Coaching Paraprofessionals to Promote Engagement and Social Interactions during Small Group

Activities

Jennifer R. Ledford
Kathleen N. Zimmerman
Kate T. Chazin
Natasha M. Patel
Vivian A. Morales
Brittany P. Bennett

Abstract

Paraprofessionals need adequate training and supports to assist young children with autism spectrum disorders to engage in appropriate social interactions during small group activities with their peers. In this study, we used in-situ coaching and brief post-session feedback to improve the use of environmental arrangement, prompting, and praise by three paraprofessionals working in inclusive classrooms. Results suggested the brief coaching intervention was effective for improving target behaviors. In addition, generalized use of behaviors and child outcomes were positive. In-situ feedback is a promising practice for improving use of evidence-based practices by non-certified personnel in early childhood settings.

Keywords: engagement, social interactions, paraprofessionals, autism, multiple baseline

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Many young children with disabilities attend regular early childhood programs and

receive special education services in that setting (38%; U. S. Department of Education, 2014).

These children make up a heterogeneous population that includes children with autism spectrum

disorders (ASD) and low social competence. Although inclusive placements are consistent with

least restrictive environment mandates and offer peer observation and interaction opportunities

for children with disabilities (Justice, Logan, Lin, & Kaderavek, 2014), persistent difficulties

with peer-related social interactions (e.g., proximity to children without disabilities) may not be

ameliorated via inclusive placements (Hardiman, Guerin, & Fitzsimons, 2009); children with

ASD need ongoing support and intervention to promote social skill acquisition and peer

relationships (Odom, Buysse, & Soukakou, 2011).

When used in tandem, environmental arrangement and prompting are some of the most

successful strategies for improving specific and generalized social behaviors for young children

with ASD (Ledford, King, Harbin, & Zimmerman, 2016). Both procedures are evidence-based

and consistent with recommended practices for young children with disabilities (Division for

Early Childhood of the Council for Exceptional Children, 2014). *Environmental arrangement*

refers to a number of antecedent-based strategies in which contexts are manipulated to improve

the likelihood that a specific behavior occurs (Barton, Lawrence, & Deurloo, 2012). This often

includes arranging physical materials (e.g., leaving a preferred item in a location that is visible

but inaccessible, to encourage a vocal request for the item). Social environments can also be

arranged (e.g., child is assigned to participate in an activity with peers who may be particularly

likely to evoke positive or successful interaction attempts). *Prompting* refers to the provision of

assistance to children to engage in desirable behaviors, accompanying systematic procedures for reinforcing behavior occurrence, and ultimately removing prompts (Wolery, Ault, & Doyle, 1992). Of course, when antecedent strategies are used, they are often paired with consequence-based procedures such as providing access to a reinforcer contingent on target desirable behaviors and withholding access to reinforcers contingent on undesirable behaviors (differential reinforcement; Karsen & Carr, 2009); social praise is a common planned consequence in preschool classrooms (Bayat, 2010). For example, an adult might provide withhold praise while a child wanders around the classroom (inappropriate behavior) and provide praise once he appropriately transitions to a small group activity (desirable behavior).Successful teachers should use a combination of environmental arrangement and prompting strategies (Grisham-Brown, Hemmeter, & Pretti-Frontczak, 2005; Sandall & Schwartz, 2008). However, teaching staff report a need for training in order to use these and similar evidence-based practices (EBPs; Carter, O'Rourke, Sisco, & Pelsue, 2009).

Use of Intervention Strategies in Typical Settings

Children in inclusive early childhood contexts are often served by both a certified teacher *and* one or more non-certified adults (i.e., paraprofessionals, paraeducators, 1:1 assistants). In fact, paraprofessionals report consistently that they engage in individualized instruction for children with disabilities (Jones, Ratcliff, Sheehan, & Hunt, 2012; Liston, Nevin, & Malian, 2009) and there are more paraprofessionals than early childhood special education (ECSE) teachers who are employed to provide special education services to children aged 3-5 with disabilities (full-time equivalent personnel, U.S. Department of Education, 2016). However, paraprofessionals and other non-certified early childhood instructional personnel vary widely in terms of education, training, and experience (Giangreco & Broer, 2002; Uitto & Chopra, 2015).

Given that highly qualified and certified teachers often need ongoing supports in order to effectively use EBPs with fidelity (Barton, Chen, Pribble, Pomes, & Kim, 2013; Dunst, Bruder, & Hamby, 2015; Strain & Bovey, 2011), we would expect similar supports would be needed to support use of EBPs by paraprofessionals (Stockall, 2014). In early childhood settings, paraprofessionals have been coached to engage in behaviors designed to improve social behaviors for children with ASD (cf., Feldman & Matos, 2012) although no study has been conducted which measured both activity engagement and social interactions. Because engaging with materials appropriately and interacting with peers are essential for maximizing learning opportunities, coaching indigenous implementers to attend to and intervene with both may be critical.

Behavioral skills training, widely used to train adults (cf Love, Carr, LeBlanc, & Kisamore, 2013; Sarokoff & Sturmey, 2004), is one framework that can be used when training service providers; it includes the provision of information (i.e., rationale, procedural steps), modeling, practice opportunities, and feedback (e.g., social praise). These steps are not original to BST (e.g., the teach-model-coach-review framework includes essentially the same steps; Roberts et al., 2014). However, even considering similar procedures, there are few published studies that have evaluated the use of BST or other model-practice-feedback coaching strategies for paraprofessionals working with young children for improving the use of evidence-based practices. Two such studies were conducted individually with young children with ASD (Gianoumis, Seiverling, & Sturmey, 2012; Seiverling, Pantelides, Ruiz, & Sturmey, 2010). In these two studies, araprofessionals were trained to implement natural language paradigm (NLP) strategies one-on-one in self-contained preschool classrooms with children with ASD to improve child language outcomes during toy play. BST procedures (teach, model, practice, feedback)

were used to train adult participants to implement NLP procedures during explicit training sessions; no in situ coaching was provided. After training, staff implemented procedures with fidelity and child responding increased for 75% of child participants across both studies. These studies are important because they demonstrate effectiveness of BST training for teaching paraprofessionals to use evidence-based strategies. However, additional information is needed regarding the use of strategies during small group activities, since more restrictive settings are not feasible or preferable for some children as it precludes peer interaction. Moreover, the inclusion of peers in a small group may considerably impact the difficulty of intervention implementation, limiting the generalizability of these studies to small group settings. A third study used BST to train paraprofessionals to increase a specific type of interaction between peers (mands; Madzharova, Sturmey, & Jones, 2012), but used A-B designs rather than a rigorous single case designs that allows for control for common threats to internal validity (Gast & Ledford, 2014). Although coaching paraprofessionals to implement strategies with young children has been shown to positively impact child outcomes (cf. Robinson, 2011), this has not yet been demonstrated when BST is used as most of the studies either did not report child-level outcome data or reported equivocal outcomes. Thus, the purpose of this study was to assess the effectiveness of ongoing coaching and feedback for improving paraprofessionals' use of specific environmental arrangement and prompting strategies during a small group activity.

Research Questions

The primary research question guiding the study was: (1) Does the provision of coaching improve the use of targeted instructional behaviors by paraprofessionals during small group activities including children with and without ASD? Additional secondary questions were: (2) Do levels of prompted and unprompted *targeted social responses* increase for *children with ASD*

when coaching is provided to paraprofessionals? (3) Do levels of *overall unprompted social interactions* increase for *all children* when coaching is provided to paraprofessionals? (4) Do levels of engagement increase *for all children* when coaching is provided to paraprofessionals? and (5) To what extent did adult participants report that coaching was helpful and that it resulted in maintained changes in behavior?

Method

Participants and Coaches

Paraprofessionals. Inclusion criteria for adults were: (a) assigned to a classroom or position in which they worked with small groups of children, including a child with ASD; (b) exhibited interest in improving skills related to small group activities; (c) employed by school with history of consistent work attendance; (d) demonstrated availability and willingness to receive in-situ coaching; and (e) performed below criterion (80% independent use of procedures) in initial sessions without coaching. Three full-time paraprofessionals in inclusive early childhood classrooms volunteered to participate (Table 1). Paraprofessionals all had high school diplomas and 8-14 years of experience with children with disabilities. Two paraprofessionals (Carly and Kristen) were employed by the local school system to serve children in inclusive classrooms who had Individualized Education Programs. Each served children in the classroom to which their target child was assigned for at least 1 hr per day; remaining hours were spent serving children in 2-3 other classrooms. The final participant (Vikki) was employed by the university-affiliated early childhood program as a teaching assistant and worked full-time in one classroom. All of the paraprofessionals were supervised by certified early childhood special educators; none received regular, systematic feedback about effective teaching practices, small group activities, or promoting social interactions among children. A fourth potential

paraprofessional (a part-time teaching assistant who was also a graduate student in early childhood special education) was recruited; she did not meet criteria for inclusion because she engaged in many targeted instructional behaviors in an initial small group session.

Child Participants. Each paraprofessional participated with a group of three children consisting of one target child and two peers in the context of a small group activity (see Table 1). Classroom teachers nominated one target participant and two to four peer participants for study participation from each of the three target participants' classrooms. All child participants were 38-65 months old and parental consent was obtained prior to study initiation.

Target child participants were selected for inclusion based on the following criteria: (a) diagnosis of ASD or rating of *severe* on the Childhood Autism Rating Scale-2 (*CARS-2*; Schopler, Van Bourgondien, Wellman, & Love, 2010); (b) teacher report of low engagement during classroom small group activities; and (c) teacher report of low frequency or absence of social interactions with peers during classroom small group activities. Researchers asked teachers to nominate two to four peer participants based on the following criteria: (a) average to above average engagement; (b) high rates of social behaviors with peers during classroom activities; and (c) generally compliant with adult directives during small group activities.

The study included three target child participants (Molly, Simon, and Ava) and nine peer participants (see Table 1). Molly and Simon received special education services as children with ASD and Ava received special education services as a student with a developmental delay. Molly communicated in 1-2 word utterances to request preferred items and often engaged in echolalia and repetitive motor movements with small objects. Simon communicated using trained scripts to request items or assistance (i.e. "I want [item]," "I need [item]," "Help") and engaged in frequent verbal and motor stereotypy. Ava communicated vocally using 3-5 word

utterances to request preferred items/adults/activities and comment on ongoing activities. Ava collected items in the classroom (i.e., small toys, markers) without functionally manipulating the materials. Outside of the study target children displayed low levels of activity engagement and did not engage in social interactions with peers during small group activities in the classroom.

      Coaches. Coaching was provided by two Caucasian female graduate students in special education with previous experience implementing small group interventions with embedded social skills instruction in early childhood settings. Coaches had demonstrated competency in teaching students with disabilities in small groups, implementing behavior management strategies, teaching response prompting procedures, and providing specific feedback to adults implementing novel interventions. A third graduate student, an Indian-American female, conducted generalization sessions; she did not attend any other sessions. The first author trained all coaches by providing written directions, discussing and modeling procedures, evaluating role play videos, and providing feedback on practice sessions.

Settings and Materials

      For Carlie (Molly) and Kristen (Simon), sessions occurred in a small resource room near their regular classrooms, often used for small group activities. This location was selected by classrooms teachers. Molly's teacher suggested the resource room because her classroom did not have adequate space to conduct the sessions and coaching (e.g., additional materials and adults). Simon and his peers engaged in activities in the resource room daily during nap time (outside of research activities), while some children napped in their classroom; Kristen's responsibilities included planning and conducting activities in this room for approximately an hour per day. Thus, sessions were conducted in this room as part of his typically occurring routine. For both Carlie and Kristen, feedback sessions were conducted in the same room, while children played

independently, played with another adult, or transitioned to a new activity. No other children or adults were present during Carlie and Kristen's sessions.

Vikki's (Ava) sessions occurred in her classroom during typically occurring small group centers. Vikki's sessions occurred at a rectangular table with three child-sized chairs and one adult chair at a table toys center available during the typically occurring small group centers routine. Approximately 2-3 nonparticipating adults and 4-6 nonparticipating children were present in the classroom during sessions for Vikki. Coaching sessions occurred in a small office inside the classroom.

Eight sets of classroom materials were used during all sessions. Materials were selected by the first and second authors, who had experience teaching in early childhood settings and were familiar with the participants; they were selected due to their appropriateness for children with wide-ranging developmental levels and common use in early childhood settings. Materials included markers, dot markers, modeling clay with related utensils, sculpting sand, stamps and stamp pads, paint pens, and sponge painting supplies; order of use was randomly selected across all sessions. All materials were presented in a 33 cm x 20 cm x 12 cm clear storage container and paper (if needed) was placed on the table by the researcher prior to sessions. Additional materials such as cleaning wipes, a MotiVaider©, a Gymboss©, and a 12 cm x 12 cm visual with a printed drawing, and edibles (e.g., crackers, chocolate candies) were present during all sessions.

Response Definitions and Procedures

The primary dependent variable was the percentage of steps implemented correctly by the paraprofessionals during small group activities; decisions to change conditions were made based

on this variable. The secondary dependent variables were the number of targeted social

interactions, number of total social interactions, and percentage of intervals of engagement.

Paraprofessional Implementation. Paraprofessional implementation of environmental

arrangement and prompting strategies (including praise statements) were measured via video

using direct observational recording (Ayres & Ledford, 2014). Two types of behaviors were

measured for each session: pre-session behaviors (behaviors occurring before children engaged

with activity materials) and session behaviors (behaviors occurring while children were engaging

with activity materials). The following pre-session behaviors were measured as present or

absent: greeting child participants, putting on an interval timer (MotiVaider© or Gymboss©),

naming a purpose for the session, explicitly naming and providing a visual of a targeted social

behavior, and modeling how to perform the social behavior. A total count of praise was coded,

which included providing behavior-specific praise either for child engagement with activity

materials or for peer social interactions, with a goal of doing so at least five times per session for

each child in the group.The interval timers were set to cue implementers to use praise statments,

although they were also instructed that it could occur at any appropriate time. Paraprofessionals

could create a combination of five total praise statements by praising any combination of

engagement and social interaction behaviors, but each behavior had to be praised at least once

(i.e., 4 engagement and 1 social interaction praise statements; 3 engagement and 2 social

interaction praise statements; 1 engagement and 4 social interaction praise statements). If needed,

a prompt to engage in play or social interactions preceded the praise statement (i.e.,

paraprofessionals were told to prompt participant engagement and social interactions if needed,

so that praise could be provided).

The total percentage of steps completed correctly was calculated by totaling the number of occurrences of pre-session behaviors (maximum of 6) and praise statements for each child (maximum of 5 per child) and diving the sum by the number of expected opportunities per session (6 pre-session behaviors and 5 praise statements for each child in the group). For example, if the paraprofessional engaged in 5 of 6 pre-session behaviors and 15 praise statements (5 for each child in the group) across engagement and social interaction behaviors (without modeling from the coach), the total number of correctly implemented steps would be 20 (5 pre-session and 15 praise statement behaviors) out of 21 expected behaviors (6 pre-session and 15 praise statement behaviors). The quotient would then be multiplied by 100 to conclude that 95% of steps were implemented correctly during the session. Prompting of engagement behaviors or social interaction behaviors was not included in the total steps completed correctly during the session since prompting was not required if children independently exhibited engagement and social interaction behaviors.

Social interactions. Child social interaction behaviors were measured via video with ProCoderDV (Tapp & Walden, 1993) using timed event recording (Ayres & Ledford, 2014) to calculate the total number of peer-directed social interactions by session for each child. General social interactions and target social interactions (specific to each target child) were measured. General social interactions were defined as any positive or neutral attempt to communicate with another child that was not the target social interaction. Examples included vocal initiations and responses (e.g., "Do you want to play?"), and non-vocal initiations and responses (e.g., giving item to or taking item from peer, shrugging, smiling) clearly directed to another child (e.g., smile and eye contact). Non-examples included problem behavior, stereotypy, and parallel play that was not cooperative in nature (e.g., playing beside peer). The first author and classroom teachers

selected target social interactions for each target child. Molly's target behavior was to respond appropriately to a peer's offer of a toy, Simon's target behavior was to appropriately respond to a peer request for an item, and Ava's target behavior was to appropriately request an item from a peer. Definitions, examples, and non-examples are displayed in Table 2.

Engagement. Child engagement behaviors were measured via video with ProCoderDV (Tapp & Walden, 1993) using momentary time sampling (MTS) procedures with 10 s intervals (Ayres & Ledford, 2014); consistent with MTS procedures, only one behavior was marked for each interval, based on whether a child was *engaged* or *unengaged* at the moment the interval ended. *Engaged* was defined as appropriately attending to or orienting to the instructor, peer, or materials, and/or manipulating instructional materials appropriately (e.g., in the manner intended). Examples included looking at a speaker or attempting communication (e.g., giving or gesturing), looking at a peer's actions or product, and pausing while making a choice (for a single interval). Non-examples included looking at a peer's face when the peer is manipulating a material and consecutive intervals of holding a toy (e.g., holding an item for more than one interval without using it functionally). *Unengaged* was a mutually exclusive code defined as orienting away from the instructor, peer, or instructional materials; manipulating instructional materials in an unintended manner; engaging in problem behavior; and engaging in self-stimulatory behavior (specific definitions, examples, and non-examples of behaviors coded as unengaged [self-stimulatory, problem behaviors] available from the first author). The percentage of intervals of engagement was calculated by session for each child by dividing the total number of engaged intervals by the number of engaged plus unengaged intervals and multiplying the quotient by 100. If a child's hand or face were not visible due to camera angle, a third option,

"unable to code" was marked; these intervals were not used to calculate percentage of intervals coded as "engaged" or "unengaged".

Procedures

Primary child materials (play dough, moldable sand, markers, paint, paper) were placed on the table by the coach before each session across all conditions. Prior to all sessions, paraprofessionals were shown the materials to be used during the session (e.g., dot markers, play dough). Paraprofessionals were asked to select any two consented peers to participate in the small group with the target child. The paraprofessionals gathered the children per their typical classroom routine. Sessions were 5 min in duration and began when the teacher told the children they could play or presented materials to children (e.g., opening a container). The coach started a timer and sessions stopped when the timer beeped after 5 min. Coaches informed the paraprofessional that children could continue playing with the materials after the timer beeped, but filming and data collection would cease. Coaches thanked the paraprofessionals for conducting the session and cleaned up the area (e.g., wiped marks from table).

Baseline and Generalization. Prior to sessions, paraprofessionals were instructed to conduct the activity as they normally would and the coach provided no other directions or guidance to adult or child participants throughout the session. Cleaning wipes, interval timers (e.g., MotiVaider© and Gymboss©), social interaction visuals, edibles, and additional materials (e.g., paint tubes, paper) were placed in a 25 cm x 25 cm x 30 cm crate on the floor next to the instructional table. The coach mounted the video camera on a tripod or shelf to film the session. If the paraprofessional asked the coach any questions the coach replied with the following phrase, "Do whatever you normally would do." Child bids for attention were responded to with the general phrase, "You're working with (paraprofessional name)." At the end of the session the

coach informed the paraprofessional the session was finished, provided general praise (i.e., "That looked great"), and did not provide any specific guidance or feedback on the session. Generalization sessions followed the same procedures as baseline sessions, with filming and instructions provided by a different adult to determine whether the presence of the coach alone was responsible for paraprofessional behavior. The coach was not present during generalization sessions.

Coaching and Feedback. All coaching intervention sessions included the following components: pre-session goal review (e.g., providing instruction regarding specific behaviors), modeling (in initial sessions and by request in later sessions), feedback, and provision of answers to any posed questions. Thus, the typical didactic BST approach was used to provide in-situ daily mini-sessions, rather than the traditional professional development involving the use of the four components during contrived sessions until mastery is reached. Instruction, practice, and feedback were used during every coaching sessions; modeling was used in initial coaching sessions and anytime it was requested. Coaches also reported specific percentages of correct implementation after paraprofessionals reached 100% correct implementation of procedures for a single session. Prior to the start of the session the coach reviewed the goals for the day (instruction), modeled implementation behaviors during initial sessions or by request during any session (e.g., specific praise statements for the session materials, prompting of social interactions, setting a purpose for the session), and answered any questions posed by the paraprofessional. During the first intervention session the coach modeled the pre-session behaviors, at least one engagement praise for each child, and at least one social interaction prompt and praise for the target child (modeling). Coaches then asked the paraprofessional to implement the remainder of the session alongside the coach (practice). During sessions coaches

praised paraprofessionals at least once per minute and reminded paraprofessionals when prompting and praise opportunities arose (feedback). If a paraprofessional failed to praise both children in a social interaction (e.g., praise the child receiving a material but not the child offering a material), the coach would provide a vocal reminder to praise the offering child and give a model praise statement if requested. Coaches tallied the number of praise statements directed at each child during the session and provided vocal prompts to the paraprofessional if she was not equitably delivering praise to all children (e.g., "You've praised Simon 3 times so far—that's great! So far, you haven't praised Amy or Allen yet, so you could do that now since they are playing together nicely."). As paraprofessionals demonstrated independent implementation of prompting and behavior specific praising of engagement and social interaction behaviors, the coach increased the physical distance between herself and the table where the activity occurred (intervention session 3 for Kristen and session 4 for Carlie and Vikki). Coaches told paraprofessionals edible reinforcers were available if they did not think social praise would be an effective reward. Kristen and Vikki chose not to use edibles; Carlie offered Molly preferred edibles approximately 1-3 times per session, although she rarely accepted. Carlie also delivered one edible (small cheese cracker) to each peer participant at the end of each session while they walked back to the classroom.

After children returned to their typical routines or while they continued playing with the session materials, the coach completed the following post-session coaching behaviors: reviewing the session data relative to the goals for the day, providing specific examples of correct implementation of goals (e.g., "I noticed you moved the materials bin next to Simon to increase the need for peers to request materials from him—that was a great way to arrange the environment to increase opportunities for peers to ask for materials."), requesting questions from

the paraprofessional and answering posed questions, collaboratively reflecting to identify things that went well and things that could be improved for the next session, and setting goals for the next session. Discussion and feedback with paraprofessionals (including any questions before the session began) averaged approximately 8 min per session across participants (range: 6 min 30 s - 9 min 30 s) during the intervention condition.

Maintenance and Enhanced Maintenance. Maintenance sessions matched baseline procedures except the interval timers, visuals, and edibles (Carlie) were placed on the table with the instructional materials. At the beginning of the session coaches told the participant to continue doing all the great things they had been doing and that no feedback would be provided during or after the session. The coaches asked the paraprofessionals if they had any questions before the session started. Coaches responded to implementation questions (e.g., Can I still prompt them?) with general statements that the paraprofessional could continue to use any behaviors she had learned.

Although Carlie and Kristen were technically prompting and praising social interactions correctly during maintenance, researchers thought Simon and Ava might respond with more unprompted correct responses if they were given more time to respond. Thus, during the enhanced maintenance condition, we asked both paraprofessionals to wait for 3-5 s before providing prompts when a peer initiated an interaction, and prompted them to wait in situ once per session. This was the only procedural change from the typical maintenance sessions. At the end of the sessions Carlie and Kristen were thanked for trying the variation during the session.

Social validity. All three adult participants were provided with a short social validity questionnaire several months following study completion. The purpose of the questionnaire was to assess whether participants reported positive perceptions of the study procedures and whether

they perceived that it resulted in maintained changes in their own behavior. The questionnaire included three questions with Likert-style responding, ranging from *Never* to *Almost Always* (or *Almost Daily*). The first question asked if the coaching procedures were helpful; the second asked how often participants *currently* encouraged social interactions during small group activities; and the third asked how often they did so prior to study participation. The fourth question was an open ended statement asking participants to describe how participation in the study changed their interactions during small group activities and to include any other information they would like to share. The school year ended shortly after completion of the study; social validity questionnaires were provided the following fall.

Experimental Design

Paraprofessional implementation data 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 behavior of the previous participant showed consistent changes in level (e.g., change was based on visual analysis rather than a set criterion).Visual analysis of graphed data was conducted to analyze changes in level, trend, and variability in order to determine the presence of a functional relation between paraprofessional coaching and paraprofessional implementation of targeted behaviors (Gast & Spriggs, 2014). Child engagement and social interaction data were also analyzed in the context of a multiple probe across participants design, but experimental decisions were based on paraprofessional implementation data.

Interobserver Agreement and Procedural Fidelity

Interobserver agreement (IOA) data were collected during at least 33% of sessions for each paraprofessional and child in each condition. IOA data were collected via video and calculated using point-by-point agreement ([agreements/(agreements + disagreements) x 100]; Ayres & Ledford, 2014). Average IOA across conditions for paraprofessional implementation was 89.7% for Carlie (range 83.5-94.2%), 96.8% for Kristen (range 94.9-98.7%), and 95.1% for Vikki (range 92.6-97.7%). The average agreement for social interaction data (with a 5 s agreement window) was 94% (range across children: 88-99%) and the average point-by-point agreement for engagement was 94% (range across children: 89-100%).

Procedural fidelity (PF) data were collected to evaluate the coaches' adherence to coaching procedures during 40-67% of baseline, 50-67% of intervention, 50-100% of maintenance, 50% of enhanced maintenance, and 100% of generalization sessions for each participant. PF data were collected via video using direct, systematic observational recording (i.e., each occurrence or non-occurrence was recorded; Ledford, Wolery, & Gast, 2014). Coaching fidelity 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). Average PF was 96.1% (range 64.3-100%) for Carlie's sessions, 98.9% (range 96.4-100%) for Kristen's sessions, and 98.4% (range 89.3-100%) for Vikki's sessions. Average PF for Carlie was lower than the other adult participants due to a fire drill occurring at the beginning of one coaching session, eliminating the ability of the coach and paraprofessional to continue the session (range without the fire drill was 96.4-100%). High levels of fidelity were expected since the coaching form completed each session dictated each expected behavior for the coaches.

Results

Paraprofessional Implementation

As shown in Figure 1, there was an immediate small to moderate change in level (14-40% change from final baseline to first intervention session), with no overlap with baseline conditions for any participants. During baseline the percentage of steps performed correctly was variable and ranged from near-zero to 30-40%. For all paraprofessionals, implementation reached 100% (mastery), and the percentage of steps completed without coach modeling steadily increased over time; with Carlie and Vikki performing 100% of steps starting in the fifth intervention session and Kristen performing 100% of steps independently in the third session. We continued coaching until the participant reached 100% accuracy in at least one session *and* the participant reported that she felt confident she could do so subsequently without coaching.

During maintenance conditions, levels were more variable and lower than those in the coaching condition, but were consistently higher than baseline levels; across paraprofesionals, levels ranged from 67-100%. A single generalization session was conducted with a researcher who had not served as that participant's coach to determine whether the coach was the discriminative stimulus for performing the desired behaviors; levels of implementation during these sessions were overlapping with other maintenance sessions.

Target Social Interactions

For each participant with ASD (Molly, Simon, Ava), a social behavior was selected based on observation and teacher report. Paraprofessionals were given a goal of prompting and praising these interactions (or praising only, if they occurred without prompting) at least once per session per child. As shown in the left panel of Figure 2, no prompted or unprompted target social behaviors occurred during baseline for any participant. During intervention conditions, all target child participants had at least one prompted or unprompted social interaction in each session,

with one exception for Molly and one for Ava. In these sessions, paraprofessionals attempted

prompting, but completed the interaction in such a way that it was coded as not meeting our

criteria (e.g., accepting the material on Molly's behalf, and then handing it to her, rather than

physically prompting her to take it directly from the peer). For all target child participants,

unprompted target interactions (shown as filled circles) rarely or never occurred during 4-6

coaching sessions.

Total Social Interactions

Participants with ASD. As shown in the right panel of Figure 2, no child with ASD

engaged in unprompted social interactions during baseline conditions; in addition, only Ava

engaged in prompted social interactions (range 0-1 per session). Following implementation of

coaching, the number of prompted social interactions increased in level for all target children.

Moreover, the total number of prompted interactions exceeds the number of prompted *target*

interactions (Figure 2, left panel), suggesting that paraprofessional participants generalized their

use of prompting to encourage a variety of peer interactions for all target participants. Only Ava

had increased *unprompted* interactions during the coaching condition. Both Molly and Ava had

variable increases in unprompted interactions during maintenance phases.

Peers. The total number of unprompted social interactions for each peer participant is

shown in Figure 3; these interactions reflect any social initiations and responses to other peers

and to target participants. Because the same peers did not necessarily participate in every session,

fewer than three data points per participant were collected in each condition. Further, because

their data were secondary and were coded post-hoc, baseline levels and trends were not

considered in making condition change decisions. However, the data generally show an increase

the total number of unprompted social interactions between baseline and coaching conditions for most peers, though most comparisons include at least one overlapping data point.

Engagement

As shown in Table 3, participants with ASD had dissimilar levels of engagement during baseline conditions; Molly was mostly unengaged (mean across sessions: 17% engaged), Simon was more engaged (mean=72%), and Ava's engagement approximated that of her peers (mean=93%). During coaching conditions, only Molly's engagement improved (mean=52%), while Simon and Ava's engagement remained stable; Molly's engagement continued to improve during maintenance and generalization conditions (mean=81%, 60%, respectively). All peer participants had high rates of engagement regardless of condition (range: 93-100%).

Social Validity

All three adult participants reported that the coaching procedures were *Almost Always* helpful and all reported that they encouraged social interactions *Almost Daily* in their current work. Two of three paraprofessionals reported that was an increase from their previous rates (*At Least Once a Week)*, while one participant reported that she had also previously encouraged interactions *Almost Daily.* Two paraprofessionals provided written responses to the final open-ended question, both reported that participation was a positive learning experience and that the coaching either encouraged awareness or behavior change regarding the use of prompts during small group activities. Although delaying social validity measurement by several months may have reduced recall, it might provide more accurate information about maintenance of use.

Discussion

The purpose of this study was to assess the effects of a brief coaching and feedback framework on strategy use by paraprofessionals. Secondarily, we assessed whether there were

concomitant changes in the engagement and social interactions of young children with ASD. The coaching framework included a brief pre-session introduction to materials, in-situ coaching, and post-session feedback. Including all components, sessions occurred for less than 15 min in the context of typical activities. Paraprofessionals learned to engage in targeted intervention behaviors and implemented them accurately and independently after a relatively small number of sessions. Some changes in child behavior, particularly prompted behaviors, occurred.

Several conclusions from this study are notable. First, coaching and feedback resulted in immediate behavior change for paraprofessionals implementing small group activities typical of early childhood settings. Overall, paraprofessionals received in situ coaching during five or six sessions (25-30 min total) and less than 1 hr of pre- and post-session coaching and feedback. Research suggests that short-term professional development (PD) has generally been ineffective for changing educator behavior (Bruder, Mogro-Wilson, Stayton, & Dietrich, 2009; Dunst, Bruder, & Hamby, 2015; Strain & Bovey, 2011), but many of these studies included instruction in a workshop format, which may not include a sufficient number of opportunities for practice and feedback. The drawback of the frequent, short sessions (e.g., 5 min child activities) is that it may not be representative of typical activity length for children (e.g., art activities may generally last 15 min rather than 5) and typical coaching staff (e.g., instructional coaches employed by the school district) may typically be available for longer durations more intermittently (e.g., once per week for an hour). Additional research is needed to determine what frequency and duration is feasible, and whether interventions based on typical practice result in similar outcomes.

Paraprofessional behavior change was consistent and replicated across tiers; this could be due to the fact that all paraprofessionals had considerable experience serving young children with disabilities in inclusive contexts. However, the inclusion of paraprofessionals with varying

demographics (age, race, ethnicity) is a strength of the study; this diversity is reflective of paraprofessionals in early childhood settings (U. S. Department of Labor, 2015). Moreover, coaching and feedback was similarly effective for Vikki, a bilingual adult for whom English was a second language. She did request a modification that may have improved her success: specifically, she asked for her coach to provide explicit scripts that could be used because she found it difficult to generate appropriate praise statements in a timely manner during ongoing activities. In a previous study (Ledford et al., 2017), another non-native English speaker required some additional modifications to reach mastery for providing effective one-on-one instruction for a young child with ASD in an elementary classroom. Additional research is needed to determine which coaching and feedback procedures are most helpful, whether these vary based on adult characteristics, and the feasibility of the coaching model's implementation with indigenous staff as coaches.

Our data suggest the coaching and feedback intervention was effective for producing context-bound behavior change, although we did not measure behavior change outside of study contexts. Our data do suggest that paraprofessionals generalized the use of prompting for targeted social interactions, given that paraprofessionals prompted more target social interactions *and* non-targeted interactions during intervention and maintenance conditions. Additional studies should be conducted to determine whether PD for paraprofessionals, who generally receive limited training regarding effective instruction and environmental arrangement, should focus on a specific behavior (e.g., prompting a single type of interaction) rather than a wide range of behaviors (e.g., all social interactions). A more limited focus might allow for increased practice opportunities, greater fluency, and increased confidence; this might then more readily translate to generalized behavior change.

Likely due to the very brief nature of the intervention, change in child behaviors was less consistent and robust than changes in adult behaviors. Across paraprofessionals, consistent changes in *prompted social interactions* occurred between baseline and intervention conditions. However, changes in *unprompted social interactions* were minimal or not present. Children were generally appropriately engaged at high rates regardless of condition. For one participant with lower-than-average engagement, no changes occurred during the intervention. Again, this may be due to the very limited duration of intervention. For the participant with the lowest engagement, data show increased engagement over time. For peers, it is encouraging that data show that participating in a small group with targeted objectives for the child with ASD (but no specific targeted behaviors for peers) does not negatively impact engagement. Although the number of data points per child per condition was not sufficient, preliminary data suggest the rate of unprompted social interactions also increased. These data may have also been impacted based on the reinforcing value of individual activities; for example some variability in engagement may have resulted from a child exhibiting a high preference for paint pens but relatively lower preference for modeling clay. We made the choice to vary materials to more closely mirror typical classroom conditions and to prevent satiation, but future research is needed that more carefully parses out potential causal relationships between materials and engagement. Previous studies using BST to train paraprofessionals to use strategies to promote social skills which measured child outcomes have reported similar growth in baseline and intervention conditions (Seiverling et al., 2010) or mixed results (Gianoumis et al., 2012), or have used non-experimental designs (Madzharova et al., 2012); thus additional research is needed to determine whether strategy use is continued by paraprofessionals and whether child outcomes are positive.

Implications for Practice

This study suggests that paraprofessionals can learn to use EBPs (environmental arrangement and prompting) during a small group activity similar to ones that typically occur in preschool classrooms. Moreover, this can occur in a relatively short period of time and without considerable out-of-classroom training. Individualized coaching and feedback may be an efficient alternative to more typical PD practices. Some research shows coaching and feedback could also be used as a secondary intervention when paraprofessional behavior change does not occur following a less intensive workshop training (cf. Chazin, Barton, Ledford, & Pokorski, 2017; Ledford, Zimmerman, Harbin, & Ward, 2017); our research extends this by showing that some coaching and feedback interventions may be efficacious even without an initial workshop component. It may be that using simple coaching and feedback structures of relatively short duration may be more effective that more time-intensive PD models. This suggests school systems should reconsider the use of typical workshop training models and attempt to use PD resources to provide in situ training and support for paraprofessionals.

Limitations

Although results are promising, several limitations should be noted. First, maintenance data were limited due to the end of the school year. Future studies should include long term measurement of maintenance. In this study, paraprofessionals maintained use of most behaviors, but the extent to which that would be true following an extended break from coaching is unclear. In addition, we measured implementation in the absence of the coach, but it would be informative if future research could include clandestine observation (e.g., with no observer). This would provide information regarding the extent to which behavior change was durable and generalized. We also implemented intervention in two tiers following an increasing data point; we did not consider this to be problematic because (a) both data points were near the average for

the condition, reducing the likelihood of regression to the mean threats to internal validity (Gast & Ledford, 2014), and (b) we expected immediate differences between conditions. Some visual analysts might find these decisions reduce their confidence in the size of the effect. We also included only three participants, employed by the same school district and working in the context of the same inclusive early childhood program. The extent to which these findings are generalizable may be limited. Finally, research is needed regarding feasibility of supervising paraprofessionals providing similar coaching and feedback, since teachers commonly report being unprepared to engage in these critical behaviors (Jones, Ratcliff, Sheehan, & Hunt, 2012).

Conclusion

In this study, we successfully taught paraprofessionals to engage in evidence-based practices to support engagement and social interactions for young children with ASD. Results suggest that brief coaching and feedback procedures may be efficient means by which we can improve behaviors of non-certified individuals who are increasingly providing a large portion of the support for young children with disabilities; these brief, focused interventions may be more feasible than long-term, broad PD or workshop-type activities. Given the need for adequate supports for children with ASD in inclusive environments and the importance of social skills on future school performance (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011), this study suggests the potential promise of coaching and feedback for a diverse population of adults.

Compliance with Ethical Standards

Jennifer Ledford declares she has no conflict of interest. Kathleen Zimmerman declares she has no conflict of interest. Kate Chazin declares she has no conflict of interest. Natasha Patel declares she has no conflict of interest. Vivian Morales declares she has no conflict of interest. Brttany Bennett declares she has no conflict of interest.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from parents or legal guardians of all individual participants included in the study.

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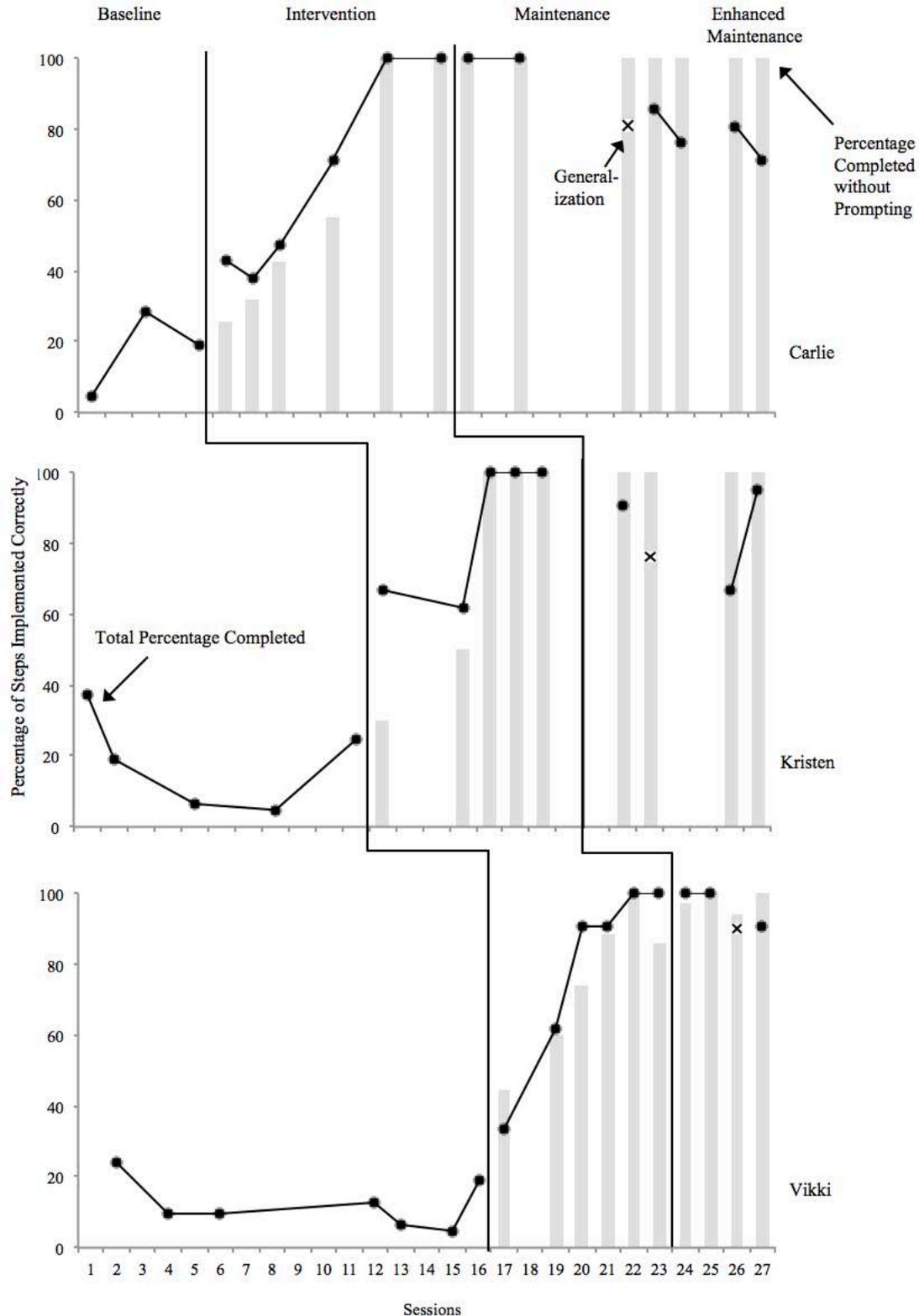
Figure 1. Percentage of steps per session completed accurately by the paraprofessional without coach modeling or assistance (lines) and the percentage of steps modeled by the coach (bars).
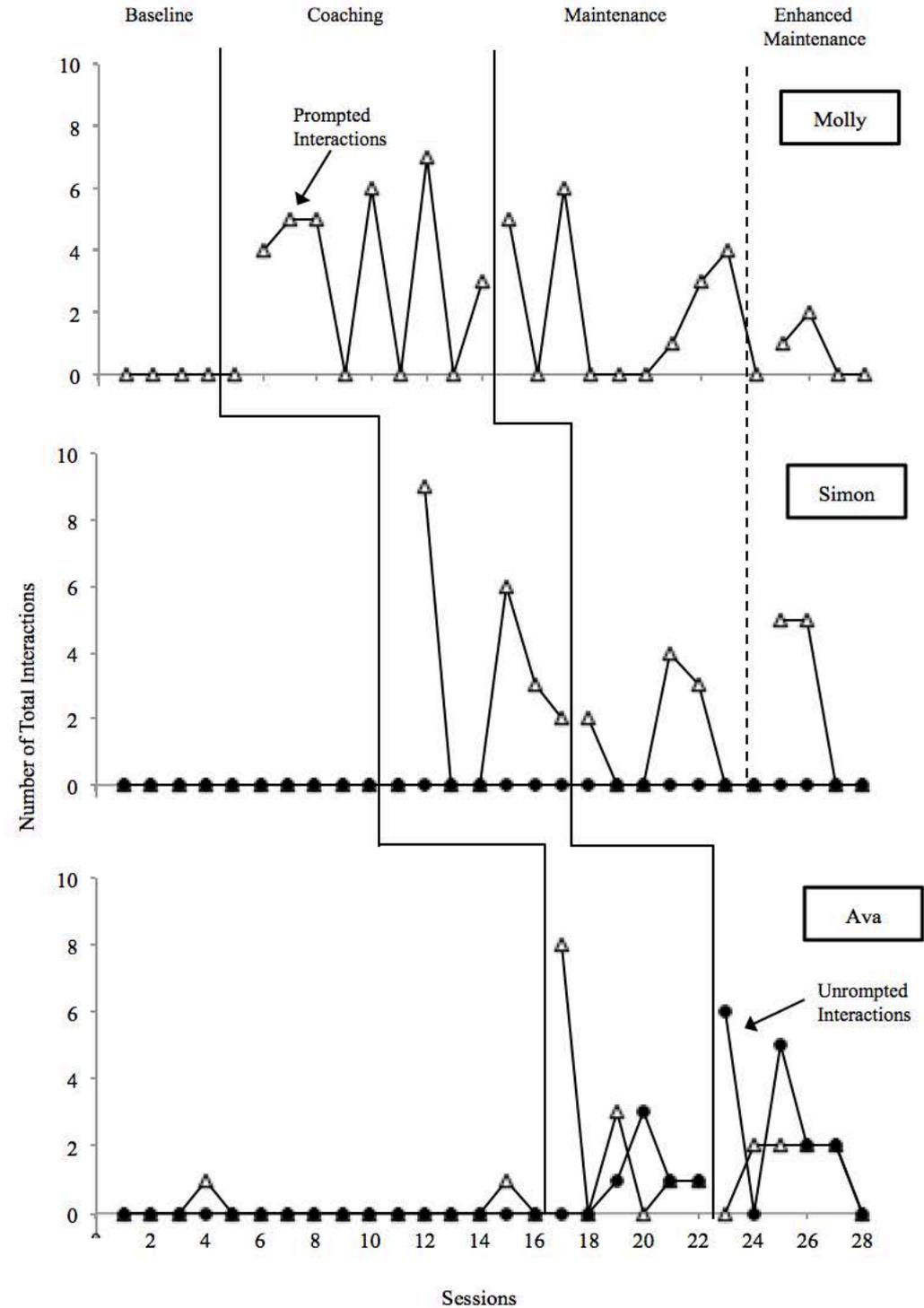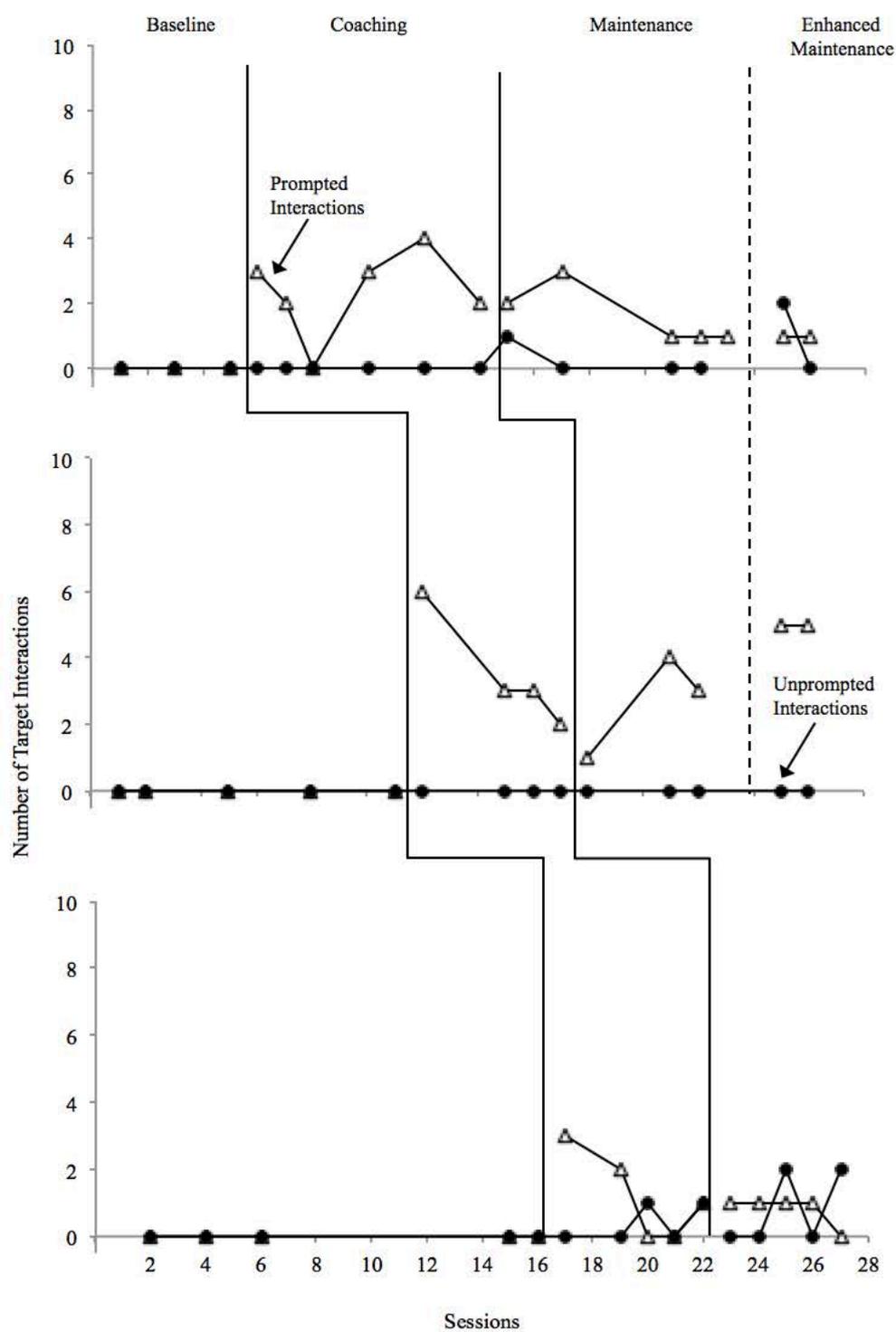
Figure 2. Number of prompted and unprompted **target** social interactions (left panel) and **total** social interactions (right panel) for target participants with ASD directed to any peer.
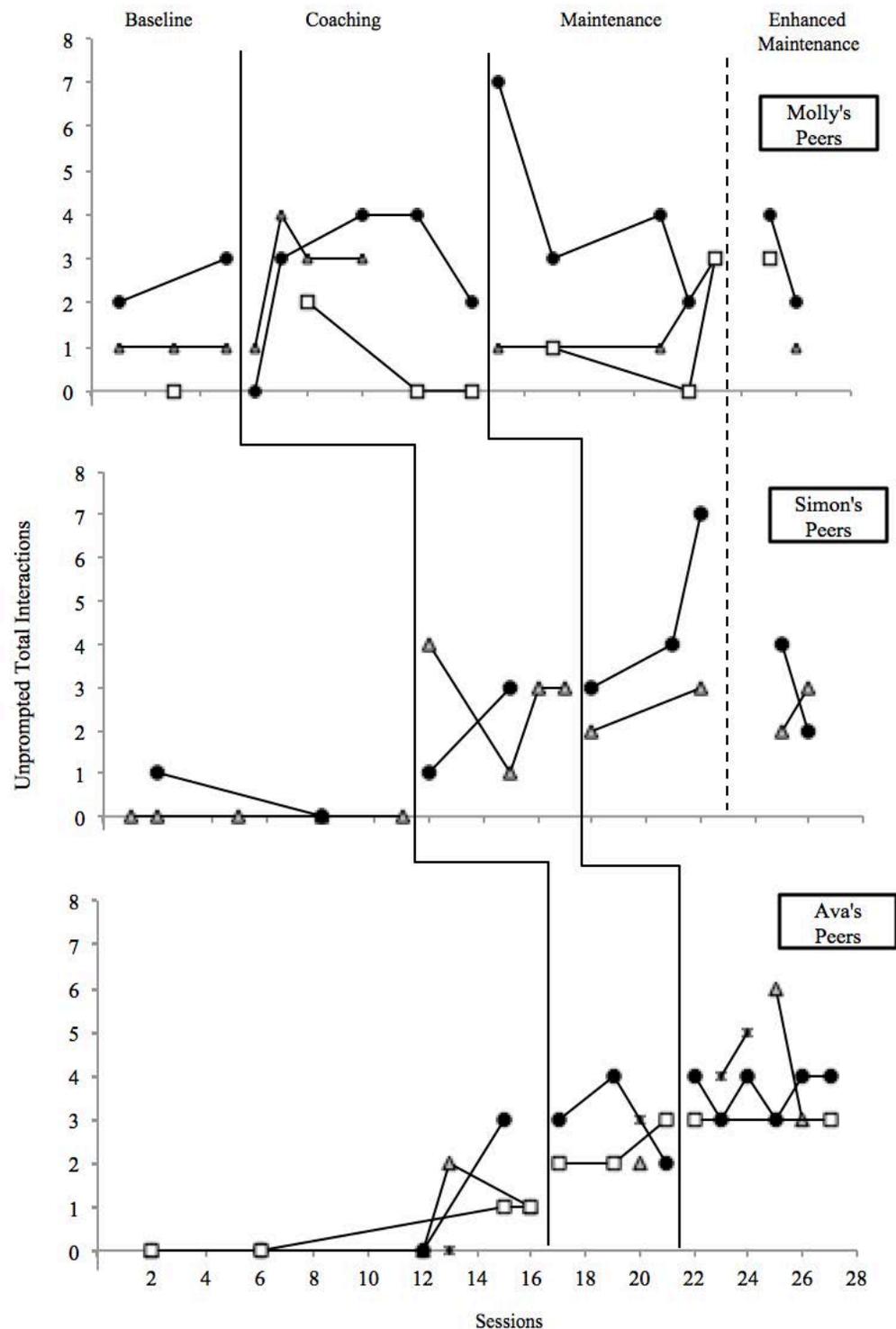
Figure 3. Number of unprompted overall social interactions for each peer without ASD, directed to a peer with or without ASD. Each data path represents a different peer.