Play to teach language: Coaching paraeducators to facilitate communication in the preschool classroom

Dr. Rebecca Frantz,

Sarah Hansen , Buket Erturk , Wendy Machalicek , Jane Squires , Tracy Raulston

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Abstract

Paraeducators are ideal candidates for delivering communication interventions to children with developmental delays (DD), as they spend a significant amount of time with these children. However, professional development is often inadequate and limited research supports best practices. Additionally, paraeducators support multiple children with varying skill levels. Little research has been conducted on the use of strategies with multiple children. This single-case study examines the effect of a training package on paraeducators' fidelity of intervention implementation with a child dyad and subsequent child outcomes. Results suggest formal coaching contributed to improved fidelity of intervention implementation. Furthermore, paraeducators were able to use intervention strategies with children with varying communication skills and goals. Variable increases in child communication were also detected.

Keywords: coaching, communication, paraeducators, preschool classroom, developmental delays

Play to Teach: Coaching Paraeducators to Facilitate Communication in the Preschool Classroom

Children with developmental delays (DD) are at an increased risk for delayed communication skills (Kaiser & Trent, 2007), often preventing them from engaging in meaningful social interactions that help them access learning opportunities in the classroom (Kaiser & Trent, 2007; Wetherby & Woods, 2006). Early communication skills are linked to other developmental outcomes, including social and literacy related skills (Dickinson, Golinkoff, & Hirsch-Pasek, 2010; McLelland & Morrison, 2003). Furthermore, poor communication is frequently associated with peer rejection and challenging behavior (Matson, Boisjoli, & Mahan, 2009; McLelland & Morrison, 2003).

Naturalistic behavioral interventions delivered by individuals with whom the child regularly interacts in their daily lives facilitates the acquisition, generalization, and maintenance of communication skills among children with DD (Cowan & Allen, 2007; Snyder, Rakap, Hemmeter, McLaughlin, Sandall, & McLean, 2015). The supportive evidence from previous research has led to naturalistic behavioral interventions being widely recommended for advancing communication among children with autism and other developmental delays (e.g., Cowan & Allen, 2007; Schreibman, Dawson, Stahmher, Landa, Rogers, McGee,...& McNerney, 2015). Enhanced Milieu Teaching (EMT) is a naturalistic behavioral teaching approach (Hancock & Kaiser, 2002) with a strong evidence base (Kaiser & Trent, 2007). Previous research suggests EMT is effective for increasing the communication skills of preschool-aged children with autism and other developmental delays (Hancock & Kaiser, 2002; Ingersoll, 2010).

Paraeducators are especially suitable intervention agents for delivering EMT in the preschool classroom because they are increasingly responsible for providing direct support to children with DD (Giangreco & Broer, 2007; Hughes & Valle-Riestra, 2008). This reliance on paraeducator support is expected to continue, owing to special education teacher shortages and budgetary constraints (Giangreco & Broer, 2007; McLeskey & Billingsley, 2008)

Unfortunately, a majority of paraeducators do not have the required training and supervision to deliver effective interventions (Carter, O'Rourke, Sisco, & Pelsue, 2009; Giangreco, Edelman, & Broer, 2001). Previous literature suggests pre-service training is largely inadequate, and in-service training is limited (Carter et al., 2009; Hall, Grundon, Pope, & Romero, 2010). Didactic workshops are currently the most popular format for professional development, but overreliance on pre-service workshops is problematic, since they may not produce permanent behavior change that can generalize to real word situations (Lang & Fox, 2004; Parsons, Rollyson, & Reid, 2012).

Although there is strong support for naturalistic behavioral interventions for increasing communication skills, there is limited research on the use of these interventions among paraeducators (e.g., Hall et al., 2010; Schepis, Reid, Ownbey, & Clary, 2003). In addition, previous studies have focused on one-on-one implementation, yet in most preschool classrooms adults attend to multiple children with varying communication skills and goals. The current study attempts to address current gaps in the literature by examining the effect of a training package for supporting paraeducators to use naturalistic behavioral teaching strategies based on Enhanced Milieu Teaching (EMT). The following research questions are addressed: 1) Is there a functional relation between coaching paraeducators to use EMT and increased paraeducator fidelity of implementation?; 2) Is paraeducators' use of EMT associated with increases in child

communication skills?; and 3) Are paraeducators able to use EMT with children with varying communication skills? The current study applies a cascading logical model to the intervention, meaning changes in adult behavior are expected to contribute to changes in child behavior.

Methods

Participants

Four paraeducators and seven preschool children, ages three to five-years with DD, were recruited from three reverse-inclusion preschool classrooms in the Pacific Northwest. These classrooms had a majority of children with an Individualized Family Education plan (IFSP), and some typically developing children. Each classroom had one lead teacher and two or three paraeducators. Each paraeducator was paired with two child participants with an educational classification of a developmental delay and demonstrated communication delays, as reported by their lead teacher and documented in their IFSP. Additional children in the classroom also rotated through the play center to assess paraeducators' generalization of strategies. All paraeducators were coached by the first author, who had over five years of experience implementing EMT with diverse children.

Classroom one. One paraeducator (Jillian) and two target children (Alana and Orlando) participated. Jillian, was 47-years old, Pacific Islander, had 21-years of experience working in an early childhood setting, and had attended some graduate school. Alana was 4-years old, White, and had an eligibility of autism spectrum disorder (ASD). Orlando was 5-years old, Latino, had an eligibility of DD. See Table 1 for further information about child communication skills.

Classroom two. Two paraeducators (Erin and Brianne) and four target children (Owen, Adam, Leah, and Esther) participated. The first paraeducator, Erin, was 20-years old, White, had 2-years of experience working in an early childhood setting, and had attended some college. She

worked with Owen and Adam. Owen was 3-years old, White, and had an eligibility of DD. Adam was 4-years old, White, and also had an eligibility of ASD. The second paraeducator, Brianne, was 28-years old, White, had 4-years of experience working in an early childhood setting, and had attended some college. She worked with Esther and Leah. Esther was 4-years old, Asian, and had an eligibility of speech and language delay. Leah was 3-years old, White, and also had an eligibility of speech and language delay.

Classroom three. One paraeducator (Janice) and one child (Dylan) participated. Three additional children with DD rotated throughout the play center so that Janice was interacting with a child dyad, but no data were collected on them. Janice, was 47-years old, had 7-years of experience working in an early childhood setting, and had attended some graduate school. Dylan was 4-years old, White, and had an eligibility of ASD.

Setting and Materials

All baseline and intervention sessions were conducted during center-based play. Each center was a well-defined play space (e.g., rug, table with child-sized chairs, cabinets) within each classroom. Materials available in the classroom (e.g., dollhouses, Marble Run™) were used, in addition to play materials supplied by the first author. Supplied materials included symbolic play sets (e.g., doctor kit), turn-taking games (e.g., Pop the Pig™,) and sensory materials (e.g., water beads). Indirect preference assessments completed by lead teachers were used to determine included play materials. Playsets were regularly rotated and materials from the classroom varied by daily availability.

Pre-Baseline Measures

Pre-baseline child assessment procedures were conducted prior to baseline data collection during classroom observations of free play and during one-on-one 15-minute play interactions

with the first author, occurring in a quiet area of the classroom with a small table and child-size chairs. During play interactions, the researcher did not provide any modeling, prompting, or verbal feedback.

VB-MAPP and CDI. Portions of the Verbal Behavior Milestones and Assessment Program (VB-MAPP; Sundberg, 2008) were used in conjunction with the MacArthur Bates Developmental Inventory (CDI; Fenson et al., 2000) to gather pre-baseline data on child participants' social communication skills prior to intervention and to guide intervention targets.. The VB-MAPP is a developmentally-guided verbal behavior curriculum-based assessment designed to select communication goals for children with autism and related developmental delays. The VB-MAPP provides a representative sample of a child's verbal and related skills, containing measureable communication milestones that are sequenced and balanced across three developmental levels (level 1: 0-18 months, level 2: 18-30 months, and level 3: 30-48 months). Students at 0 -18 months should have level 1 skills, students at 18 – 30 months should have level 2 skills, and students at 30 – 48 months should have level 3 skills. The following sub domains of the VB-MAPP milestones portion were conducted: mands (i.e., verbal requests and rejects); tacts (i.e., verbal comments); independent play; and social behavior and social play as these were directly or indirectly targeted. The CDI: Words and Sentences (Toddler Form B) was used, as it is appropriate for 16 to 30-month old children, and can also be used with older children with DD (Fenson et al., 2000). See Table 1 for a summary of information collected from the VB-MAPP and CDI.

Assessing mean length of utterances. All child utterances per session were collected from videos of two 15-minute baseline sessions to select goals for each target child based on their mean length of independent verbal requests during baseline. Verbal requests were

considered independent if they occurred within more than 5 s of an adult verbal prompt. Table 1 provides a summary of data collected for each target child.

<INSERT TABLE 1 ABOUT HERE>

Data Collection Procedures

Direct observations. 12 to 15-minute play interactions between paraeducators and target children were video recorded for observation using a video camera, located on a nearby shelf approximately two feet away, across all phases of the study. Play interactions were scheduled for 15 minutes but may have been shorter due to environmental constraints (e.g., delays in bus schedule). All play interactions coded for data collection were at least 12-minutes. Paraeducators wore a Sony ECM AW4™ blue-tooth wireless microphone connected to the video camera.

***Paraeducator fidelity of implementation*.** Fidelity of implementation among paraeducators was the primary dependent variable of interest. Fidelity of implementation was measured during each play observation using an event recording system, in vivo or through video observations made available to all data collectors. The paraeducator received a score of 0-1 (0= incorrect use or absence of strategy, 1= correct use of strategy) or not applicable (NA) for each of the items being measured out of a total of 14 possible items. Since paraeducators were using EMT with two children at a time, paraeducators had to demonstrate the use of strategies with both children within the observation period. Additional task fidelity items were added to ensure that paraeducators were using strategies with both children. For example, the paraeducator had to expand on childrens' communication at least three times per child and use an environmental arrangement strategy at least two times with each child. By providing anchors for each child, the fidelity measure helped to ensure paraeducators were attending to both children, and switching their focus of attention from one child to another. The fidelity of implementation

checklist is available by the first author upon request. The percentage score of strategies implemented correctly by the paraeducator was calculated by adding the total number of points earned and dividing by the total number of applicable items and then multiplying by 100. Scores marked as NA were not included in the overall score.

Target child behavior. Data on child communication were collected for each target child during all play observations, in vivo or through video observation. Videos were made available to all data collectors. The following behaviors were coded: 1) rate of *prompted target verbal requests* per minute, defined as any verbal requests for an object or action that met or exceeded the target child's individual target length of words and that occurred within 5 s of an adult verbal prompt; and 2) rate of *independent target verbal requests* per minute, defined as any verbal requests for an object or action that met the target child's individual target length of words or above and that occured without an adult verbal prompt. Requests were chosen as a dependent variable since EMT targeted child requests through the use of least-to-most prompting procedures.Environmental arrangement was used to evoke a request, and least-to-most prompting was used to support child requests. For example, paraeducators placed a desired toy in sight but out of reach of the child to encourage requests and then supported requesting through least-to-most prompting. Data on target children's mean length of utterances (MLU) were collected at four randomly selected sessions during baseline and intervention phases. Data on MLU included all utterances, prompted and independent, whether or not they were requests. MLU data were not conducted for Dylan because his peers did not have video consent. Data collectors recorded each utterance verbatim. The number of words for each intelligible child utterance was added, and the average was calculated for each observation (Johnson, 2005).

***Treatment fidelity*.** Treatment fidelity data on the first author's use of coaching procedures with all participants were measured in vivo or through video observations made available to all data collectors using an event recording system for 85% of coaching sessions. Coaching procedures included: 1) Review the EMT task analysis with the paraeducator; 2) Give the paraeducator fifteen minutes to practice using the strategy with the child dyad; 3) Point out an opportunity to use a strategy; 4) Wait for the paraeducator to use the strategy correctly; 5) Provide error correction as necessary; 6) Model a strategy as necessary after three failed opportunities to use the strategy correctly; 7) Provide descriptive verbal praise at least eight times during the observation period; 8) Ask the paraeducator to reflect at the end of the observation session; and 9) Give the paraeducator an opportunity to ask any questions and respond to paraeducator questions. The first author received a score of 0-1 (0= incorrect use or absence of strategy, 1= correct use of strategy) or not applicable (NA) for each of the items being measured out of a total of 9 possible items. The percentage score of strategies implemented correctly by the first author was calculated by adding the total number of points earned and dividing by the total number of items and then multiplying by 100. Scores marked as NA were not included in the overall score. Mean treatment fidelity was 93.81% (range: 85.7%-100%).

Interobserver agreement (IOA). All data were first coded via video observation by the primary researcher and then coded for reliability by four secondary trained graduate-student observers that did not have a role in any other study procedures. During training, observers were given operational definitions of the dependent variables with examples and nonexamples, and they practiced coding video observations of adults and children not included in the study. Observers needed to have 90% agreement with the researcher before coding data for reliability. Data were collected across at least 25% of all phases of the study for each participant and a gross

agreement method was used to calculate agreement. The agreement for each instance of the behavior was compared, the total number of agreements were divided by the total number of disagreements and agreements, and multiplied by 100 to obtain a percentage. Mean IOA for paraeducator fidelity of implementation, calculated for 31.95% of sessions, was 92.67% (range: 85.60%-100%). Mean IOA for child behavior, calculated for 27.34% of sessions, was 89.32% (range: 75.00%-100%). Mean IOA for treatment fidelity, calculated for 85% of sessions, was 100%. IOA for MLU was calculated by comparing the MLU calculated by each independent observer. The smaller observed MLU was divided by the larger observed MLU and multiplied by 100. IOA for MLU was collected for 20.83% of observations and the mean IOA was 93.83% (range: 84.00%-99.20%).

Social validity questionnaires. Participating paraeducators and their lead teacher completed social validity questionnaires at the conclusion of the study. Data from one of the lead teachers are missing due to maternity leave during the study. Adapted versions of the Treatment Acceptability Rating Form (TARF-R; Reimers, Wacker & Cooper, 1991) were developed for this study, with questions focused on the acceptability and effectiveness of the coaching procedures, in addition to any disadvantages.

Research Design and Procedures

A single-case multiple baseline design with a dual randomization procedure (Cooper, Heron & Heward, 2007; Ledford & Gast, 2018; Kennedy, 2005) was used to increase the internal validity of the study by decreasing the probability of a Type I error (Koehler & Levin, 1998) and allow for greater statistical inferences (Kratchowill & Levin, 2010). First, paraeducator participants were randomly assigned to a position within the multiple baseline, where coaching start dates were staggered over time (Kratchowill & Levin, 2010). Second, the lengths of the

baselines were randomly assigned within a researcher-elected range of possible intervention start dates (Kratchowill & Levin, 2010), which were chosen to ensure that the baselines were appropriately staggered according to single-case research design logic (Kratchowill & Levin, 2010). Classrooms participated in baseline sessions for five days to sixteen days and coaching and/or maintenance for three weeks to eight weeks.

Baseline. Baseline sessions occurred three to four days per week. During baseline, each paraeducator engaged in 12 to 15-min play interactions with a child dyad in a designated play center in the preschool classroom. Baseline sessions were videotaped and the coach was present during play interactions, but she did not provide any directions or feedback.

Training. Paraeducators participated in a 2-hour training session with the first author on the use of EMT. A PowerPoint™ presentation was used that included an overview and task analysis of each strategy, examples and non-examples, video models, and comprehension questions. Paraeducators were then led through role-play on the use of least-to-most prompting strategies and taught how to use an activity matrix for embedding intervention into daily play activities using classroom toys and materials. Each paraeducator was given a binder with printed materials. Paraeducators learned the following EMT strategies: 1) follow the childrens' lead during play; 2) notice and respond to childrens' communication attempts; 3) imitate the childrens' actions and accompany them with words; 4) model and expand language and play; 5) environmental arrangement to create communication temptations (e.g., in sight but out of reach, inadequate portions); and 6) least-to-most prompting beginning with a choice prompt, followed by a "say prompt", with a 3-s time delay in between. Each prompting episode was followed by reinforcement for correct responses. Training also focused on implementing EMT with two children at a time. Paraeducators were taught to identify child communication and play levels

and model and expand language and play at each child's target level. They were instructed on noticing and responding to both childrens' communication attempts, balancing communication turns between children, labeling peers' actions, integrating childrens' interests, facilitating turn-taking with materials, and using peers for environmental arrangement (e.g., have peer hold materials). The first author used a checklist with 14 items to ensure all training components were used with each paraeducator.

Coaching. Immediately following training, paraeducators participated in coaching during 12 to 15-min play interactions with a child dyad in the designated play center. At the beginning of each session, the coach reviewed a task analysis of EMT with the paraeducator. Then the coach gave the paraeducator fifteen minutes to practice using the strategy with the child dyad. During this time, the coach pointed out opportunities to use a strategy and waited for the paraeducator to use the strategy correctly. She provided error correction as necessary, and modeled a strategy as necessary after three failed opportunities to use the strategy correctly. She provided descriptive verbal praise at least eight times during the observation period. At the end of the observation session, she asked the paraeducator to reflect on the session, and gave the paraeducator an opportunity to ask any questions and responded to any questions.

Maintenance and generalization. Maintenance sessions began after paraeducators achieved 90% fidelity across two consecutive sessions. All coaching procedures were removed, except for that the first author provided the paraeducator with a printed task analysis of EMT strategies. Otherwise, maintenance sessions included the same procedures as baseline. Only Jillian (four sessions) and Brianne (six sessions) participated in maintenance. If fidelity of implementation dropped below 80% after two consecutive sessions, paraeducators received further coaching. Jillian received further coaching from the lead researcher after two

maintenance sessions, including a 40-min session involving a review of the strategies she was not consistently using and video feedback.

During generalization probes, the paraeducators were observed interacting with two children from the reverse-inclusion classroom, other than the target children, with a range of communication abilities. Since there were two paraeducators in Classroom Two (Erin and Brianne), some generalization probes were conducted by switching target children (i.e., Erin interacted with Leah and Esther for Session 22 and 23 and Brianne interacted with Owen and Adam for Session 22). All procedures remained the same according to the phase.

Results

Paraeducator fidelity of implementation

Paraeducator fidelity of implementation was assessed in a multiple baseline design across participants. Visual analysis of the line graphs suggests a functional relation between coaching on EMT and fidelity of implementation of EMT, with three basic demonstrations of the effect for Jillian, Erin and Janice. All three paraeducators had low levels of fidelity of implementation during baseline with little variability. They all had immediate increases in their fidelity of implementation upon introduction of coaching.

While the fourth tier, Brianne, shows a small immediate change in level following introduction of training, Brianne had an increasing trend in her fidelity of implementation during baseline. Due to this increasing trend, there is not a clear demonstration of the effect for Brianne. Jillian and Brianne participated in a maintenance phase. Maintenance data for both participants indicate sustained fidelity of implementation with only small decreases from the coaching phase. Data for paraeducator fidelity of implementation is represented in figure 1.

INSERT FIGURE 1 ABOUT HERE

Child prompted and independent target verbal requests

The cascading logic model of this study hypothesized that change in paraeducator fidelity of implementation following training and coaching would result in corresponding changes in the level of child target verbal requests. There were increases in prompted target verbal requests for children working with Jillian, Erin, Janice, and Brianne, indicating a change in prompted target verbal requests following paraeducator training. Alana, Orlando, Owen, Dylan, and Esther had low levels of prompted target verbal requests during baseline and increases in rate upon the introduction of EMT, with minimal overlap in data between phases. Leah's rate of prompted target verbal requests was highly variable during baseline and there was significant overlap between her rates of prompted target verbal requests during baseline and EMT sessions. Following intervention, Leah's prompted target verbal requests demonstrate an increasing trend. However, the overall variability and overlap in her prompted target verbal requests limit clear interpretation of her data. Prompted target verbal requests are shown in Figure 2.

INSERT FIGURE 2 ABOUT HERE

In regards to independent communication, there were increases in independent target verbal requests for children working with Jillian, Erin, and Janice. Alana, Orlando, Owen, and Dylan had low levels of independent target mands during baseline with increases in rate upon introduction of EMT, with some overlap in data between phases. Adam's rate of independent target verbal requests were low and stable during baseline and there was significant overlap between his rates during baseline and EMT sessions. Similarly, Leah had variable and low levels of independent target verbal requests during baseline and there is a significant overlap in data between baseline and EMT sessions. Finally, Esther had low levels of independent target verbal requests that remained at low levels with significant overlapping data points. Therefore, it is

difficult to determine changes in independent verbal requests for these three participants. Data on independent target verbal requests are represented in Figure 3.

INSERT FIGURE 3 ABOUT HERE

Mean length of utterance (MLU). MLU increased from baseline to intervention for all children, with mean average increases of 0.44 to 0.88. For Alana, her mean MLU during baseline was 3.37 (range = 3.86 – 3.24) and 3.86 (range = 3.58 – 4.14) during EMT. Orlando's mean MLU during baseline was 2.31 (range = 1.87 – 2.75) and 3.19 (range = 3.12 – 3.25) during EMT. Owen's mean MLU during baseline was 0.89 (range = 0.80 - 0.98) and 1.67 (range = 1.44 – 1.90) during EMT. Adam's mean MLU during baseline was 1.99 (range = 1.94 – 2.05) and 2.54 (range = 2.53 – 2.54) during EMT. Esther's mean MLU during baseline was 1.32 (range = 1.12 – 1.52) and 1.76 (range = 1.44 – 2.07) during EMT.

Generalization. For all paraeducator participants, there was an increase in fidelity of implementation during generalization probes taken during coaching or maintenance sessions. Generalization data mirror experimental results of paraeducator behavior. Paraeducator fidelity of implementation during generalization sessions are shown by the closed triangles in Figure 1.

Social Validity. Using a 5-point Likert scale (1= negative response, 5= positive response), lead teachers found the intervention to be acceptable (*M*= 4.6; range: 4-5) and effective (*M*= 4.5; range: 4-5). Paraeducators also found the intervention to be acceptable (*M* = 4.5; range: 3-5) and effective (*M*= 4.5; range: 3-5). Using a 5-point Likert scale (1= few disadvantages, 5= many disadvantages), lead teachers found there to be few disadvantages (*M*= 2.3; range: 1-3). Paraeducators also found there to be few disadvantages (*M*= 2.64; range: 1-4).

Statistical Analysis

The randomization procedure used in this study allowed for the calculation of a between-case effect size, Hedges *g* (Hedges, Pustejovksy, & Shadish, 2012), using DHPS Macro. These effect sizes were compared to Cohen's *d* guidelines (Cohen, 1988) to determine the magnitude of effect. Effect sizes should be interpreted with caution, since single-case research often produces large effect sizes that are insensitive to variability (Parker, Brossart, & Vannest, 2005). In addition, zero values in baseline can bias DHPS Macro's interpretation of results (Hedges et al., 2012). For paraeducator implementation fidelity, Hedges $g = 4.59$, indicating a large effect. For child prompted target verbal requests, Hedges $g = 2.09$, indicating a large effect. For child independent target verbal requests, Hedges $g = .042$, indicating a small effect.

Discussion

The current study addresses gaps in the literature regarding professional development for paraeducators working with children with DD by examining the impact of a training and coaching package on paraeducators' use of EMT strategies and subsequent improvements in child communication skills. The study utilizes a cascading logic model, with the primary dependent variable of interest being paraeducator fidelity of implementation. Changes in paraeducator behavior were expected to lead to subsequent increases in child behavior. Overall, results indicated promising changes in paraeducator and child behavior.

Visual analysis indicates participation in the training and coaching package contributed to increases in paraeducators' fidelity of implementation. Statistical analyses suggest a large magnitude of the effect. Visual analysis further suggests paraeducators' use of strategies contributed to small to moderate increases in child communication, although child data were highly variable. Paraeducators were able to implement EMT with two children at a time,

switching their attention from one child to another. Furthermore, paraeducators were able to use EMT strategies with children with varying communication skills. Overall, paraeducators and teachers had positive responses to the coaching procedures.

It is important to note that previous research on the use of naturalistic behavioral interventions has demonstrated an increase in child communication skills after six to thirty weeks (Snyder et al., 2015). Children in the current study received intervention for only three to eight weeks; therefore, it is unlikely that any significant increases in child communication skills can be determined. It is especially unlikely that there were any significant increases in the distal outcome of independent communication. Because least-to-most prompting was used, it is expected that independent communication acts will increase over time. All children demonstrated increases in MLU following implementation of EMT.

It was expected that most paraeducators would already be using some of the EMT strategies related to following the childrens' lead during play and modeling language before training and coaching. However, this was not the case for most of the paraeducators and the coach needed to provide corrective feedback related to these strategies during coaching sessions. As expected, prompting procedures were the most difficult strategy for paraeducators to learn to use correctly. Additionally, more coaching may be needed related to modeling and expanding language at each child's target level.

Limitations

Despite the methodological rigor of the current study, there were several limitations. Due to the cascading logic design of the study, it is only possible to determine a functional relation between the intervention and paraeducator behavior. Additionally, a gross agreement method

was used to measure paraeducator and child behavior. A point by point agreement method would have provided a more precise measure of behavior.

Another limitation was the short duration of intervention, making it difficult to detect significant changes in child behavior. The measures used may also not have been sensitive enough. Since paraeducators were modeling and prompting new language, children may have learned new vocabulary. Anecdotal observations suggest target children were using new words, however this in not reflected in the data.

In classroom three, there was only one consented target child and other peers from the classroom were included in the dyad. The peer did not remain consistent due to absences or delays in bus arrival. Paraeducator and child outcomes may have varied depending on the participating peer. In addition, there were two paraeducators in classroom two. It is possible that Brianne learned strategies from Erin, contributing to an increasing trend in her use of strategies during baseline. Brianne's use of strategies during baseline may have also impacted child behavior.

Due to the randomization design, the lead investigator began coaching at the predetermined start point rather than following the data. Brianne's increasing trend in baseline immediately prior to the introduction of coaching for Erin limits an interpretation of changes in Brianne's behavior. However, the randomization design increases the internal validity of the study by reducing the probability of a Type I error, mitigating this concern. In single case designs with fewer participants, internal validity can be strengthened by assigning starting data points to intervention or treatment at random, therefore reducing the likelihood of type I error caused by decisions to move into intervention at the lowest possible baseline point (Kratochwill & Levin, 2010). While in this case randomization led to intervention following an ascending

baseline, failure to follow the assigned randomization would have nullified the increased internal validity.

In regards to ecological validity, a limitation is that researchers brought toy sets into the classroom, rather than only using toys already available. This was done to make sure that a variety of toys were consistently available and readily accessible, and reduce placing additional responsibility on classroom teachers. To mitigate this limitation, the researchers chose toy sets that were identical or similar to those already available in the classroom.

Finally, no descriptive social validity data was taken.One paraeducator gave neutral responses on the social validity questionnaire. It may have been that the lead classroom teacher suggested she participate and she did not personally perceive benefits to participating in coaching. It would be beneficial to gather further information regarding paraeducator and teacher perceptions of the coaching procedures to better understand their responses and guide future adaptations.

Future Research

In the current study, paraeducators were taught to implement EMT with a child dyad. Future research should examine paraeducators' use of EMT strategies with small groups of children to more accurately reflect the natural environment in the classroom and provide opportunities to target social behavior and play with peers.

Future research should also provide more maintenance data to examine maintenance of paraeducator fidelity of implementation over time. It may be that paraeducators are unable to sustain their use of strategies without continued direct coaching. Furthermore, it is challenging for paraeducators to use EMT strategies equally with more than one child. In this study, the coach kept track of the number of times the paraeducator provided environmental arrangement

and prompting to each individual child while collecting fidelity of implementation data. Therefore, she was able to prompt the paraeducator to use EMT strategies with both children through direct coaching. In future studies, and in the classroom, paraeducators may need simple strategies to collect data on their own use of strategies with each child. It is also recommended that researchers extend generalization data by examining the generalization of paraeducators' use of strategies across settings, activities, and materials.

Finally, it is worthwhile to evaluate how to more efficiently train paraeducators. In the current study, all paraeducators were trained individually by the first author. This approach is likely not sustainable. Examining other approaches, including a "train-the-trainer" model in which teachers train paraeducators, or online coaching with live or virtual feedback, may be valuable.

Conclusion

All preschool staff should have some knowledge of evidence-based practices for teaching young children with DD. However, paraeducators receive limited training (Carter, O'Rourke, Sisco, & Pelsue, 2009; Giangreco, Edelman, & Broer, 2001), which is a disservice to children with DD in the preschool classroom. Paraeducators would benefit from training on basic strategies, including child-led play and modeling language, in addition to more advanced strategies such as prompting procedures. The current study provides evidence for the effectiveness of professional development for paraeducators using didactic instruction, modeling, role-play, and direct coaching. Effective professional development practices will enhance the quality of implementation of evidence-based interventions delivered in preschool classrooms, leading to improved outcomes of young children with DD.

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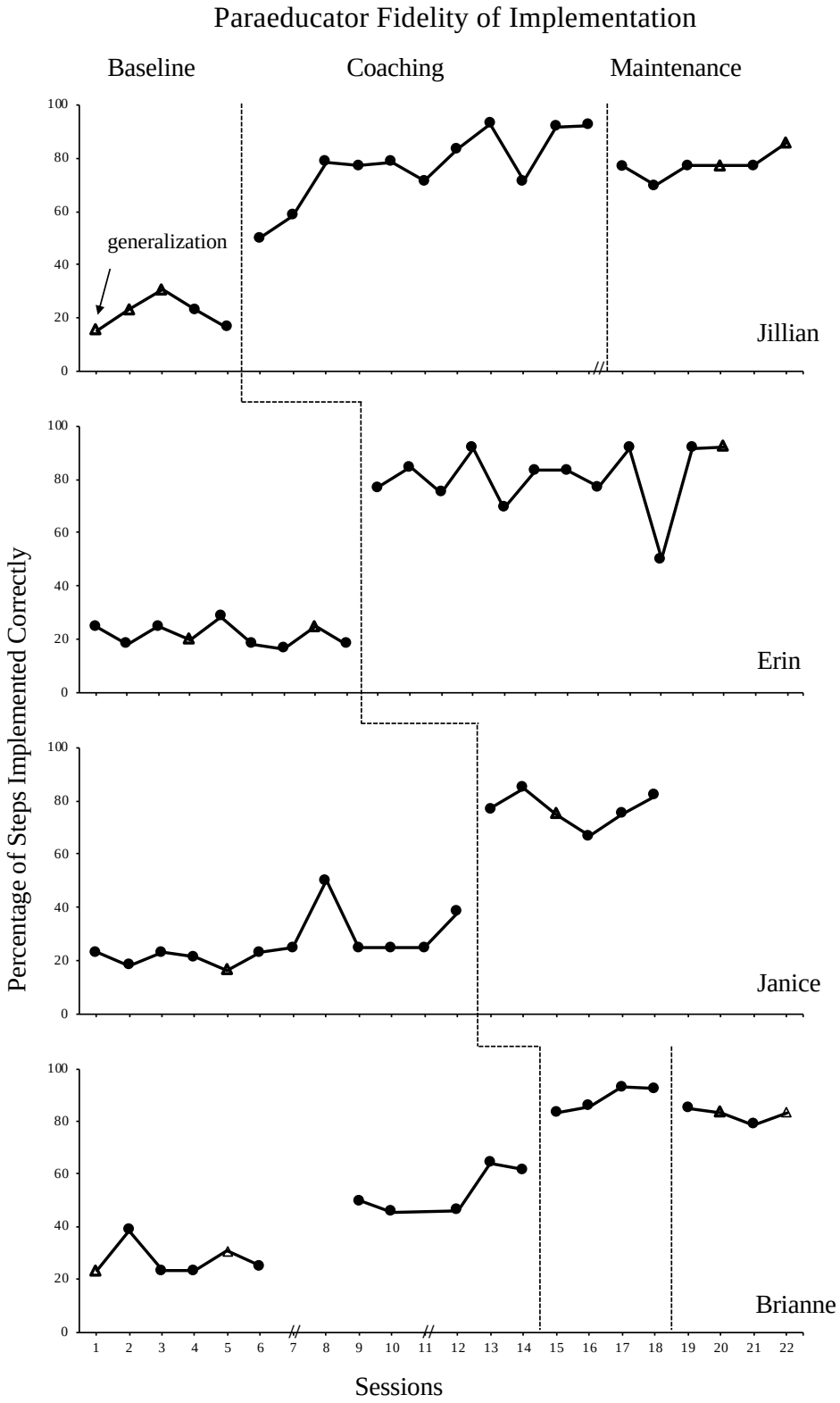
Table 1

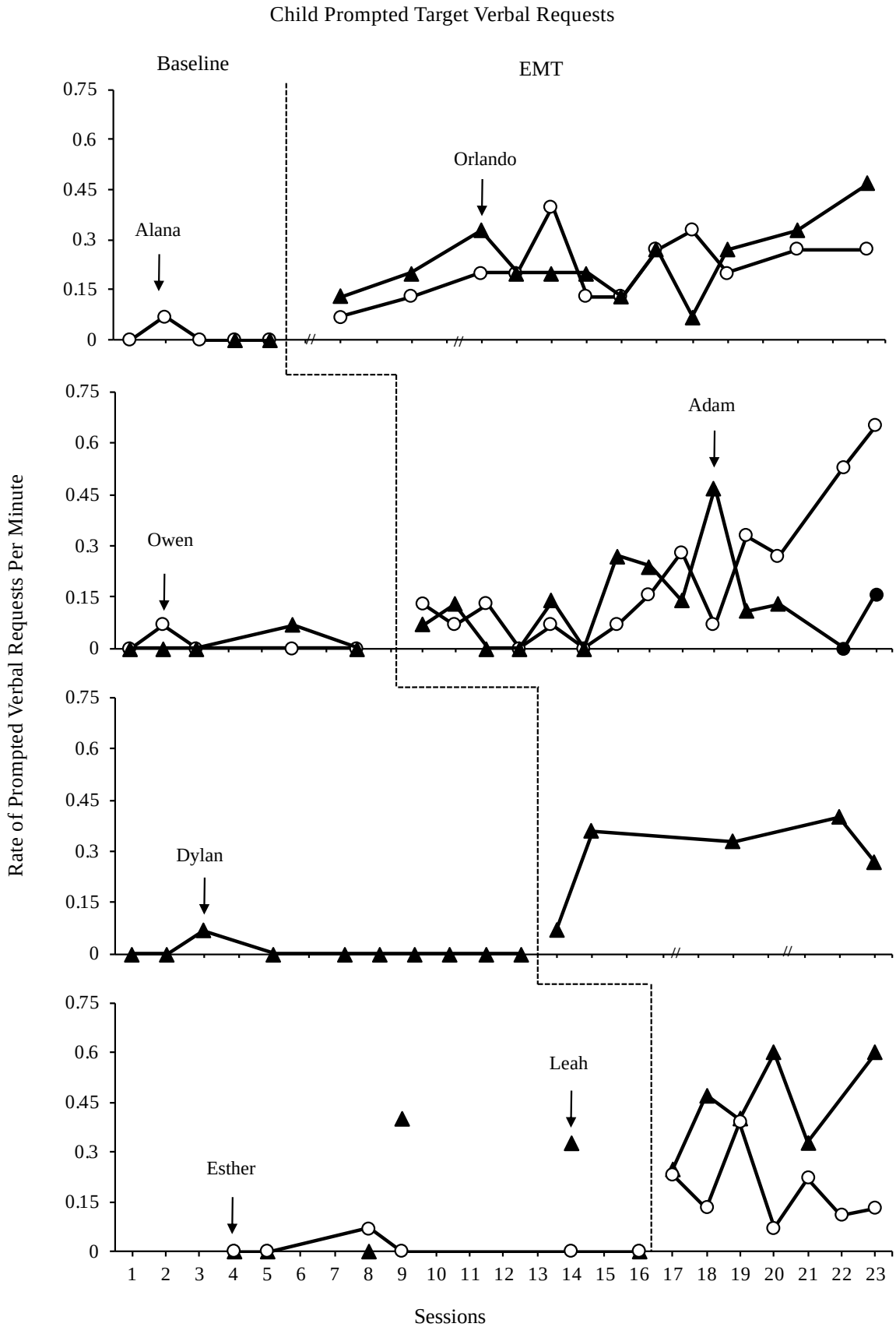
Target Student Pre-Baseline Performance

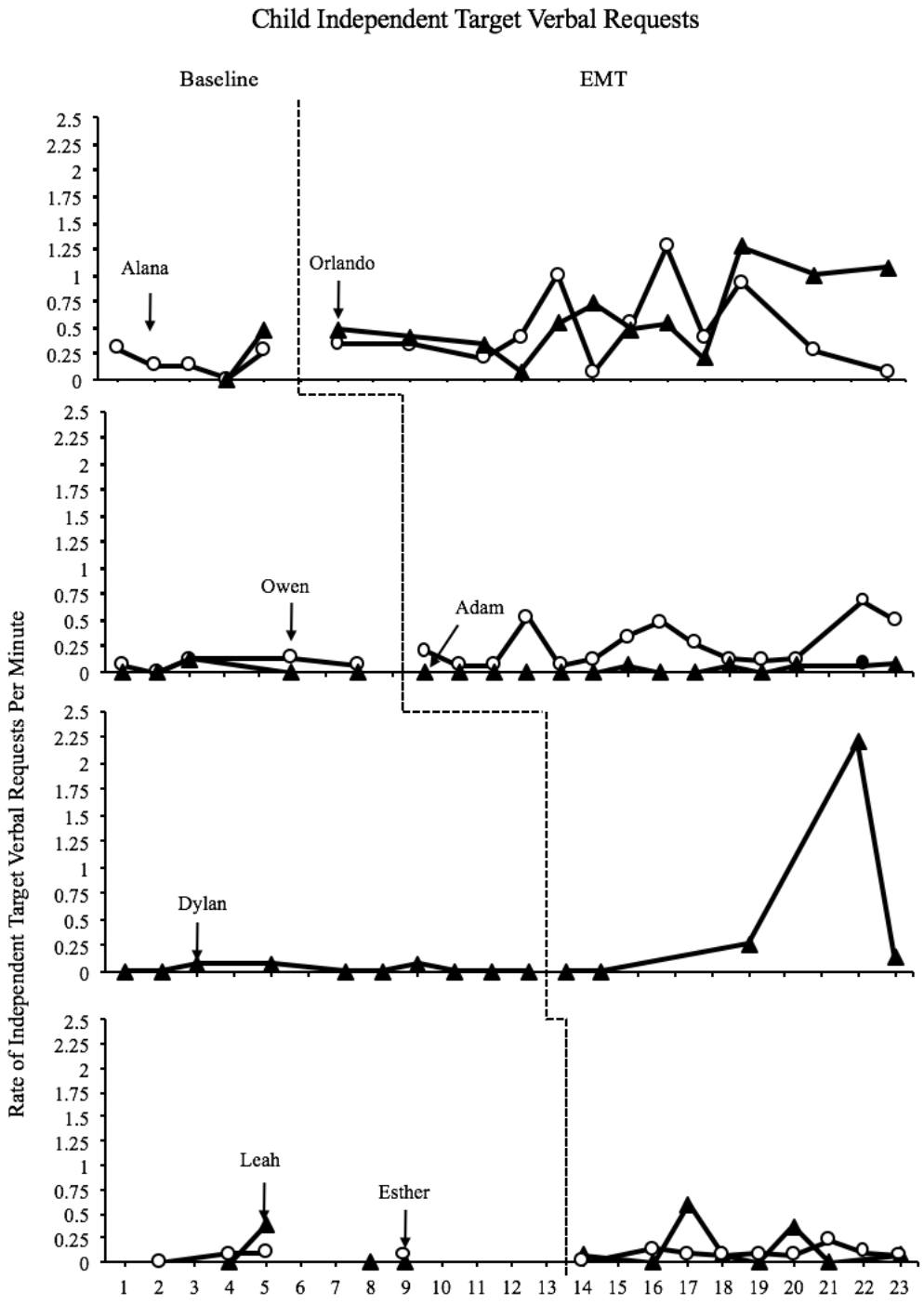
Student	CDI	Mand level	Tact level	Independent play level	Social behavior and play level	Mean length of unprompted requests
Alana	49	3	3	2	2	4.63
Orlando	19	3	3	3	2	2.83
Owen	8	1	1	2	1	0.33
Adam	24	2	3	3	2	3.68
Dylan	NA	2	2	3	2	2.70
Leah	NA	1	1	1	1	0.08
Esther	NA	1	2	2	2	1.80

Note. Data collected from the MacArthur Bates Developmental Inventory (CDI; Fenson, 2000) and Verbal Behavior Milestones and Placement Program (VBMAPP; Sundberg, 2007)

Figure 1


Paraeducator Fidelity of Implementation
Baseline
Coaching
Maintenance
generalization
Jillian
Erin
Janice
Brianne
Percentage of Steps Implemented Correctly
Sessions
0
20
40
60
80
100
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22


Child Prompted Target Verbal Requests
Baseline
EMT
Alana
Orlando
Owen
Adam
Dylan
Esther
Leah
Rate of Prompted Verbal Requests Per Minute
0.75
0.6
0.45
0.3
0.15
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Sessions


Child Independent Target Verbal Requests
Baseline
EMT
Alana
Orlando
Owen
Adam
Dylan
Leah
Esther
Rate of Independent Target Verbal Requests Per Minute
0
0.25
0.5
0.75
1
1.25
1.5
1.75
2
2.25
2.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23