

Improving the Use of Evidence Based Instructional Practices for Paraprofessionals

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Abstract

Coaching has been shown to improve the use of evidence-based instructional practices (EBIPs), but relatively few studies have been conducted to assess the effectiveness of coaching for adults belonging to minority groups and paraprofessionals in public elementary school settings. In this study, a multiple probe design across participants was used to assess the effectiveness of coaching and the provision of feedback on the use of prompting procedures and associated practices for three adults supporting three young students with autism in a self-contained elementary school setting. Results showed improved use of target practices and increased student engagement. More research is needed regarding the training and coaching of teaching teams and the use of evidence-based coaching and feedback practices to assist paraprofessionals in implementing EBIPs with small groups of students and in a variety of educational settings.

Improving the Use of Evidence Based Instructional Practices for Paraprofessionals

Nearly all children with autism spectrum disorders (ASD) served through Part B of IDEA attend school-based programs for preschool, kindergarten, and early elementary school (U. S. Department of Education, 2014). These students make up a heterogeneous population, including those who have considerable deficits in communication and social skills and may engage in challenging behavior. Although EBPs and recommended practices for teaching students with disabilities exist, including practices specific to young children and those with ASD (e.g., DEC, 2014; Wong et al., 2013), federally funded programs vary widely in their accurate implementation of these practices, even when training is provided (cf. Odom, 2009; Stahmer et al., 2015). Inadequate implementation has been identified as the “greatest threat to evidence-based education” (Detrich & Lewis, 2012, p. 214). Moreover, research shows that implementation is rarely improved when manualized procedures are provided to interventionists (Barton, Chen, Pribble, Pomes, & Kim, 2013; Strain & Bovey, 2011) or when traditional workshop training is conducted (Hall, Grunton, Pope, & Romero, 2010; Suhrheinrich, 2011). The need for intensive training is apparent but daunting; teachers rate professional development as being more useful when the total duration of training is longer rather than shorter, with highest ratings for professional development lasting at least 33 hours (Choy, Chen, & Bugarin, 2006).

Paraprofessionals often serve students with ASD (Carter, O’Rourke, Sisco, & Pelsue, 2009), with recent increases in the use of individually-assigned paraprofessionals (Carlson et al., 2008). These staff members, also referred to as paraeducators and teaching or educational assistants, are generally not certified teachers and may not have a background in special education; they are not often required to have a related post-high school degree (e.g., only 18% of reporting districts required associate’s degree or higher; U.S. Department of Education, 2014).

However, paraprofessionals are often tasked with teaching students with ASD and the most significant challenges, including cognitive and behavioral difficulties (Giangreco & Broer, 2010). Most paraprofessionals work in special education, with schools employing many more paraprofessionals than teachers, especially at the elementary level (Suter & Giangreco, 2009; U.S. Department of Education, 2007); the average number of special education paraprofessionals to teachers has been estimated to be about 3.5 to 1 (Suter & Giangreco, 2009). Although the use (and misuse) of paraprofessionals to support inclusion has received recent attention (cf. Giangreco, Doyle, & Suter, 2015), about 30% of paraprofessionals support students who spend less than 20% of their day in general education settings (Suter & Giangreco, 2009).

Given the lack of certification and education, varying levels of experience, and the diverse and considerable needs of the population they serve, paraprofessionals are likely to benefit from the provision of additional resources and training regarding the use of EBPs (Giangreco, Suter, & Doyle, 2010). This is especially true because most special education teachers report being inadequately prepared to provide training (Wallace, Shin, Bartholomay, & Stahl, 2001). Since paraprofessionals spend most of their time implementing teacher-planned instruction (Carter et al., 2009; Suter & Giangreco, 2009), specific training in evidence-based instructional practices (EBIPs) is needed. Increasing the use of EBIPs is likely to improve student outcomes by increasing engagement and learning opportunities while decreasing time spent in unsuccessful instruction (Cook & Odom, 2013). These practices should include effective teaching of both academic and social skills (e.g., using effective prompting strategies, providing support and reinforcement) and prevention and appropriate responding to challenging behaviors, since these behaviors result in less optimal outcomes (cf. Robertson, Chamberlain, & Kasari, 2003). Effective targeting of academic and social skills and minimization of problem behavior

leads to better immediate learning outcomes (e.g., learning in early childhood settings), and superior long-term outcomes in later educational settings (e.g., less restrictive placements). Moreover, improving the engagement of paraprofessionals in effective instruction may result in increased self-efficacy and reduced paraprofessional proximity (which may lead to fewer peer interactions and increased stereotypy; Young, Simpson, Myles, & Kamps, 1997).

Unlike provision of written guidance or didactic professional development generally provided over a few hours in a single day, modeling and coaching have been shown to improve implementation of a variety of evidence-based practices in early childhood and special education contexts. Previously targeted adult behaviors include responsive communication and interactions, appropriate use of reinforcement and behavior management strategies, and the use of systematic prompting procedures (Barton et al., 2013; Barton, Fuller, & Schnitz, 2016; Brock & Carter, 2015). Coaching can include a variety of specific practices (Artman-Meeker, Fetting, Barton, Penney, & Zeng, 2015), but generally includes performance feedback (a promising practice, Casey & McWilliam, 2011) and self-reflection (Barton, Kinder, Casey, & Artman, 2011). Relatively few studies have focused on teaching paraprofessionals in public elementary school settings serving early school-aged students (for reviews, see Artman-Meeker et al., 2015; Casey & McWilliam, 2011). Moreover, few studies have included modeling of desired behaviors, opportunities to practice, and assistance with materials (Artman-Meeker et al., 2015). These coaching behaviors may be crucial for paraprofessionals, who may need additional scaffolded support when compared to the assistance and instruction needed by certified teachers.

The purpose of this study was to extend current research on coaching procedures for improving instructional practices of paraprofessionals employed by a large urban school district. Research questions were: (1) Does coaching and feedback result in improvements in the use of

evidence-based instructional practices (EBIPs) above and beyond changes occurring after a typical didactic professional development activity? (2) Does coaching and feedback result in concomitant changes in student engagement?

Method

Participants and Coaches

Three paraprofessional-student dyads in a self-contained classroom for learners with ASD participated in this study. Descriptive information about participants can be found in Table 1. All paraprofessionals volunteered and consented to participate in the study; the classroom teacher nominated student participants and parental consent was obtained. For all students in the classroom, instruction occurring prior to and outside of the study primarily occurred in one-to-one teaching arrangements.

Dyad 1: Blanche and Ace. Blanche reported receiving minimal training in working with students with ASD prior to study initiation and did not have previous experience using constant time delay (CTD) procedures. She had previously supported Ace in a self-contained setting for approximately 2.5 months for no more than 2 h a day prior to participation in the study. Ace spent limited time in general education settings for related areas (e.g., art). Blanche reported minimal confidence in teaching academic and social skills to Ace. Ace did not independently transition in his classroom environment using a visual schedule and required physical prompting to engage in classroom tasks. He did not verbally communicate and did not use assistive or augmentative communication devices in the classroom; primary methods of communication included crying and pulling an adult to a preferred item or area. Ace's academic targets in the classroom included one-step discrete tasks such as identifying 3-D objects based on name or color from a field of two. Ace engaged in frequent stimulatory behaviors such as repetitive vowel

utterances, spinning in a circle, and bouncing in a chair. Blanche reported she was unable to gain and sustain Ace's attention to tasks or directions in the classroom.

Dyad 2: Olive and Jay. Olive reported receiving minimal training in working with students with ASD prior to study initiation and did not have previous experience using CTD procedures. Prior to the study, Olive had primarily served students in the classroom other than Jay for approximately 2.5 months; Jay was identified as her student partner by the lead teacher due to scheduling changes that occurred before the study started. Olive reported she had some confidence while working with Jay, but that he frequently would scream and refuse to do work. Jay independently navigated his classroom environment using a visual schedule but rarely engaged in independent work without teacher prompting assistance; he spent limited time in general education due to lack of independence and problem behaviors including elopement. He communicated in 1-2 word utterances to request desired items or activities in the classroom. Jay's academic targets in the classroom included letter-sound identification, sight word reading, single-digit addition, and number sequencing to 20. The classroom teacher reported Jay engaged in frequent escape behaviors such as elopement and screaming when presented with transitions from preferred activities to instructional tasks. Olive reported she felt Jay was making progress, but did not know how to respond when he engaged in problem behavior.

Dyad 3: Marigold and Kai. Marigold reported minimal training in working with students with ASD prior to study initiation. She had no previous experience using CTD procedures and spoke English as her second language. She had known Kai for approximately 2.5 months and frequently worked with him throughout the school day. Marigold reported she did not have confidence working with Kai and often had difficulty eliciting responses to questions and directions. Kai independently navigated his self-contained classroom environment using a

visual schedule but required prompting to attend to instruction and materials. He most frequently received one-on-one instruction; he spent approximately 25% of the school day in general education settings. Kai communicated in 3-4 word utterances often in the form of scripted or echoic phrases. Kai's academic targets in the classroom included writing his name, identifying sight words, and writing letters. The classroom teacher reported Kai was extremely inattentive and required constant redirection to attend to instruction and Marigold reported she felt Kai was capable of completing his academic tasks, but that she did not know how to keep his attention.

Coaches. The first author, a professor and doctoral level board certified behavior analyst, delivered a half-day training on EBIPs with the assistance of two graduate students with previous experience implementing EBIPs with students with disabilities. Three graduate students in special education who were also working towards certification in behavior analysis (BCBA certification) conducted all coaching sessions. All coaches had demonstrated competency in using response prompting procedures, teaching students with disabilities in small groups, and behavior management strategies. The first author trained all coaches by providing written coaching procedures, discussing procedures and rationales, modeling procedures, and providing opportunities for practice with feedback.

Settings and Materials

All baseline and intervention sessions occurred in a self-contained special education classroom attended by participants; the initial didactic training session occurred in a different classroom on a day when students were not present (a district professional development day). The participants were enrolled in a school in a large urban area in the southeastern United States; their primary placement was in a self-contained classroom for children in kindergarten through second grade. During the didactic training session, information and sample videos were

presented via a slide show, and modeling and practice occurred with typical classroom materials (e.g., flash cards, reinforcers, data sheets). Slides were printed on handouts. During the session, the instructor (first author), two graduate students (third and fourth authors), three participants, and one non-participating paraprofessional were present. The fourth paraprofessional declined participation in the study, but indicated an interest in receiving the initial training.

Pre-baseline and baseline sessions were conducted with typical classroom materials already being used by classroom staff such as file folder games, colored construction cards, sight word cards, and handwriting tracing sheets. All sessions were implemented during typical classroom instruction while additional staff provided ongoing support to other students. During coaching sessions approximately 2-8 non-participating students and 1-3 adults were present in the classroom. Coaching sessions occurred in two work areas arranged in the classroom with a single rectangular table and two chairs; these work areas were defined by the teacher before the study began and were used by instructional staff throughout the school day. All students were taught both social and academic behaviors. Ace was taught to match objects by color and to make a request using picture exchange, Jay was taught to use a self-management system to independently complete tasks related to previously acquired skills and to make a request using picture exchange, and Kai was taught to read sight words and answer social questions. Because students were taught different behaviors based on teacher input, materials varied by dyad; a list of materials used can be requested from the first author. These materials included office supplies (e.g., laminated paper, kitchen timer) and reinforcers (e.g., light-up pen, bouncing ball); estimated expense for materials not provided by the classroom staff was approximately \$60.

Response Definitions and Procedures

The primary dependent variable was the percentage of correctly implemented steps by the

paraprofessional during teaching sessions; condition change decisions were made based on this variable. The secondary dependent variable was the percentage of intervals during which each student was engaged during instructional sessions.

Paraprofessional EBIP Implementation. Each paraprofessional was expected to engage in the same series of instructional behaviors to teach target behaviors to their student partner (see Table 2), although the student-level target behaviors were different (see Table 1). For example, all paraprofessionals were taught to use CTD with an initial 0-s session, so correct implementation of the prompt for that session was provision of the controlling prompt immediately following a task direction. However, Marigold's correct implementation of that step for academic trials was to provide a verbal model of a sight word ("What word?" followed immediately by "Car.") and Blanche's correct implementation of that step for academic trials was to provide physical guidance (e.g., "Match" followed immediately by taking Ace's hand and placing a blue manipulative on the blue sheet of paper).

Paraprofessional implementation of EBIPs was measured via video using direct observational recording of session-based and trial-based events (Ayres & Ledford, 2014). The following session-based behaviors were measured as present or absent during a session: teaching two or more unknown targets, providing choice of tokens (for Jay and Kai only), providing choice of reinforcer, providing end-of-session access to the reinforcer if earned, and providing verbal praise for earning the reinforcer within 3 s of delivering the reinforcer. The following behaviors were measured on a trial-by-trial basis as occurring or not occurring: secure attention, present stimulus, deliver task direction, wait prescribed interval, deliver controlling prompt, wait 3 s, confirm correct, deliver token (Kai and Jay only), reminder to wait for prompt, saying "no" and providing correct response, recording the student response, and at most a 5 s inter-trial

interval. Implementation of each behavior varied contingent on student responding, consistent with CTD procedures (i.e., the delivery of a wait reminder or token; Ledford et al., 2008). To calculate the percentage of steps correctly implemented, researchers divided the total number of correctly implemented behaviors by the total number of opportunities to implement behaviors then multiplied the quotient by 100. For example, if a paraprofessional implemented 10 trials there were 120 opportunities to engage in EBIPs during instructional trials, and 5 additional session-based behaviors to engage in at the beginning and end of the session for a total of 125 opportunities to implement EBIPs. The number of steps varied because researchers did not control for the number of trials conducted; this was avoided to minimize disruption to ongoing classroom procedures. Coaches provided more confirmation and less direction and assistance over time; see Figure 1.

Student Engagement. Student engagement behaviors were measured via video with ProCoderDV (Tapp & Walden, 1993) using momentary time sampling procedures with 20 s bins (Ayres & Ledford, 2014). The following exhaustive and mutually exclusive behaviors were measured: engaged, unengaged, waiting, problem behavior, and self-stimulatory behavior. Engagement was defined as attending or orienting to the instructor or materials, and/or manipulating instructional or other materials appropriately (e.g., in the manner intended, prompted or unprompted). A student was scored as being unengaged if he or she was not manipulating materials appropriately at the moment the interval ended *and* review of the prior 10 s indicated this behavior was not a natural break in instruction (e.g., if a child briefly paused to read a word in order to correctly match the word to a picture, *engaged* was scored; if a child was staring at the word when the interval ended, and for the prior 10 s, *unengaged* was scored). Waiting was defined as remaining oriented toward the instructional area or instruction without

engaging with materials or individuals during a pause in instruction. Problem behavior was defined as participants engaging in inappropriate behavior towards self, materials, or others; when problem behavior occurred, no other behavior was coded (e.g., a participant could not engage in problem behavior and engage). Problem behavior included: yelling at a volume above a conversational level, crying, throwing or damaging materials, making forceful contact with others with any part of one's body or object under one's direction, elopement from the instructional area (e.g., more than 0.3 m away from the table) without permission, self injury, blocked attempts to do any of the above, and failure to follow a direction within 10 seconds. Self-stimulatory behavior for Ace and Kai was defined as repetitive hand flapping, flapping of an object, producing a vocal humming noise, or aberrant vocalizations at or below a conversation level; these behaviors occurred rarely and were often concurrent with problem behavior. Self-stimulatory behavior for Jay was defined as repetitively flapping an object in front of his eyes or producing a buzzing sound with his lips.

Procedures

The study included three conditions: pre-baseline, baseline, and coaching. All sessions were 10 min in length and occurred during typical classroom instruction.

Pre-Baseline and Baseline Sessions. Baseline and pre-baseline sessions were procedurally identical. Pre-baseline sessions occurred prior to the didactic training; baseline sessions occurred after the training but without additional coaching and feedback supports. During these sessions, paraprofessional participants were directed to conduct instruction as they typically would. Pre-baseline and baseline sessions began when the paraprofessional and student were seated or standing at the workspace. Researchers did not provide any coaching or assistance to paraprofessionals during pre-baseline sessions. Sessions ended after 10 min (i.e., video

recording was stopped at this time); instructional sessions lasted for approximately 10-30 min depending on classroom routine.

Training. Training occurred for approximately three hours during a pre-scheduled professional development day. Training content focused on evidence-based instructional practices for working with learners with ASD. Content was organized into seven domains for session-based and trial-based behaviors. Session-based content included preparing the learning environment, providing choice, and managing problem behavior. Trial-based content included securing attention, errorless learning using constant time delay procedures, consequences, and data collection. Each behavior was presented using behavior skills training (Sarokoff & Sturmey, 2004) procedures and included instruction, modeling, rehearsal, and feedback. Consistent with behavioral skills training procedures (cf. Fetherston & Sturmey, 2014; Love, Carr, LeBlanc, & Kisamore, 2013), researchers provided explicit information regarding rationale and steps, modeled correct use of procedures, provided practice opportunities, and gave performance feedback. Paraprofessionals asked questions throughout all segments.

Coaching Intervention. All coaching intervention sessions included the following components: pre-session goal review, positive affirmations of correct implementation, modeling (in initial sessions; occurred in later sessions when requested), and answering questions. Coaching sessions began with the paraprofessional and researcher reviewing one to two goals for the day. Coaches also reported specific percentages of correct implementation from the previous day's session once participants reached at least 80% independent implementation of targeted behaviors. The coach asked the paraprofessional if she had any questions and answered any posed questions. The coach then offered to model any new behaviors for that session and asked the paraprofessional if she wanted additional modeling or if she was ready to implement without

modeling. During the first intervention session, coaches modeled about half of instructional trials, and then asked the paraprofessional to conduct the remaining trials. During this sessions, coaches delivered tokens, prepared materials, recorded data, and delivered the terminal reinforcer for all trials. The decision to provide this scaffolded support initially was made to reduce the initial response effort to allow paraprofessionals to successfully complete targeted behaviors. Coaches released aspects of the instructional session to paraprofessionals in the following predetermined order: initiating an instructional trial and delivering the task direction and controlling prompt, delivering reinforcement, delivering all instructional trials, recording data, and finally preparing the instructional environment. Coaches provided verbal direction to remind paraprofessionals of the next step in the trial (i.e., deliver a token for a prompted correct response), secure attention before presenting a stimulus, block problem behavior, deliver only controlling prompts, count the designated wait interval, and record data. Coaches delivered an affirmation to paraprofessionals noting successful implementation of any targeted behavior at least once every minute. If a paraprofessional made an error during implementation, the coach immediately provided redirection to increase the likelihood the behavior would be implemented correctly during the next trial. If two errors occurred in a row, the coach offered to model the behavior. Coaches also provided verbal prompts to complete the correct sequence of behaviors to prevent paraprofessional errors in implementation. As paraprofessionals demonstrated competency and confidence in implementing targeted behaviors, the coach increased the physical distance between the coach and the paraprofessional. At least the last three sessions for each paraprofessional were conducted with the coaches standing outside the instructional area.

After all instructional trials were delivered and students gained access to terminal reinforcers, the paraprofessional walked the student to his next destination. Ace transitioned to a

classroom swing, Jay transitioned to group circle time with the lead teacher, and Kai transitioned to the computer or independent work. Paraprofessionals and coaches then completed approximately 5 to 10 min post-session coaching sessions to reflect on each paraprofessional's implementation of her goals for the session. Planned behaviors during post-session coaching sessions included the following: reviewing daily goals and data, answering questions, eliciting teacher input for successes and challenges during the session, recording teacher responses, and identifying and recording two goals for the next session. On some occasions, participants identified a third goal, but this was not required. Any suggested changes to instruction made by the paraprofessional (i.e., securing materials to the table, increasing speed of instruction) that did not interfere with correct implementation of procedures were honored and implemented in the next session. Goals for the next instructional session were suggested by the coach or paraprofessional and often reflected a struggle experienced during the session or the next step of procedures to be released to a paraprofessional. Finally, sessions ended with paraprofessionals completing a self-assessment questionnaire regarding their ability to teach the student and the student's progress on targeted behaviors (data available from the first author).

Experimental Design

Paraprofessional implementation data from instructional sessions were collected in the context of a multiple probe across participants design (Gast, Lloyd, & Ledford, 2014) with three potential demonstrations of effect. Coaching began for the first paraprofessional when baseline data were stable and began in subsequent tiers when the previous paraprofessional reached a predetermined criterion (at least 80% correct implementation across 2 intervention sessions). Coaching continued after a participant reached criterion until the paraprofessional stated she could conduct the session without coaching. Visual analysis (Gast & Spriggs, 2014) of graphed

data to analyze changes in level, trend, and variability was conducted to determine the presence of a functional relation between paraprofessional coaching and implementation of EBIPs.

Student engagement data were also analyzed in the context of a multiple probe across participants design, but these data were considered secondary; instructional decisions were made based on paraprofessional implementation data.

Interobserver Agreement (IOA) and Procedural Fidelity

IOA data were collected during 33-42% of sessions in each condition for each participant, except pre-baseline condition for Dyad 1 (no IOA data are available for this single session, which was used as a practice session). IOA data were collected via video and calculated using point-by-point agreement [$\text{agreements}/(\text{agreements} + \text{disagreements}) \times 100$] (Ayres & Ledford, 2014). Average IOA across conditions for teacher implementation was 95.26% for Blanche (range 89-98%), 96.01% for Olive (range 89-100%), and 96.34% for Marigold (range 91-99%). Average IOA across conditions for student engagement was 89.5% for Ace (range 77-94%), 96% for Jay (range 90-100%), and 91.1% for Kai (range 87-97%).

Procedural fidelity (PF) data were collected to evaluate the coaches' adherence to BST procedures during 100% of pre-baseline sessions, 50-85% of baseline sessions, and 35-52% of intervention sessions for each participant. PF data were collected via video using direct, systematic recording (i.e., each occurrence or non-occurrence was recorded; Ledford, Wolery, & Gast, 2014). Fidelity of coaching was measured for each coaching behavior during all conditions by dividing the number of observed behaviors by the number of planned behaviors multiplied by 100 (Billingsley, White, & Munson, 1980). Coaching fidelity was 100% across all participants, conditions, and implementers for each procedural step of coaching. High levels of fidelity were expected since daily coaching reflection forms included each planned coaching behavior.

Results

Paraprofessional EBIP Implementation

For all three participants, correct implementation remained low during pre-baseline and baseline conditions (Figure 1). For Blanche and Marigold, implementation was stable at around 50% correct. Olive's implementation was more variable in both pre-baseline and baseline conditions, ranging from about 35-65% correct. Upon implementation of the coaching condition, level immediately increased for all three participants. Olive's data immediately increased to near 100% implementation and stayed stable for the remainder of the condition. Blanche and Marigold's implementation increased immediately to about 80% and data had an increasing trend, with stable responding between 95-100% after several coaching sessions. Olive implemented 100% of the session after three coaching sessions whereas Blanche and Marigold had an increasing trend in independent implementation culminating in 100% implementation after 10 and 12 sessions, respectively.

A functional relation between coaching and paraprofessional correct implementation of EBIPs exists as evidenced by consistent increases in level between baseline and coaching conditions for each participant. Furthermore, the immediate increase in level of responding is replicated across participants when intervention is implemented. Although not assessed in the context of a single case design and with limited data points for some participants, it is important to note that no consistent changes in behavior occurred following a didactic training, even though an evidence-based training model was used.

Student Engagement

Ace had variable levels of engagement during pre-baseline and baseline conditions that increased in level during intervention (Figure 2). A change in level and increasing trend is

evident when intervention is implemented, although data remain variable. Similarly, Jay's engagement data were variable during baseline conditions, with an increase in level evident when conditions changed. Despite the increase in level and decrease in variability, much of the data between conditions is overlapping. Kai's data show a decreasing trend during baseline conditions with an immediate increase in level when the coaching intervention was implemented.

Acquisition of Target Behaviors

Experimental evaluation of target behavior acquisition is not possible, since paraprofessionals were not directed during baseline conditions and thus often did not provide sufficient opportunities to engage in the targeted behaviors although they were aware of what the behaviors were. All children reached at least 90% unprompted correct responding for social behavior targets by the end of instruction, and two of three children reached that criterion for targeted academic behaviors. Ace made progress (from 0% correct responding during initial sessions to 45% unprompted correct responding). Session data are available from the first author.

Discussion

Results of this study suggest the provision of coaching and feedback during short, typically-occurring instructional sessions, can be effective for improving paraprofessionals' use of effective instructional practices (Figure 1). Moreover, although not evaluated in the context of a single case research design, data also suggest that use of practices is *not* improved following a relatively short professional development session. This lack of behavior change was demonstrated even though the informational session included the use of a behavioral skills training approach. These procedures were designed to improve implementation, including video and live models and opportunities to practice and ask questions. Moreover, changes in adult behaviors were also associated with improvements in engagement (Figure 2) and with

acquisition of targeted behaviors for student participants (data available from first author).

The context in which these changes occurred is important to note. First, changes in student behavior occurred for several different target behaviors, including social behaviors such as requesting, answering questions, and academic or readiness behaviors such as sight word reading and matching. Second, changes in adult behaviors occurred for paraprofessionals who all had (a) self-reported low levels of knowledge and skill regarding teaching students with ASD, (b) limited previous experience with teaching students with disabilities (i.e., they were all first-year paraprofessionals), (c) identified as belonging to minority groups, and (d) with one participant for whom English was a second language. These characteristics may be typical of the diverse populations of adults and students in public school settings.

Limitations

Although findings of this study are promising, a few limitations should be noted. These include: (a) the use of research assistants as coaches, (b) use of a relatively large amount of resources, (c) variable timing of transfer of control to participants, (d) lack of generalization and maintenance data, and (e) lack of social validity data. First, all coaches were graduate students who had demonstrated expertise in the use of response prompting procedures and behavior management. The use of expert versus indigenous or peer coaches has been discussed, and some peer-based coaching strategies have been shown to be effective. However, the need for expert coaching in special education has been noted, particularly when it occurs in authentic contexts (Leko, Brownell, Sindelar, & Kiely, 2015). Anecdotally, all paraprofessionals expressed a desire for professional assistance during typical instructional activities as compared to previous experiences of receiving out-of-context professional development activities. However, we did not specifically offer or request information regarding their desire for peer coaching. Additional

research is needed to determine in what contexts and under what conditions expert coaching versus peer coaching is more effective, feasible, and acceptable to trainees. In addition, the resources used in the context of this study, including daily coaching and feedback and materials provision (e.g., bringing in external reinforcers) may limit the generalizability of findings to typical contexts. However, no high-cost external materials were provided; typical materials found in most classrooms may be sufficient for replicating this study.

Finally, although data were similar across tiers and a functional relation was demonstrated for the use of coaching to improve paraprofessionals' instructional behaviors, the degree to which researchers modeled EBIPs varied based on requests and performance. For Marigold, much more modeling and assistance was provided both because she requested it and because she demonstrated slower acquisition of targeted behaviors. She exhibited several difficulties related to language, including inconsistent pronunciation of some targeted sight words and confusing question words *who* and *what*. She also acquired some steps more slowly which seem less dependent on language use, including repetition of task directions and failure to ensure attention prior to a task direction. She only demonstrated correct independent performance in the final few sessions. This may have impacted her ability to maintain and generalize skills. However, the semester ended and we were not able to collect these data.

Finally, we did not collect formal social validity data. However, anecdotal data suggest positive results: (a) Participants asked to keep instructional materials used in sessions (e.g., token boards), (b) Blanche reported that Jay was able to spend considerably more time in the general education setting due to her ability to adequately support him following training, and (c) Marigold reported that she used procedures learned during study sessions in the general education classroom when she supported Kai there.

Future Research

Many questions remain regarding the use of coaching for improving the use of effective instructional behaviors for paraprofessionals. Specifically, additional research is needed to determine what implementation strategies are useful for supporting supervising teachers to engage in effective coaching to improve paraprofessional implementation. In this study, a researcher with a doctoral degree who was a certified behavior analyst planned the coaching procedures and provided the initial training, and these resources may not be available for typical teachers. It is promising that the coaches were graduate students with bachelor's or master's degrees in related fields, which is similar to the credentials of many supervising teachers.

Future studies should include collection of maintenance and generalization data. It may be that coach presence served as a reminder to engage in effective instructional behaviors, and that the paraprofessionals discontinued use following the end of the study. Data collection by a non-coach researcher or a school staff member (i.e., supervising teacher) would provide information about implementation under more typical conditions. Similarly, measures of feasibility are needed; the resource constraints of teachers and school systems should be considered and additional data are needed to determine how school systems might use funds designated for less-effective professional development for more focused and evidence-based in-classroom coaching. Moreover, the careful and time-intensive coding of variables such as engagement is unlikely to be feasible in a typical setting. Our coding, a variation of MTS, should also be researched further to identify potential flaws or benefits in using context to make in-the-moment decisions. Finally, more research is needed for participants with limited English proficiency or for whom English is a second language.

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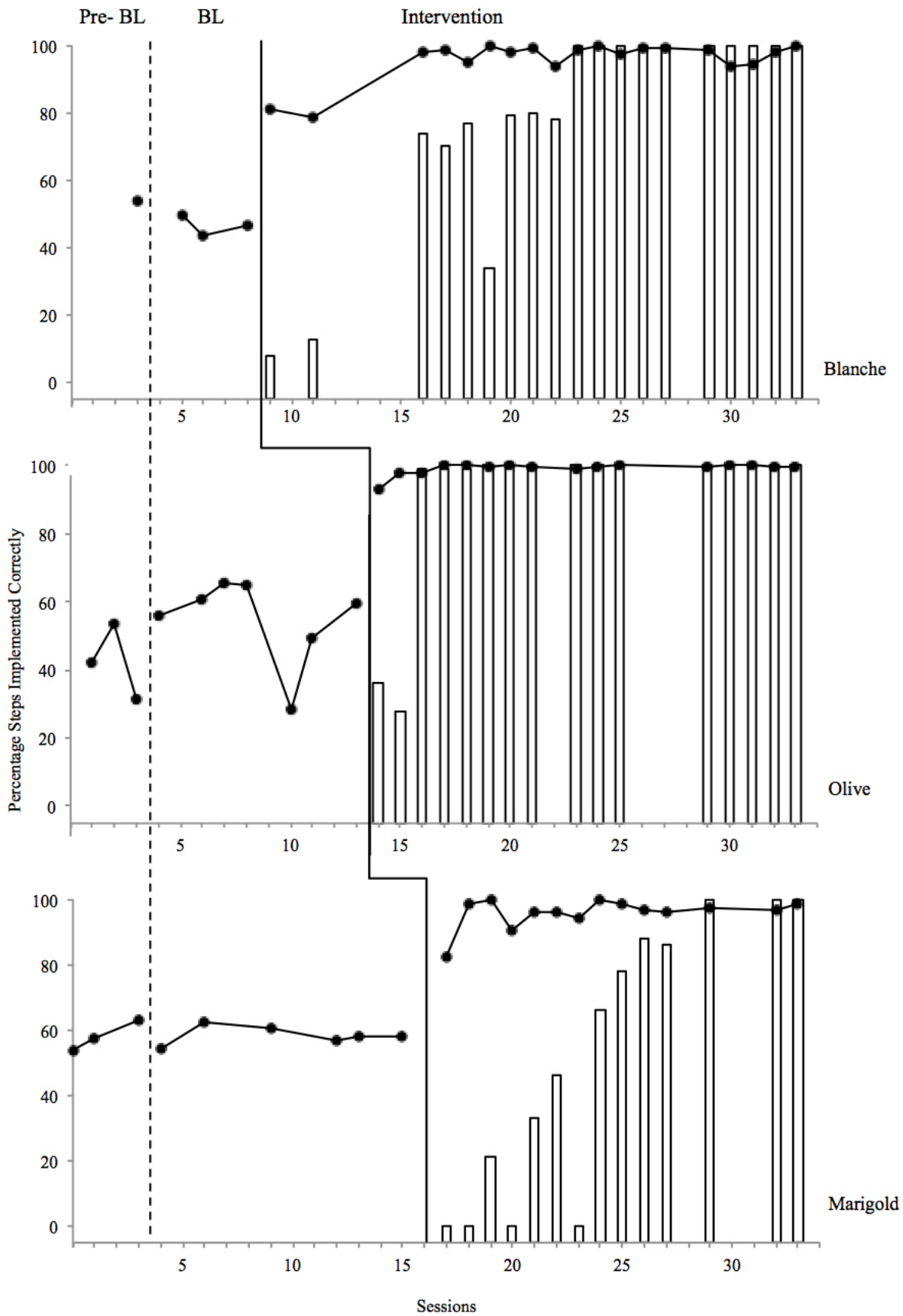
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Figure Captions

Figure 1. Paraprofessional implementation of evidence-based instructional procedures across conditions (data path) and the percentage of trials independently completed (without direct assistance from the coach; bars). BL=baseline. Mastery criterion to discontinue coaching was at least 80% correct implementation across 2 intervention sessions.

Figure 2. Student participant engagement across conditions. BL=baseline.



Pre- BL BL Intervention

