Research Note

Peer-Mediated Augmentative and Alternative Communication Interventions for Young Children With Autism Spectrum Disorder and Limited to No Spoken Communication

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Purpose: Increasingly, research has identified effective approaches to improve communication and social engagement of preschool-age children with autism spectrum disorder (ASD) with limited spoken communication during interactions with peer partners. These include teaching peers to use the same augmentative and alternative communication (AAC) system, along with direct instruction (Thiemann-Bourque et al., 2018). The purpose of this research note is to summarize the author's contributions to this literature and provide clinicians with evidence-based strategies to support communicative interactions between children with ASD and peers without disabilities.
Method: This research note describes a series of studies conducted by the author and her colleagues with a focus on peer-mediated and direct AAC instructional approaches, defining target skills and how to measure effects on children's social communication competence, and the potential benefits of integrating approaches for preschool children with ASD who have significant social and communication needs.
Results: Outcomes summarized include fidelity of treatment implementation, improved rates of augmented and spoken communication, increased functional communication using different modalities, and enhanced reciprocal communication between children with ASD and peers during routine activities. Study limitations and directions for future intervention research are also discussed.
Conclusions: Together, the research reviewed shows that peers can be taught to be responsive AAC communication partners at a young age, with high fidelity of strategy implementation by peers and by speech-language pathologists or other early intervention staff. Providing children with increased social learning opportunities within the context of shared AAC activities allows both partners to become more competent in their social communicative interactions.

Advances in augmentative and alternative communication (AAC) interventions, for example, mobile technologies such as the Apple iPad with various voice output apps, have rocketed in the mainstream to support communication development of young children with autism spectrum disorder (ASD; Still et al., 2014). Another popular AAC approach that continues to be present in preschool classrooms is the Picture Exchange Communication System (PECS; Bondy & Frost, 1994). Reviews examining these two AAC approaches with children with ASD have reported improvements in augmented communication, speech, vocabulary learning, and literacy and decreases in challenging behaviors (Flippin et al., 2010; Ganz et al., 2012; Gevarter & Zamora, 2018; Iacono et al., 2016; Light & McNaughton, 2014; Schlosser & Koul, 2015). Across these reviews, there is a consistent lack of research reporting effective AAC treatment approaches for younger children with severe ASD and limited to no spoken communication, and even fewer that include training peers without disabilities as communication partners. In addition, there is a persistent gap between the possibilities that AAC instruction offers to improve communication and social interaction skills and the actual outcomes reported in the literature (Light & McNaughton,

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2014). Detailing the components of effective interventions that utilize AAC for intentional communication and social engagement would provide much needed support for early special education teachers, speech-language pathologists, and other service providers to increase children's social communication competence across settings and partners.

Components of Effective Peer-Mediated AAC Interventions

Extending a transactional model of early development (Snyder-McLean & McLean, 1978) to peers in the environment, social and communication development may be accelerated by changes in a child's social environment—in this case, more responsive peer partners who have skills using the same AAC systems (Thiemann-Bourque et al., 2018). As children become more competent communicators, exchanges with peers without disabilities can lead to additional social learning opportunities and access to classroom or extracurricular activities. Thus, reciprocal interactions that are successful may trigger additional attempts by both children with ASD and peers to initiate and maintain communication exchanges. To improve core deficits in social communication and reciprocity, we need to understand the active ingredients of interventions that not only provide a means for children with limited spoken language to communicate but also attend to the contributions of peers and what they need to learn.

Interventions that include peer-mediated approaches, which can also be referred to as "communication partner instruction" (Kent-Walsh & McNaughton, 2005), and AAC instruction have received more research attention over the past 5 years (Kent-Walsh et al., 2015; Therrien & Light, 2016; Thiemann-Bourque et al., 2016, 2018, 2017). In a systematic review of 17 single-case design studies focusing on communication partner training, Kent-Walsh et al. (2015) reported moderate intervention effect sizes and use of the following instructional strategies: (a) description and modeling of social skills and/or strategies, (b) verbal rehearsal, (c) practice and role play of target skills, and (d) guided practice during interactions with the augmentative communication system. Although only five of these studies included peer partners, the approaches are similar to those reported in a review by Therrien et al. (2016) of 19 studies designed to improve peer interactions of children 3–21 years of age who use aided AAC (i.e., speech-generating devices, picture symbols, and communication boards). Approaches included teaching peers strategies to be responsive communication partners to promote interactions and instructing children to use AAC within social interactions. In addition, 79% (or 15) of studies that integrated child-specific, peer-mediated, and environmental arrangement approaches reported stronger outcomes. Therrien et al. noted a lack of studies focused on teaching peers without disabilities within AAC interventions for preschool-age children with ASD. Other limitations in AAC intervention studies include small samples of children, few outcomes reported across communication partners, and a lack of attention to assessing generalization and maintenance of gains (van der Meer & Rispoli, 2010).

The author of the current article, along with her colleagues, has begun to address these limitations by examining preschool-based interventions that incorporate AAC and peer-mediated approaches, with effects measured across multiple communication outcomes and settings for children with ASD and limited to no spoken language. Table 1 summarizes three recent studies in regard to data collection, communication mode, child and peer communication measures, and treatment fidelity outcomes for a total of 52 children with ASD, 105 peer partners, and 45 school staff. Across these three studies, similar approaches were utilized to (a) teach peers to be responsive social partners and (b) instruct peers and children with ASD to communicate using the same AAC system. Recent advances in technology and the surging availability of iPads or other tablets have created an environment where most preschoolers have familiarity and commonly use these devices at home and at school. Emerging research has established evidence of effectiveness to support using this technology to improve communication outcomes and peer interactions (Light & McNaughton, 2013; Schlosser & Koul, 2015; Still et al., 2014; Therrien et al., 2016); however, a great deal more research is needed, particularly for young children with severe ASD and limited to no spoken language. In our recent research, we conducted both single-case designs (Thiemann-Bourque et al., 2016, 2017) and a randomized controlled trial (Thiemann-Bourque et al., 2018) to improve knowledge that will impact clinical practice for preschool-age children with moderate-to-severe ASD. Specific training components and AAC instructional approaches from this body of research will be discussed first, followed by recommendations for measuring social communication and observed study outcomes.

Peer Recruitment and Training

Given the abundance of research and empirical support for teaching young peers to initiate, respond, and prompt children with ASD to communicate and engage in social interactions (Goldstein et at., 2014, 2007; Watkins et al., 2015), it is surprising that few AAC intervention studies involving peers report on their characteristics or explain how they were selected for participation. Based on the author's 20 years of experience conducting research in this area, the following criteria are recommended to identify and recruit peers: (a) consistent school attendance, (b) interest in participating, (c) ability to follow instructions, (d) age-appropriate social skills, and (e) high social status or standing with other peers. Although some peers may not meet all criteria, training will likely be more feasible and implementation may be more reliable with those who meet the majority of these features. Prior to the start of the intervention, a team member (e.g., speech-language pathologist, special educator, or paraprofessional) meets with each peer to explain their role, review how often they will meet and what skills they will learn, what social activities they will engage in, and assure that the adult will be there to help as needed. At this age, the children with ASD would not attend the peer training sessions. Peers are trained in a quiet room and can be taught in small groups. Typically, up to three peers

Table 1. Data collection and social communication measures for preschool children with moderate-to-severe ASD and peers.

Study	Total *N*	Data collection	Communication mode measures	Child with ASD social measures	Peer social measures	Fidelity
Thiemann-Bourque et al. (2016)	FC = 4 P = 7 School staff = 3	6-min interval 2 activities per week	PECS Speech Gestures	Total spontaneous acts: initiations and responses Functions: gain attention, comments, requests, and shares Engagement	Total spontaneous acts: INs and RSs	90% school staff (range: 75%–100%)
Thiemann-Bourque et al. (2017)	FC = 3 P = 3 Research staff = 3	6-min interval 2 activities per week	SGD Speech Gestures	Total spontaneous acts: initiations and responses Functions: gain attention, comments, requests, and shares Reciprocity: IN + RS sequence totals Engagement	Total spontaneous acts: INs and RSs Reciprocity: IN + RS sequence totals	92% research staff (range: 86%–100%)
Thiemann-Bourque et al. (2018)	FC = 45 P = 95 School staff = 42	10-min interval 1–3 activities per week	SGD Speech Speech + SGD Gestures Vocalizations	Total spontaneous acts: INs and RSs Reciprocity: proportion of INs vs. RSs	Total spontaneous acts: INs and RSs Reciprocity: proportion of INs vs. RSs	89% school staff (range: 67%–100%) 83% peers (range: 60%–100%)

Note. ASD = autism spectrum disorder; FC = focal child; P = peer; PECS = Picture Exchange Communication System; SGD = speech-generating device; IN = initiations; RS = responses.

are recruited per child with ASD and participate for the length of the intervention. Peers rotate in dyads (one child: one peer) over 2 different consecutive days before the next peer joins. This allows each peer more time to become familiar with the expectations, practice the target skills, and demonstrate competencies. It also allows the focal child with ASD the opportunity to learn from the same peer models, as each will be unique.

Training follows a standard protocol of (a) labeling and defining target skill, (b) adult modeling, (c) adult–child practice, (d) child–child practice, and (e) corrective feedback and reinforcement. Time for training generally takes 75–90 min over 2–3 days, with each session lasting 25–30 min. Materials are created that illustrate and define each skill and substep in the form of a Buddy Book, a laminated flag, or other visual cues. These materials can be shared with the classroom teacher or other service providers working on the child's team. The peers are taught three buddy steps—"Stay–Play–Talk"—using a modified version of training strategies developed by Goldstein and colleagues (English et al., 1997; Goldstein et al., 1997). The main modifications to the original approach are adding AAC instruction during the "Talk" phase and teaching peers to use two naturalistic behavioral approaches found to improve child responsiveness (Alpert & Kaiser, 1992; Koegel et al., 2009). These latter two approaches focus on (a) teaching peers to elicit attention (labeled "Get Attention") prior to communicating and/or prompting AAC use by saying the child's name or using a gesture (e.g., tap on shoulder) and (b) creating an expectant pause and chance for the child to communicate (labeled "Hold and Wait"). Pictures and words for these two approaches are included in a Buddy Book, along with cues for Stay–Play–Talk steps. Steps to "Stay" with your buddy include (a) "sit close" and (b) "if your buddy moves, you move." Steps to "Play" with your buddy include (a) "share toys" and (b) "take turns." For the Talk phase, steps vary based on the AAC system. For example, steps for Talk using PECS include (a) "pick and put" (i.e., pick a picture, put in buddy's hand, and wait) and (b) "take, say, and give" (i.e., take the picture, say the picture, and give object to buddy). Steps for Talk using a speech-generating device (SGD) include (a) "look and listen" (i.e., look at buddy and listen to words) and (b) "push and talk" (i.e., push button and say words out loud). For the Talk phase using the iPad as an SGD with a voice output app (e.g., Touch Chat, Proloquo2go), peers practice with an adult using preprogrammed vocabulary that matches functional communication for upcoming social activities with a student with ASD. Symbols on each page provide multiple reasons to communicate, such as to request objects, request actions, comment, use social niceties (e.g., "You did it!", "High five!"), or request attention (e.g., pictures of peer and focal child). Although the ultimate goal is to increase a child's repertoire of a range of communicative functions, initial instruction and SGD programming should be based on individual child needs and strengths. One additional peer training approach is to have peers view a short video recording on different ways children communicate, including the type(s) of AAC system they will be trained on. For example, we have created short clips of communicative interactions between peer actors using the intended AAC system. At the end of peer training, we present a certificate to each peer for learning to be a good buddy, and we send a Buddy Book home to keep parents informed. This book is also shared with the child's special education team.

SGD Intervention for the Child–Peer Dyad

The school staff implementer sets up the environment and follows a sequence of steps to help the children experience successful communicative interactions (see Table 2). Once the peers are trained, one is selected to join the child with ASD in a planned social activity in the classroom or quiet room nearby. Sessions are conducted for 15–20 min, 3 times (or more) per week. The flag or other visual cue is always present to remind peers of the steps. The same peers participate weekly for 3–4 months (or longer, depending on time available), with the option to train additional peers as child behaviors improve across partners and new settings. In our most recent study (Thiemann-Bourque et al., 2018), we collected peer fidelity data on implementation of steps that corresponded to staying close and sharing toys, gaining attention, promptly responding, communicating with the SGD, responding to adult prompts, saying words out loud, and enjoyment/showing affect (see Table 3). Data collected for 41% of treatment sessions revealed that peer implementation fidelity was 83% on average (range: 60%–100%).

The setting for the group will vary based on what is needed to maintain child attention and decrease potential distractions or behavioral challenges. Activities to elicit child and peer communication are planned according to preference assessment, parent/teacher report, and clinical judgment of toys/games that will motivate children to interact. Motivational learning perspectives build on the transactional model of social communication development by considering the contribution that natural social reinforcers play within child–peer social exchanges. In our previous work, we observed that preferred activities within preschool routines can be important for initial increases in child communication; specifically, we found that children engaged in higher rates of communication and were more consistently engaged in the context of snack and cause–effect toys (Thiemann-Bourque et al., 2017). Other examples of highly preferred activities include creating matching games of pictures from favorite TV shows or movies, simple puzzles (e.g., trains, shapes, and gears), hammer and ball runs, and toys that play music or make sounds. It is likely that some child-preferred activities may not be motivating for the peer partners, and this is important to consider given that social situations that increase the rewards and minimize the costs for peers are preferred (Goldstein & Morgan, 2002). As quickly as possible after children begin to spontaneously communicate, additional activities that appeal to both partners are recommended, even if only introduced for part of the session. In addition, the environment should be set up to provide multiple communication opportunities for both partners to be the initiator and the responder. For example, in one activity, children take turns sending cars through a long tube (cardboard tube from gift wrapping). One child has a container with the cars, and one has the tube. They are each assigned a role at the start—holder of the container or holder of the tube—then one child would request a car (e.g., "Car please."), and the other would respond to the request (e.g., "Here you go."), followed by possibly commenting on an action (e.g., "It's fast!") and responding to the comment (e.g., "That's cool!"), and/or requesting attention (e.g., "(Name), look how far!") and responding to this request (e.g., "I see it."). Once each child has approximately five to eight turns communicating within each role, they would then switch roles. Children with ASD and more significant communication and/or

Table 2. Treatment fidelity steps for staff implementation of instruction with child–peer dyad.

1. Social environment setup:
   - ☐ iPad programmed with appropriate symbols that match activity and provide different reasons to communicate (e.g., to request, to comment, and/or to gain attention).
   - ☐ One trained peer.
   - ☐ STAY–PLAY–TALK flag and/or Peer Buddy Book to cue strategy use with peers.
   - ☐ Activity is set up for multiple opportunities to communicate (e.g., turns with parts).
2. Remind peer: "Today you are going to STAY, PLAY and TALK with _____."
3. Remind peer: "You learned how to *hold and wait* so ____ has to ask you for a turn/toy; and you can *get* ___*'s attention* by tapping him on the shoulder and saying his name."
4. Demonstrate to focal child and peer the activity steps, rules, expectations and assign roles (e.g., "Peer you are in charge of the box with the cars to start, then we will switch and you will ask focal child for the cars.")
5. Direct instruction to peer prior to activity:
   - ☐ Adult prompts peer to push a button to communicate to focal child.
   - ☐ Adult prompts focal child to respond (e.g., give toy, answer by pushing button).
6. Direct instruction to focal child prior to activity: (May need to provide hand–hand prompts to communicate; encourage imitation of symbol selection and use of words)
   - ☐ Adult prompts focal child to push a button to communicate to peer.
   - ☐ Adult prompts peer to respond (e.g., give toy, answer by pushing button).
7. During activity: Adult provides prompts as needed every 30 s to 1 min at appropriate times and follows least to most prompting hierarchy (example below):
   a. Adult tells peer to hold up toy and wait for focal child to communicate.
   b. Adult tells peer to point to appropriate button for focal child to push.
   c. Adult tells peer to push the button and to tell child, "Say _____."
   d. Adult prompts focal child hand-over-hand to select symbol and communicate (combine with verbal imitation if appropriate) for a successful exchange.
8. Activity lasts a minimum of 15–20 min.

Table 3. Treatment fidelity steps for peer implementation following Stay–Play–Talk with iPad training.

1. Peer stays within 2–3 ft of focal child; does not leave the play area.
2. Peer plays with the same materials/toys as the focal child.
3. Peer gives and shares toys with the focal child.
4. Peer is successful the majority of time (i.e., 75% or more, or 3 out of 4 times) in gaining focal child's attention prior to communicating.
5. Peer responds to focal child communication attempts within an acceptable time frame (e.g., adult does not need to prompt peer response).
6. Peer communicates to the focal child using the SGD system at least 5 times during the 10-min activity (to initiate or respond UNPROMPTED).
7. Peer communicates to the focal child using the SGD system at least 10 times during the 10-min activity (to initiate or respond UNPROMPTED).
8. Peer listens and responds the majority of time to adult prompts to use the SGD after the FIRST adult prompt.
9. Peer listens and responds the majority of time to adult prompts to say words out loud to focus child after the FIRST prompt.
10. Peer appears to be having fun and smiles or shows appropriate affect while playing.

Note. SGD = speech-generating device.

behavior challenges will need more assistance to become successful at giving/sharing toys and waiting for a peer to initiate or take a turn. These social behaviors are necessary to improve the quality of the interactions and enjoyment for both partners, and although they may not be observed initially, they should be expected and targeted as soon as possible. Finally, there is a balance that needs to be assessed between the selection of an activity that will highly motivate a child to communicate (i.e., most preferred toys or objects) and the potential consequences of a child becoming overly focused and unable to share attention and turns with peers in this activity.

The goal of effective peer-mediated AAC interventions is increased spontaneous functional communication. Across our projects, we have observed that children with ASD and peers will communicate more often with the adult, especially at the start of intervention. Therefore, the adult sets up the environment for success and then turns slightly away to observe the interaction. As necessary and at appropriate times (e.g., when a symbol matches the observed communicative context), the implementer provides prompts through the peer who then prompts the child with ASD. One possible prompting sequence provided to a peer is (a) say the child's name (*Get Attention*) and hold up the desired object (*Hold and Wait*); (b) point to the symbol and wait; (c) select and push the symbol and say, "Ask me for the ____" to model the symbol; and then (d) adult prompts focal child to select symbol (and imitate if verbal) to complete a successful communication exchange, using hand-to-hand cues if needed. School staff who have successfully implemented these intervention procedures have included speech-language pathologists, early childhood special education teachers, behavior specialists, and paraprofessionals. Based on completion of checklists with 10–12 primary treatment steps (e.g., appropriate vocabulary/symbols on iPad, remind peer to use steps, practice using AAC with adult partner and peer, and using a hierarchy of prompts to elicit successful interactions), fidelity of intervention has ranged from an average of 89%–92% across studies. In addition to fidelity of implementation, there are a number of other methods to document the success of peer-mediated AAC interventions in improving peer-related social communication competence.

Outcomes of Peer-Mediated AAC Interventions

How Often Do They Communicate?

The most common method to measure the effects of social communication interventions is to count the total rates of targeted skills children use in a specified period of time. For example, coding of behaviors may occur using a 6- or 10-min interval selected from a longer 15- to 20-min social activity. In our work, with repeated observations over time, this is a sufficient amount of time to document communication changes between children with ASD and peers without disabilities. This approach is preferred over time sampling methods that may not provide a complete picture or capture all communication attempts for children with ASD and limited to no spoken language. Given that the primary goal of including and training peers is to improve communication and successful back-and-forth exchanges, it is also essential to report changes in behaviors for the peer partners. In addition, measuring peer outcomes will enhance and refine knowledge on (a) peer section criteria, (b) skills that peers can easily learn and maintain effectively, and (c) expectations for peer implementation of strategies across different partners and settings.

In teaching peers to use PECS (Thiemann-Bourque et al., 2016), we noted an increase in average number of spontaneous acts (initiations and responses) from 0.04 in baseline to 6 per session (range: 0–13) for the four preschool children with ASD and an increase from an average of 0.2 in baseline to 7 acts in treatment (range: 1–18) for the peers. Tau-U effect sizes (Parker et al., 2011) calculated to provide a quantitative measure of the degree of change between baseline and treatment were large (i.e., .8–1.0) both individually and when combined across partners. Similarly, in the peer-mediated GoTalk4+ (Attainment Company, 2012) intervention, average communication rates for the three children with ASD increased from a baseline average of 0 to a treatment average of 6 acts per session (range: 0–22). Treatment rates for the three peers also increased to an average of 11 acts (range: 1–18). Effect sizes were moderate for the focal children (Tau-U range: 0.50–0.67) and large for the peers (Tau-U range: 0.88–1.0; Thiemann-Bourque et al., 2017). In the randomized group design, we recruited four cohorts of $N = 12$ preschool children with

ASD over 4 years, for a total of 45 preschool-age children with ASD and 95 peers (Thiemann-Bourque et al., 2018). At the start of each year, children with ASD were matched on cognitive skills and then randomly assigned to an SGD intervention that incorporated peer training or a comparison group with SGD communication activities and an untrained peer. For each cohort, we conducted a series of multiple-baseline designs across participants, and at the end of 4 years, we examined group differences between 23 children receiving the peer-mediated SGD intervention and 22 children in the Business as Usual condition using multivariate multilevel modeling. Children were between ages 2;11 and 5;0 (years;months) and had moderate-to-severe ASD with limited to no spoken communication (i.e., less than 20 spontaneous words). Trained peers (ages 3;4–5;1) were taught Stay–Play–Talk strategies and how to use the same SGD system (i.e., iPad with a voice output app) prior to taking turns in dyadic social activities with the focal child 2–3 times per week. We observed significant increases in rates of communication acts for children with ASD and peers assigned to treatment, compared to children in the comparison condition, with large effect sizes (d = 1.12 for focal children and d = 1.09 for peers). Significant improvements for the treatment group were also observed in generalization settings (i.e., a novel location) for both communication partners, and children maintained these changes 6–8 weeks postintervention. Unique to this study was measuring communication between children with ASD and unfamiliar peers (i.e., new peers not involved in the study) during the last month of treatment. Results revealed that children with ASD who received the peer-mediated SGD intervention communicated at significantly higher rates with their assigned new peers than children with ASD in the comparison condition who also participated in social activities with new peers. An additional communication outcome was the impact on one standardized language measure—that is, children in the treatment group had significantly higher raw scores on the Expressive Language subtest of the Mullen Scales of Early Learning (Mullen, 1995) from pre- to postintervention.

Is the Communication Reciprocal?

Successful outcomes should ultimately reflect a greater balance in communicative turns, as this can discriminate the quality of an interaction as opposed to the number of utterances for one partner (Goldstein & Kaczmarek, 1992). Following SGD instruction with trained peer partners, we have documented improved back-and-forth exchanges between preschoolers with ASD and peers, with reciprocity measured in two ways. First, we totaled the number of separate initiation and response sequences, with (at minimum) either partner initiating communication to start the exchange and the other partner responding within 3 s (Thiemann-Bourque et al., 2017). Sequential exchanges were defined by a 3-s pause between each initiation. In exploring changes in reciprocity across different preschool settings, we found markedly higher reciprocal exchanges during cause–effect toys (M = 9 child–peer exchanges per session) and snack (M = 11 exchanges), compared to center activities (M = 2; e.g., art, puzzles, sorting, or block play) for all children. These outcomes support the potential clinical benefits of varying the social intervention context to program for increased generalized outcomes. Second, using the same definition and time frame for an initiation and response sequence, we analyzed group differences in the proportion of each type of act expressed or, in other words, the balance of initiations and responses for children with ASD and peer partners (Thiemann-Bourque et al., 2018). Outcomes showed that, after baseline, children in the treatment group achieved more balanced levels of initiations and responses (approximately 50:50), whereas children in the Business as Usual condition demonstrated an unbalanced proportion of initiations and responses (approximately 30:70).

Together, these results provide support for how peer-mediated and AAC instructional approaches may positively alter reciprocal communication development, a core-defining characteristic for children with ASD. One limitation that needs to be addressed in future studies is the length of time children are given to communicate in one reciprocal turn. For example, a 5-s pause between communication acts may be more valid as it would allow children additional time to scan and select desired symbols and comprehend language to appropriately respond in turn. Another recommended coding consideration is to observe changes in communication acts that are related to different topics versus defining reciprocal exchanges based strictly on timing. Furthermore, sequential analyses are needed that illuminate how the use of specific communicative functions may differentially influence the expression of other types of functions, to ultimately help children participate in extended conversations as their social skills develop.

Is There a Range of Functions and Modalities?

To successfully participate in a broad variety of social and academic activities, children need to be able to communicate for different purposes and with increasingly sophisticated means or modalities. In contrast to typically developing children, children with ASD express a limited range of communicative functions—with requesting skills more developed than comments or bids to engage in joint attention (Shumway & Wetherby, 2009). This can lead to interactions where personal needs are met rather than engaging in socially oriented experiences, and a limited range of these early skills is associated with later difficulties in peer interaction skills (Charman, 2003; Freeman et al., 2015). Furthermore, the development of different modalities such as gestures, vocalizing, combining sounds to form words, and selecting symbols or using speech signifies growing linguistic complexity—skills clearly associated with later language and social development (Crais et al., 2004; Koegel et al., 2001). According to the National Joint Committee for the Communication Needs of Persons with Severe Disabilities, "AAC is truly multimodal, permitting individuals to use every mode possible to communicate. The best form or

forms of communication are determined by the individual with disabilities and their communication partners." To date, the primary targeted communication outcome of AAC intervention research is requesting skills (Iacono et al., 2016), and AAC studies documenting treatment effects on a range of communicative functions or modalities for children with ASD are minimal (Logan et al., 2017).

Bourque and Goldstein (2020) addressed this gap in AAC intervention research by recoding communication data for one cohort (n = 6) of children with ASD who participated in the Thiemann-Bourque et al. (2018) study. They measured changes in four communicative functions (i.e., requests for objects, requests for actions, comments, and requests for attention) and four modalities (i.e., gestures, speech, SGD, or speech + SGD), expressed as initiations or responses by children with ASD to trained peer partners. This in-depth analysis revealed differential responses in functions and modalities during treatment. Not surprisingly, all children showed (a) increased communication to peers to request objects and (b) increased use of the iPad as their primary communication mode. Of interest was the finding that three of the children began using four modalities including greater speech and speech combined with SGD use, and the other three improved mainly in use of two modalities—gestures and SGD. This outcome suggests the need to provide multimodal communication options to determine the best fit for individual children. Furthermore, some children showed higher rates of comments and requests for actions to peers, and minimal changes were noted for all children in gaining attention. These outcomes expand our knowledge on possible treatment strategies to help preschool-age children with severe ASD and minimal to no speech communicate with peers for different social purposes using their best modalities. For example, some children may be more responsive learning to interact with peers during physical games such rolling balls/cars down a paper tube or jumping on a small trampoline using signs (e.g., me/my turn) and gestures (e.g., pointing) with hand-over-hand adult prompts (initially) to request turns using AAC, whereas other children may respond sooner to peer prompts to request or comment using AAC, speech, or a combination of modalities.

Conclusion

Over 20 years ago, Sevcik et al. (1995) noted the importance of providing instruction to communication partners of individuals using AAC noting that this "…allows partners to validate the aided system as an acceptable and effective mode of communication, while providing a model of how the system can be used, in what contexts, and for what purposes." This research note provides a summary of the author's recent research on teaching peer communication partners of a specific population—preschool-age children with ASD and severe communication deficits who are learning to use AAC. At a young age, peers can be taught to model, prompt, and provide key language and AAC input during preschool activities with children with ASD. When children with ASD are provided with routine opportunities to observe peer AAC and language models in supported shared activities, their ability to initiate, respond, and engage in reciprocal exchanges improves. By teaching peers to be responsive listeners and AAC partners, we are changing a child's social environment and number of learning opportunities—increasing the likelihood that both partners will become more competent in their social communicative interactions across familiar and novel social contexts. In addition, preliminary results demonstrate the promise of integrating peer mediation and AAC instruction to help children learn a larger repertoire of communicative functions and modalities (Bourque & Goldstein, 2020). One direction for future research is to determine how to best define and assess the construct of peer-related social communication competence and how children learning to use AAC may exhibit different profiles that require individualized treatment approaches. An assessment tool that provides a valid depiction of children's communication competence with peers in authentic social contexts, including strengths in early behaviors (e.g., gestures, vocalizations, joint attention) and later symbolic communication (e.g., SGD use, speech, or combined SGD + speech), would provide a more effective means to identify socially valid communication targets and select the most appropriate treatment options.

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