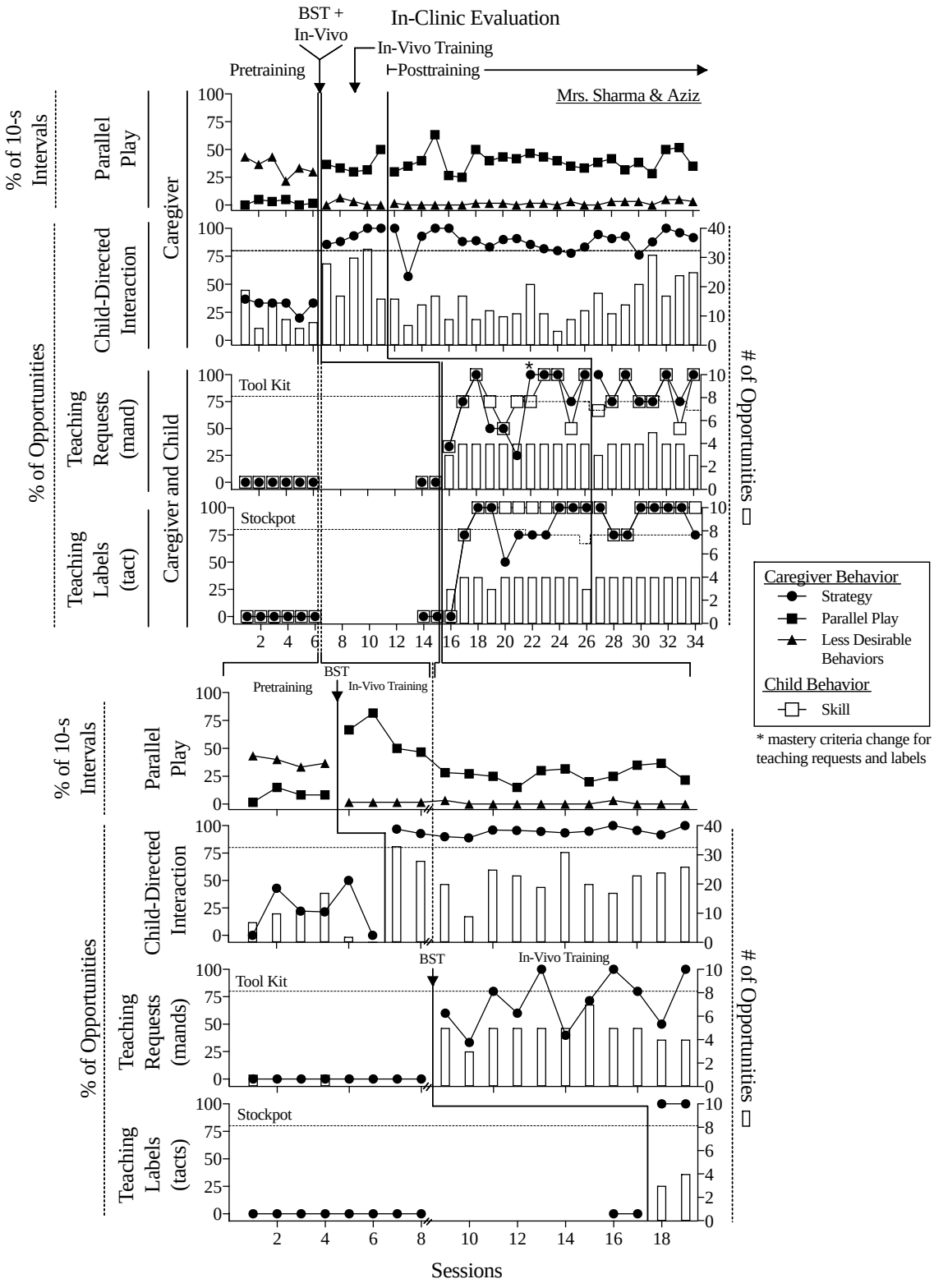

Figure 1. Depicts the in-clinic evaluation for Mrs. Sharma and Aziz.

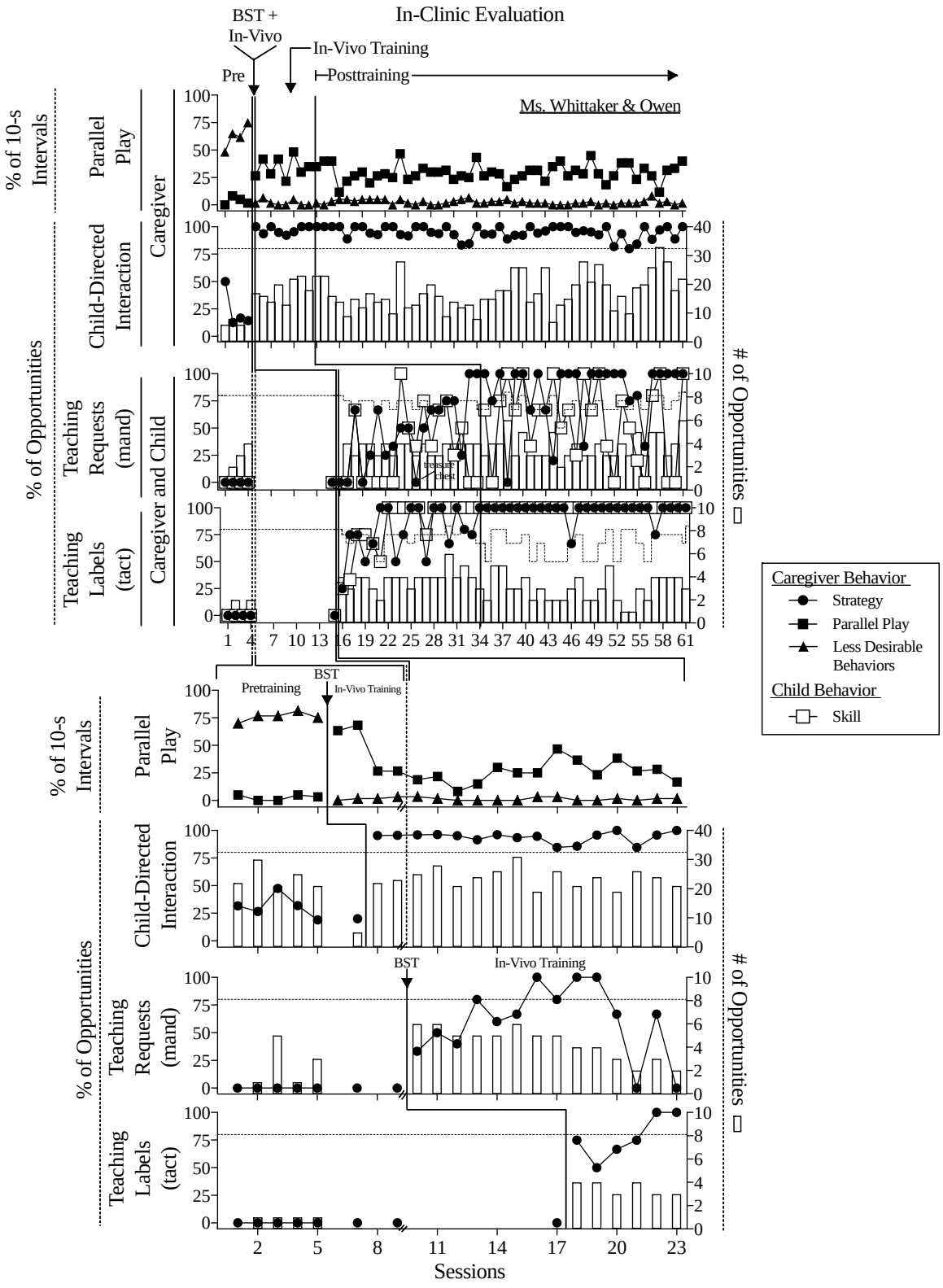

Figure 2. Depicts the in-clinic evaluation for Ms. Whittaker and Owen.

Chapter 2: Results

Caregiver Integration of the Four Strategies and Child Acquisition of Skills

During pretraining with her son (Figure 1, top four panels), Mrs. Sharma exhibited a low level of parallel play and elevated level of less desirable behaviors (top panel), moderate level of child-directed interaction (second panel), and never implemented the strategies for teaching requests (third panel) and teaching labels (fourth panel). Aziz did not exhibit the target request and label. Mrs. Sharma performed similarly during pretraining with the experimenter (bottom four panels). Next, we implemented BST (data available from the first author) followed by in-vivo training for parallel play (fifth panel) and then child-directed interaction (sixth panel). After observing an increased level of parallel play and a stable level of child-direction interaction, Mrs. Sharma implemented both strategies with her son at a satisfactory level (top two panels). During posttraining, in which there was no interaction with the experimenter, we continued to observe satisfactory implementation of both strategies.

We then implemented BST plus in-vivo training of teaching requests and teaching labels, sequentially, with the experimenter. There was variability during in-vivo training with teaching requests prior to the mastery criteria being met on the ninth training session. Mrs. Sharma immediately met the mastery criteria for teaching labels. Aziz acquired the target request within 11 sessions and the target label within 4 sessions. After Mrs. Sharma met the mastery criteria for teaching requests and labels, we assessed the continued implementation of all four strategies during posttraining, and her performance remained at or above 75%.

Ms. Whittaker exhibited similar performance as Mrs. Sharma during pretraining (Figure 2), with the exception that she engaged in higher levels of less desirable behaviors. Like Aziz, Owen exhibited zero levels of the target request and label during pretraining. Following BST, Ms. Whittaker quickly mastered parallel play and child-directed interaction during in-vivo training with the experimenter. She also implemented both strategies accurately with her child during in-

vivo training and posttraining.

Ms. Whittaker learned the strategies of teaching requests and teaching labels in a similar number of sessions as Mrs. Sharma during in-vivo training with the experimenter. Unlike Mrs. Sharma, however, we observed a decrease in Ms. Whittaker's implementation of teaching requests as she was acquiring teaching labels. During in-vivo training with Owen, Ms. Whittaker's accuracy steadily increased until she met the mastery criteria, and she required 19 sessions to master teaching requests, whereas she required 7 sessions to master teaching labels. Ms. Whittaker also exhibited variability in teaching requests for the first part of posttraining before repeatedly implementing the strategy with perfect accuracy. Similar to Aziz, Owen acquired the target request more slowly than the target label. Figure 7 depicts a summary of in-clinic outcomes obtained across both caregivers and their children. The differences in performance can be seen most notably in the increased teaching strategies for both caregivers, and in the reduction of less desirable behaviors by Ms. Whittaker.

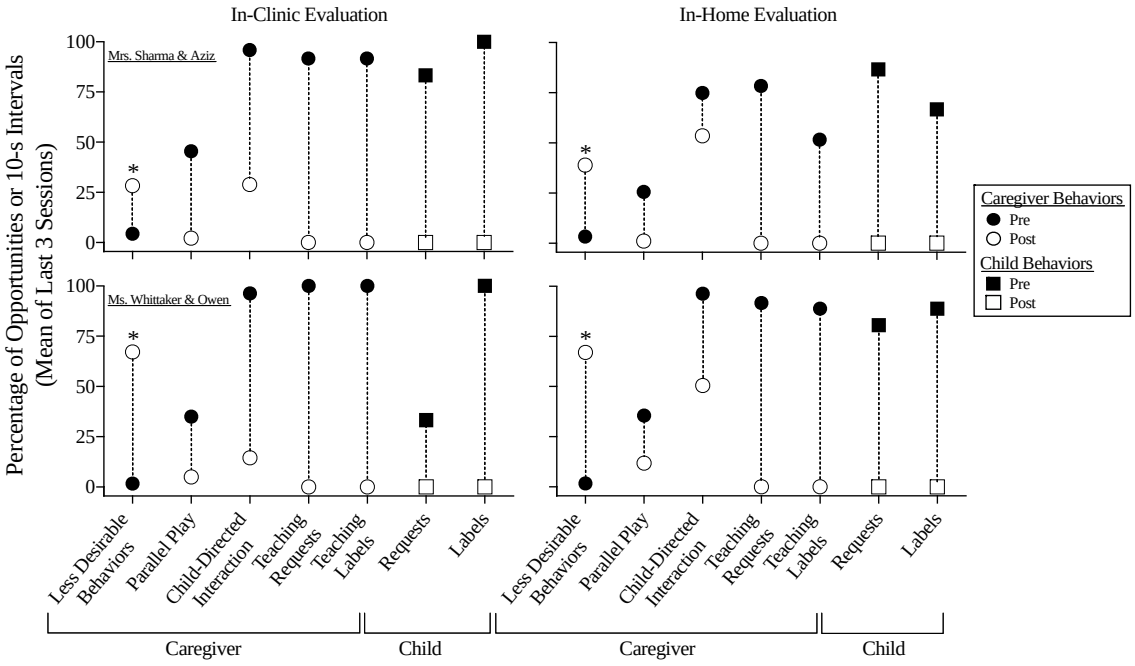

Figure 7. Depicts a summary of the outcomes obtained across both caregivers and their children. The asterisk indicates behavior targeted for decrease.

Mrs. Sharma visited the clinic 16 times with approximately 7.75 hr of total training time: (a) 5 visits and approximately 2.5 hr for trial-based BST, (b) 6 visits and approximately 2.5 hr for in-vivo training with experimenter, and (c) 5 visits and approximately 2.75 hr for in-vivo training with child. Ms. Whittaker attended clinic 22 times with approximately 12 hr of total training time: (a) 4 visits and approximately 4.25 hr for trial-based BST, (b) 6 visits and approximately 3.25 hr for in-vivo training with experimenter, and (c) 7 visits and approximately 4.5 hr for in-vivo training with child.

Child Play and Preference

The results from the administrations of the concurrent-chains preference assessment indicate that both children's preference for playing with their caregivers was unaffected by the introduction of the strategies (Figures 3 and 4). Prior to pretraining, Aziz and Owen allocated nearly all of their selections toward the context composed of the toys with caregiver context. This pattern of selections was replicated after the caregiver implemented parallel play and child-directed interaction and after all four strategies were integrated.

We measured play as the percentage of 10-s intervals with toy manipulation. Except for one session with Owen, the levels of play for both children never decreased below 70% of intervals for both children throughout the in-clinic and in-home sessions. Aziz played during a mean of 98% (range, 83% - 100%) of the intervals in clinic and 100% (range, 95% - 100%) of the intervals in home. Owen played for a mean of 97% intervals (range, 70% - 100%) of the in clinic and 95% (range, 55% - 100%) of the intervals in home. These outcomes indicate that implementing the strategies did not negatively affect the children's preference for playing with their caregiver or their level of play.

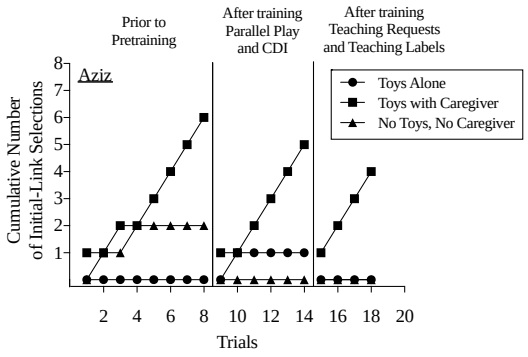

Figure 3. Depicts Aziz's Concurrent-Chains Preference Assessment.

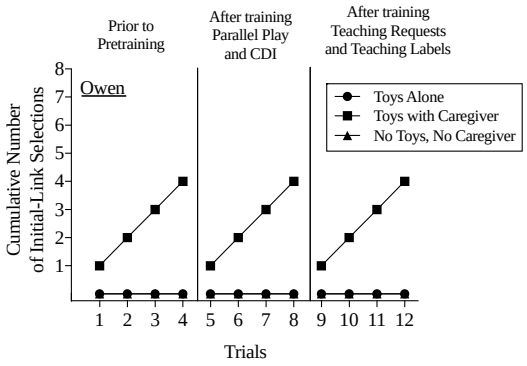

Figure 4. Depicts Owen's Concurrent-Chains Preference Assessment.

Generalization and Maintenance

Mrs. Sharma implemented all strategies with a high level of accuracy (Figure 5), and her teaching resulted in Aziz acquiring the new target request and target label (second phase). Both generalization and maintenance phases consisted of no experimenter feedback, and the primary difference was generalization consisted of activities identified via preassessments whereas, during maintenance (third phase), the caregivers identified additional toys for which to teach requests and labels. Mrs. Sharma exhibited some variability in the accuracy of teaching new requests and labels.

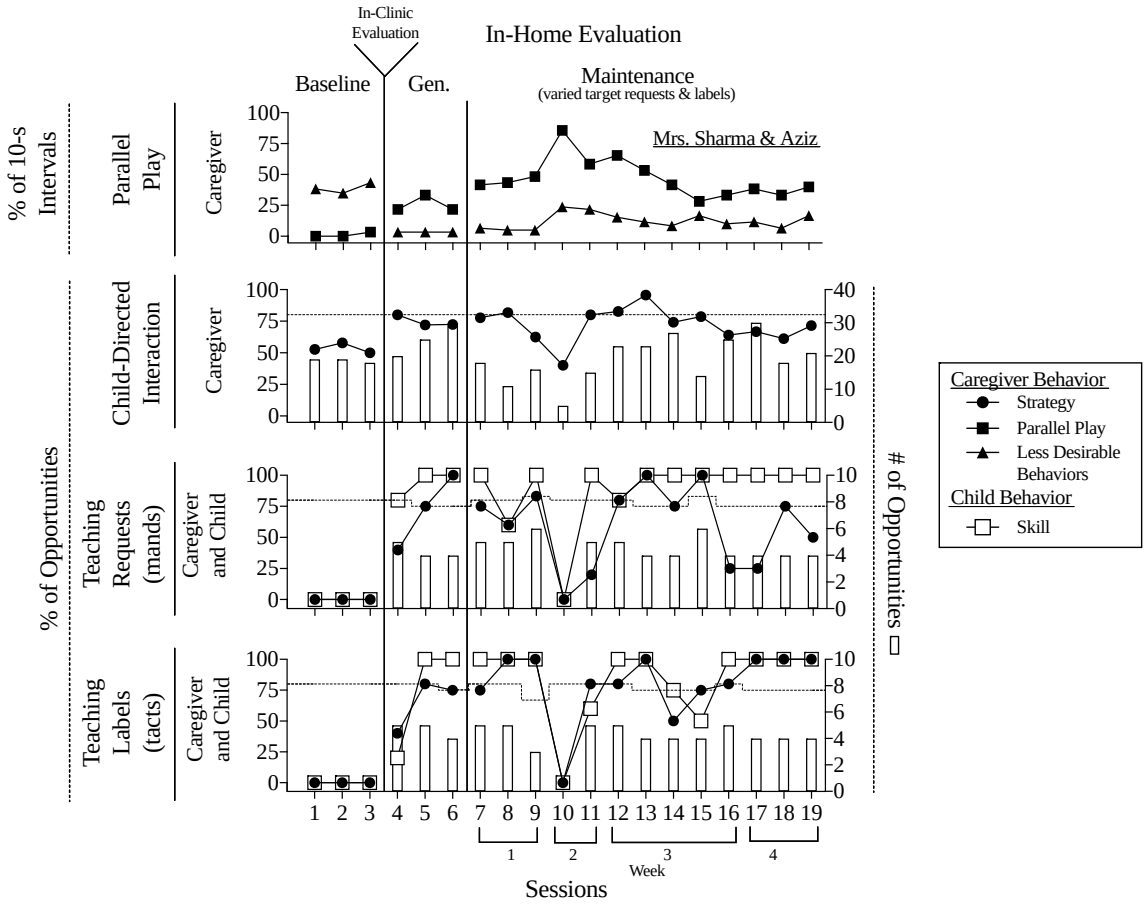

Figure 5. Depicts the in-home evaluation with Mrs. Sharma and Aziz.

Ms. Whittaker accurately implemented parallel play, child-directed interaction, and teaching labels along with fewer less desirable behaviors (Figure 6). We observed more variability in teaching requests and this seemed to be related to the reinforcing value of the dump truck, which was similar to what was observed with the target-request toy used in clinic. Similar to the modification during the in-clinic evaluation, we asked Ms. Whittaker to replace the current target-request toy (dump truck) with a different toy (spacepack; a backpack shaped like a spacecraft that contained a rocket Duplo playset). Following the toy replacement, we observed increased levels of requests by Owen and the strategy by Ms. Whittaker.

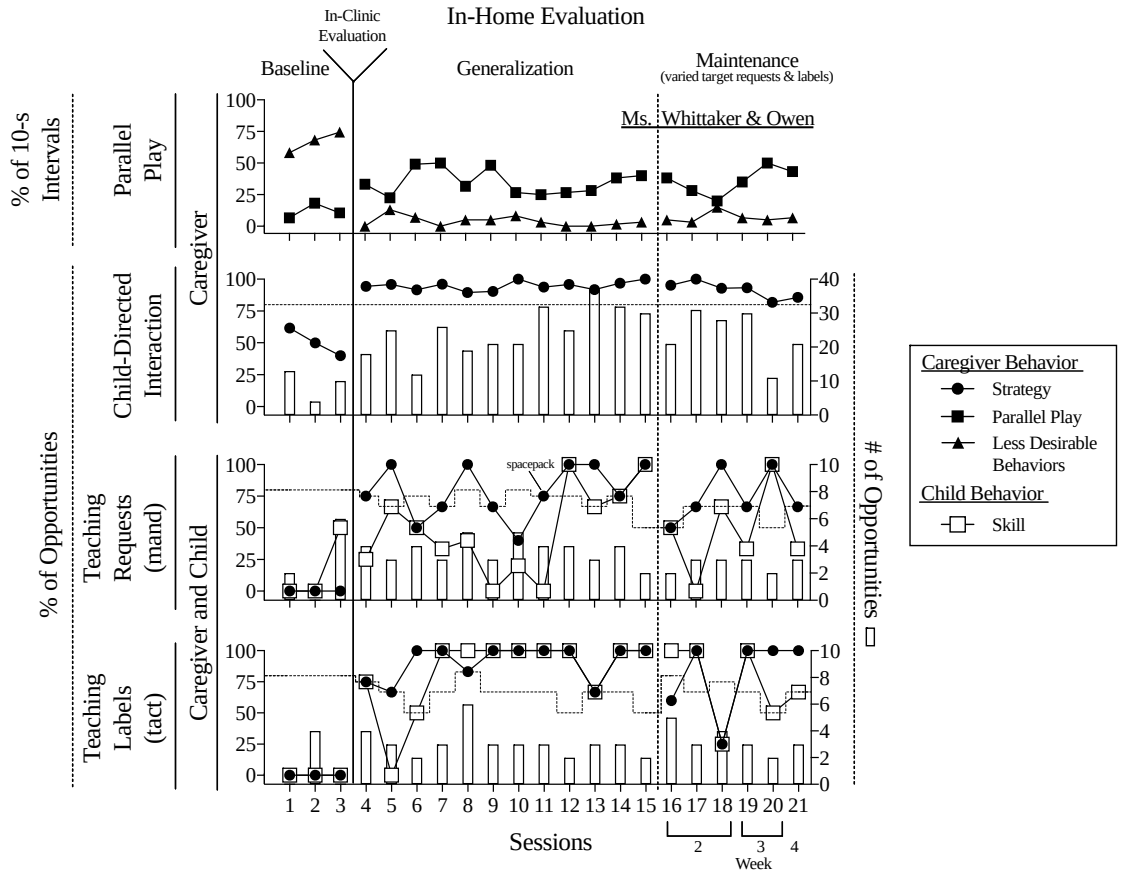

Figure 6. Depicts the in-home evaluation with Ms. Whittaker and Owen.

During maintenance, Ms. Whittaker incorporated various toy sets that were a mix of novel and familiar toys. During the first week, Ms. Whittaker reported that she did not conduct sessions due to travel, family activities, and changes in her work schedule. During the following weeks, she conducted several sessions and we observed similar levels of performance for both Owen and Ms. Whittaker. See Figure 7 for a summary of in-home outcomes obtained across both caregivers and their children. The differences in performance can be seen most notably in the increased teaching strategies for both caregivers, and in the reduction of less desirable behaviors by Ms. Whittaker.

Caregiver Satisfaction

The results of the social validity questionnaires were favorable from both Mrs. Sharma and Ms. Whittaker (see Table 2). Mrs. Sharma described parallel play as easy and child-directed interaction as effortful. She described teaching requests as easy to implement and easy for Aziz to learn, but reported that the effects of teaching labels depended on his mood and responsiveness.

Mrs. Whittaker described parallel play as teaching her more about Owen, how he enjoys playing, and reported that it resulted in Owen choosing to engage with her more during play. She reported high satisfaction with Owen's communication, expressing emotions, listening, acceptance of redirection, and decreases in aggression during child-directed interaction. She also reported that she attempted to consistently teach requests outside of the structured play sessions, but that it was difficult to know how to apply the strategy to complex scenarios (e.g., the phrase taught is longer, the request is for multiple actions or items), which may have resulted in rating her degree of comfort with implementing the strategies a 6. Ms. Whittaker provided a similar response as Mrs. Sharma regarding teaching labels in that she felt the effects of teaching labels depended on Owen's mood, environment, and the toys present.

Table 2. Depicts the data received from the social validity questionnaire we developed to be tailored toward the strategies taught in our program.

Question	Mrs. Sharma	Ms. Whittaker
Do you think parallel play improved your interactions with your child and their toys?	6	7
Do you think child-directed interaction improved your interactions with your child?	7	7
Do you think implementing teaching requests is acceptable for teaching your child new skills?	7	7
Do you think implementing teaching labels is acceptable for teaching your child new skills?	5	7
Do you like integrating the four strategies (i.e., fluidly changing which procedure you implement)?	Yes	Yes
How comfortable are you with implementing the four strategies?	7	6

Discussion

We demonstrated the efficacy of an innovative process for training two caregivers to integrate four strategies toward teaching foundational, early-learner skills to their child in a play-based context. The caregivers' implementation of two strategies directly resulted in their child learning new requests and labels of toys. Furthermore, the caregivers accurately implemented the play-based strategies in their home without the presence of the trainer. As important, implementation of the strategies did not negatively affect the children's level of play or preference to continue playing with their mother. Finally, the caregivers reported high satisfaction with the improvements in their child's play and communication, our training procedures, and the four strategies they learned; in addition, they reported being more comfortable playing with their child. Taken together, our in-home generalization and maintenance measures showed that the effects of our training reached an applied endpoint in that the mothers implemented all four strategies with new activity materials and in the absence of any expert support for nearly a month. Therefore, our outcomes provide initial support for training caregivers to integrate this collection of strategies as a starting point to build rapport and maintain play, as well as two distinct, fundamental communication skills with their child prior to, or in conjunction with, early-intervention services.

We designed our caregiver training with an emphasis toward minimizing the difficulty in acquiring each strategy and the complexity in integrating the strategies. First, we taught the strategies in a staggered manner, rather than simultaneously, and started with easier strategies to implement (parallel play and child-directed interaction). Second, we taught only three rules for integrating the strategies. Third, we instructed the caregiver to implement what we considered a reasonable number of teaching opportunities for toy requests and toy labels in a session (i.e., no more than five each over a 10-min period). The latter two features permitted flexibility in the pace with which the caregivers taught requests and labels as well as maintained an emphasis on play throughout a session. For instance, the caregiver engaged in parallel play while looking for

an opportunity to praise or imitate their child's appropriate play as well as intermittently capitalizing on their child's interest in a particular toy to teach a request or on their play to teach a label. These training features may have contributed to (a) the consistent level of play that was sustained throughout the evaluation and continued preference for playing with their caregiver despite the implementation of the teaching strategies and (b) the caregivers' high satisfaction with the intervention. Additional research is needed to determine if the frequency and relative balance of the four strategies were necessary to obtain these results.

The direct observation measures of the caregivers' and children's performances at home indicate the teaching strategies can be repeatedly implemented in a context of applied significance. The maintenance outcomes showed that the caregivers continued to conduct play-based sessions. As Schwartz and Baer (1991) and Kennedy (2002) discussed, continued implementation of an intervention, under conditions with reduced or no reactivity to the experimenter (i.e., demand characteristics), serves as a direct, valid measure of social acceptability. We did not visit the caregivers' homes; instead, we asked the caregivers to independently find times to implement the play-based sessions and record them. If the caregivers were not satisfied with the strategies, it seems less likely they would have continued to conduct numerous sessions over a one-month period. On a related point, Mrs. Sharma did not continue implementing remedial trials as part of the procedures for teaching requests and labels at home, which was her primary error when Aziz did not exhibit perfect performance. The absence of this procedure did not negatively affect Aziz's acquisition of the new target-label toy, which indicates the other strategy components were sufficient to produce acquisition and, in turn, this should minimize concerns about her variable data. Mrs. Sharma omitting this procedure likely indicates her dissatisfaction with implementing it (Allen & Warzak, 2000), and should be a consideration in addition to the necessity of the component for child acquisition of the target skill.

Future researchers should urge caregivers to implement play-based teaching in a manner

that represents an ecological fit with their routine at home. As part of their study, Pickard, Kilgore, and Ingersoll (2016) asked 16 Medicaid-eligible caregivers a range of questions regarding their perceived barriers to implementing early-intervention strategies that comprised a training program named Project ImPACT (Ingersoll & Dvortcsak, 2010). Regarding the goal of teaching during a 20- or 30-min period at home each night, nearly one third of caregivers indicated that the desired duration would be a barrier to implementation. One caregiver shared, "…my son has a twin, and then we have a 20-month-old, to set aside 10 minutes a day just with [child receiving services] is impossible;" another caregiver commented, "Maybe not a 30-minute block but 10 minutes at bath time, 15 minutes during dinner, you know [could be implemented]" (p. 396). In our study, Ms. Whittaker reported that conducting three 10-min play periods per week was difficult due to her work schedule. Future research should evaluate the potential benefits of conducting a brief intervention designed to increase adherence by discussing barriers to treatment implementation, such as an abbreviated version of Nock and Kazdin's (2005) Participant Enhancement Intervention (PEI). Obtaining qualitative data on how families implement play-based teaching may also inform modifications to the training procedures. During maintenance, we asked caregivers to conduct play-based teaching for 10 consecutive minutes but intermixing shorter periods of play-based teaching among other activities may be a better fit for some families. For instance, across a 30-minute period, the caregiver could implement the teaching strategies for several minutes among other responsibilities such a preparing for dinner and attending to the other children. In this way, the same number of instructional opportunities could take place but over a longer period of time than was taught during training.

Future research should systematically replicate our caregiver training procedures with a focus toward improving efficiency. Mrs. Sharma and Mrs. Whittaker visited the clinic 16 and 22 times, respectively, and this number of visits may be a barrier for some caregivers. One option is to adapt our procedures to be delivered in a group-based training workshop. Multimedia

presentations with videos in which the strategies are modeled could be used as didactic E-learning content (see Fisher et al., 2014; Higgins, Luczynski, Carroll, Fisher, & Mudford, 2017; Wainer & Ingersoll, 2013) prior to or during the training workshop (Lerman, LeBlanc, & Valentino, 2015). Parallel play and child-directed interaction could be taught during the first workshop, and teaching requests and teaching labels could be taught during the second workshop. Between workshops, an expert could provide in-vivo training on caregivers' implementation of the strategies with their child at home via telehealth (e.g., Knutsen et al., 2016). Telehealth would be an intuitive extension of the current procedures given that we provided feedback using bug-in-ear technology from behind a one-way mirror when the caregivers implemented the strategies with their child in the clinic. In-home training would reduce numerous visits to a clinic, which has been reported by caregivers as a barrier (Pickard et al., 2016).

Based on the children's behavior, the value of the toys we selected for teaching requests relative to playing with the activities decreased over the course of our treatment evaluation. We trained the caregivers to teach a request for one toy at a time. Aziz consistently requested the toy but did not reliably play with it; instead, he returned to playing with the same items as prior to the request. Owen would not respond toward the target-request toy after it was presented in several sessions, which interfered with the opportunity for the caregiver to teach. In response for Owen, we replaced the initial target-request toy toward increasing his motivation to access it during in-clinic teaching and in-home generalization. The challenge of maintaining motivation for target-request toys was likely due to our decision to rotate new activities every session, and we did so because implementing two strategies (child-directed interaction and teaching labels) depended on the child playing with materials. As additional support for the increased preference for the activities relative to the target-request toy, both children mastered the target-label toy in less sessions than the target-request toy in the clinic and, for Owen, in the home during generalization. As a solution, future researchers should evaluate training caregivers to momentary remove access

to the entire activity, rather than presenting preferred toys in addition to the ongoing activity, and teach a request to regain access to the activity (e.g., say “cookware”). The extent to which these modifications will improve the efficiency and social validity of training caregivers to teach requests should be evaluated.

The two children in our study acquired the target requests and labels relatively quickly after teaching was introduced. Our procedures should be systematically replicated with children who have learned only a few requests and labels. We did not report on increases in spontaneous vocalizations as a result of our intervention because these two children exhibited difficulties in articulation, which made scoring and obtaining reliable IOA difficult. Future research should evaluate the impact of parallel play and child-directed interaction on rate of spontaneous vocalizations and cumulative number of new words produced.

Both children preferred to play with their mother during each administration of the preference assessment. Because both children preferred playing with their caregiver at the start of the evaluation, the concurrent-chains preference assessment allowed us to conclude that the strategies implemented during play did not result in a less-preferred context. Application of our preference-assessment procedures would also be informative if the administration prior to the training program showed that the child preferred to not play with their caregiver. This would present the opportunity to determine whether our training program would shift selections toward playing with the caregiver in subsequent administrations, which would be a meaningful outcome for both the child and caregiver.

The mission of our training program was to develop an integrated, universal set of strategies that caregivers could implement with their child in a play-based context prior to or in conjunction with early-intensive behavioral intervention. It is likely that many families on waitlists are comprised of caregivers and children who could benefit from our program. This program is suited for children who consistently engage with toys with minimal interfering

behaviors, for caregivers interested in capitalizing on learning opportunities during play, and for caregivers who feel uncomfortable interacting with their child. It is also important to note that our program does not provide training on other universal, early-learner skills. For example, if the children in our study could not imitate vocalizations or motor movements with objects (i.e., play actions), not only could the children not respond to their mothers' instructional prompts for requests and labels, but they would also not be able to learn from parallel play and child-directed interaction (see discussion of listener skills for observational learning in Taylor & DeQuinzio, 2012). After children learn to label common objects, actions, and people, it is also important for them to answer questions about them. For example, after teaching a child to label a toy (e.g., "Plane"), it is useful for them to know its function (e.g., "It flies") and class (e.g., "It's a vehicle") when asked. Furthermore, more advanced language becomes useful during play when engaging in complex sequences of play actions and pretend play with narration (D'Ateno, Mangiapanello, & Taylor, 2003; Stahmer, Ingersoll, & Carter, 2003).

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