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Enhancing Peer Network Interventions for Students With Complex Communication Needs

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Abstract

Educators need effective ways to build the communication skills of students learning to use aided augmentative and alternative communication (AAC) and support their interactions with peers. This study used a multiple-probe-across-participants design to evaluate the effectiveness of a paraprofessional-facilitated peer network intervention to (a) increase peer interaction for students with complex communication needs and (b) investigate whether embedding peer-implemented aided AAC modeling within the intervention would increase students' use of symbolic communication (i.e., aided AAC, signs, speech). Participants were four elementary-age students with intellectual disability or autism who used a speech-generating device or communication book. The peer network increased students' overall interactions with peers but not their symbolic communication. Teaching peers to use aided AAC modeling through brief training and coaching resulted in increasing students' use of symbolic communication within interactions with peers. Implications are offered related to supporting peer interaction, improving symbolic communication skills, and involving peers in social-communication interventions.

In collaboration with speech language pathologists (SLPs), special educators are responsible for supporting students' language and communication skills (Council for Exceptional Children, 2015). This is particularly important and especially challenging when working with students with severe disabilities (e.g., autism, intellectual disability, multiple disabilities) who have *complex communication needs*—a term used when a student has limited or no use of functional spoken language to meet daily communication needs (Beukelman & Mirenda, 2013). A substantial and growing body of literature demonstrates that interventions involving aided augmentative and alternative communication (AAC) are effective to improve the communication skills of students who have complex communication needs (Beukelman & Mirenda, 2013; Biggs, Carter, & Gilson, in press; Logan, Iacono, & Trembath, 2017; Snell et al., 2010). *Aided AAC* refers to the use of electronic or nonelectronic tools, such as pictures, communication boards, or speech-generating devices, to supplement or replace natural speech to communicate (American Speech-Language-Hearing Association, 2018).

Although different forms of aided AAC provide essential access to communication, many students who are learning to use aided AAC experience challenges interacting with their peers. Chung, Carter, and Sisco (2012) observed 16 elementary and middle school students who used AAC and found students

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communicated almost exclusively with paraprofessionals or special educators, despite being in close proximity to their peers within inclusive settings. Similarly, Andzik, Chung, and Kranak (2016) found only 3% of the communication turns of elementary students using AAC were with peers. Engaging and interacting with peers within inclusive settings can form the basis for friendships, which in turn have a cascading impact on social well-being and overall quality of life (World Health Organization, 2007). Thus, research is clearly needed to identify effective ways educators can help students build communication skills, interact, and form positive relationships with peers within inclusive settings.

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Peer network interventions are designed to improve peer interaction and relationships by supporting greater integration into social environments (Asmus et al., 2017; Carter et al., 2013). Although specific procedures vary, peer network interventions share three core features: (a) establishing repeated interaction opportunities during shared social activities, (b) providing adult facilitation, and (c) equipping peers to be effective communication partners. For example, Haring and Breen (1992) evaluated the impact of peer networks for two middle school students with autism or intellectual disability by planning interaction opportunities throughout the day, teaching peers to initiate interaction, and developing strategies to help students respond to interactions. Results indicated the networks increased the quantity and quality of interactions between students and peers. Garrison-Harrell, Kamps, and Kravits (1997) established peer networks for elementary students with autism and limited verbal communication. The researchers trained students to identify symbols on a communication board, provided peer training, and introduced interactive activities across settings (e.g., language arts, lunch, recess). The intervention increased social interaction and AAC use for all three students. In a more recent series of studies by Kamps and colleagues (2014, 2015; Mason et al., 2014), school staff implemented peer networks with elementary students with autism by creating social groups involving shared play activities and direct instruction on social-communicative skills; in each study, peer networks increased students' communication and initiations with their peers.

Despite the evidence for the efficacy of peer network interventions to increase interaction, little is known about using peer networks with students with complex communication needs. Although Garrison-Harrell and colleagues (1997) focused on students with complex communication needs, researchers implemented the intervention and acknowledged potential feasibility challenges for school staff because extensive time was dedicated to one-to-one AAC training with students. Moreover, current research does not offer insight into whether peer network interventions could be used not only to promote positive social experiences but also to improve aspects of students' communication skills—without requiring separate teaching in self-contained settings. For example, one important aspect of students' communication development is the transition to using symbols expressively (Beukelman & Mirenda, 2013). When students build skills to use symbols expressively—whether through spoken words, signs, or graphic symbols with aided AAC—they can communicate about abstract concepts and express their thoughts about the future, the past, and things not present in their current setting. Students who rely on nonsymbolic communication (e.g., gestures, facial expressions) are limited to being able to communicate only about things in their immediate setting. Thus, research is needed that (a) addresses the effectiveness and social validity of peer network interventions for students with complex communication needs when the intervention is implemented by school staff and (b) explores whether adaptations to peer

network interventions could effectively promote the development of aspects of students' communication skills (e.g., use of symbolic communication) within the context of meaningful interactions with their peers.

The goals for the present study were to evaluate the effectiveness of a peer network intervention to increase interaction for students with complex communication needs and investigate whether embedding peer-implemented aided AAC modeling would improve students' use of symbolic communication. Aided AAC modeling involves providing language models using both speech and aided AAC. One approach to aided AAC modeling—referred to as augmented input, aided language modeling, or aided language stimulation—involves a communication partner using an aided AAC device alongside spoken language in natural, ongoing interactions (Biggs et al., in press). Unlike with models functioning as prompts, a student is not expected to immediately imitate the modeled symbol. For example, when looking at a book about animals, a peer might point to a picture; say, "Look at that huge elephant!"; and press *LOOK* and *HUGE* on a speech-generating device. The theory underlying this approach recognizes that students may rarely see others use aided AAC and that this asymmetry between communication input and expected output contributes to challenges learning to use AAC (Romski & Sevcik, 1996). Teaching peers to use aided AAC as a shared means of communication could demonstrate the device is a useful mode of communication and help students build connections between the meaning of spoken words, graphic symbols, and their referents (Biggs et al., in press; Romski & Sevcik, 1996).

Three recent systematic reviews concluded interventions involving aided AAC modeling can improve students' expressive and receptive communication skills (Allen, Schlosser, Brock, & Shane, 2017; Biggs et al., in press; Sennott, Light, & McNaughton, 2016). In a best-evidence synthesis of 10 studies, Sennott et al. (2016) concluded naturalistic aided AAC interventions were effective to improve communication skills in the areas of pragmatics, vocabulary (i.e., semantics), and grammar (i.e., syntax, morphology). Allen et al. (2017) conducted a systematic review of 19 studies and found that augmented-input interventions improved both receptive and expressive communication outcomes. In a broader review, Biggs et al. (in press) categorized interventions in 48 studies according to three distinct but related forms of aided AAC modeling—augmented input, aided AAC models as prompts, and aided-AAC models within instructional demonstrations. Although interventions involving each form of aided AAC modeling were found to improve expressive communication outcomes, findings also indicated that aided AAC modeling has most often been evaluated in combination with other intervention strategies. Within the review, the few studies that focused exclusively on or isolated aided AAC modeling included only young, preschool-age children, and none examined the isolated impact of peer-implemented aided AAC modeling. Therefore, relatively little is known about the unique impact of peers' use of aided AAC modeling to improve students' communication skills separate from or beyond other intervention strategies.

In the present study, we focused on the effectiveness of a peer network intervention involving aided AAC modeling by addressing the following research questions: (a) Does introducing a peer network intervention during lunch or recess increase students' overall interaction with peers and their nonprompted symbolic communication? Building on the findings of other studies on the effectiveness of peer network interventions (e.g., Asmus et al., 2017; Garrison-Harrell et al., 1997; Kamps et al., 2015), we anticipated the intervention would increase peer interaction overall, but we expected only modest or no changes in students' use of symbolic communication. (b) Is training (i.e., oral instruction, modeling, practice with feedback) and coaching effective to teach peers to provide aided AAC models during peer network sessions? We anticipated a brief training paired with two sessions with coaching would be effective to teach peers to model AAC during their

interactions. (c) Does the addition of peer-implemented aided AAC modeling increase students' nonprompted symbolic communication? Building on the findings of systematic reviews of the effectiveness of aided AAC modeling (i.e., Allen et al., 2017; Biggs et al., in press; Sennott et al., 2016), we anticipated increases in students' symbolic communication with peers only after introducing the peer-implemented aided AAC modeling component. We also addressed the social validity of the intervention by investigating how students, peers, and educators viewed its acceptability, feasibility, and impact.

Method

Students With Severe Disabilities

Students had to meet the following inclusion criteria: (a) be enrolled in elementary school, Grades 3 through 5; (b) receive special education services under the categories of intellectual disability, autism, or multiple disabilities; (c) have a significant cognitive impairment, as determined by eligibility for the state's alternate assessment; (d) be learning to use aided AAC; (e) communicate intentionally using nonsymbolic and early-emerging symbolic communication; and (f) demonstrate basic symbol-referent associations for familiar objects. Eligible aided AAC included electronic and nonelectronic devices with capacity to display a minimum of 20 graphic symbols. We used informal and formal assessments, observations, and record review to determine if students met inclusion criteria (see Table 1). During screening, we used teacher ratings from the Communication Matrix (Rowland, 2009) to determine if students had (a) surpassed preintentional levels of communication and (b) not mastered using a symbolic level for more than two of four communicative functions (i.e., refuse, obtain, social, information). We also collected 30-min communication samples across three or four settings, requiring that students produced on average (a) at least one intentional communicative act to any partner in any mode (i.e., any verbal or nonverbal interactive behavior directed to another partner that was accompanied by evidence of communicative intent) and (b) fewer than 15 nonprompted symbolic communicative acts to any partner (i.e., using speech, aided AAC, or signs). We used a receptive labeling task to determine if students demonstrated basic symbol-referent associations for familiar, functional items (e.g., pencil, book). All students correctly identified the corresponding color, line-drawn, 2-by-2-inch symbol from an array of three choices in 80% or more of 10 trials (i.e., two times each for five symbols).

Sara. Sara was a 9-year-old Hispanic female in the fourth grade. She was diagnosed with an intellectual disability and a seizure disorder at 3 years of age. According to educational records, Sara received a composite standard score of 50 on the Comprehensive Test of Nonverbal Intelligence—Second Edition (CTONI-2). Sara's family spoke both English and Spanish, but her parents indicated her primary language was English. Sara spent most of the school day in a special education classroom and participated with peers without disabilities in related arts classes (e.g., physical education, art), lunch, recess, and a 15-min morning meeting. Sara communicated using gestures and vocalizations and had limited intelligible speech consisting of *hello, bye-bye*, and animal sounds. She had used a QuickTalker23 speech-generating device for a year, prior to which she used a communication book. The speech-generating device was set up with one static page displaying 17 line-drawn symbols; she used two symbols (i.e., Play-Doh, iPad) independently to request desired activities. Although the district owned the device, Sara took it home regularly. Sara's communication goals in her individualized education program (IEP) focused on using multiple communication modes (e.g., speech, pictures, speech-generating device) to request desired objects or activities and receptively identifying pictures representing actions and objects. Communication Matrix ratings indicated Sara used single symbols to refuse and obtain items and nonsymbolic communication (e.g., gestures, vocalizations) to request attention, show

Table 1. Student Characteristics, Peer Network Activities, and Target Vocabulary.

Name, age, grade, primary disability	Vineland-II[a]	Theme (activities)	Core vocabulary	Activity-related vocabulary
Sara, 9, fourth, intellectual disability	Communication 44 (<1%) Daily living 49 (<1%) Socialization 57 (<1%) Motor skills 46	Animals (animal tangrams, Play-Doh animals, books, animal crafts, animal dominos)	Help Turn You That Finished Like What Go Not Make	Animal Puzzle Food Fun Walk
Grace, 9, third, autism	Communication 62 (1%) Daily living 65 (1%) Socialization 60 (<1%) Motor skills 61	Fashion (paper dolls, making jewelry, painting nails, fashion stickers, books and magazines)	You That Make She Is Can Do Not Off On	Paint Leggings Hair Bow Magazines Jewelry Stickers Outfit Girl Ribbon
Jeremy, 10, fourth, autism	Communication 69 (2%) Daily living 62 (1%) Socialization 60 (<1%) Motor skills 59	Outer space (planet memory game, space station set, magnetic planets, books, solar system model, space puzzle)	More Want Need I You Turn Finished Like This Go	Planet Moon Star Puzzle Rocket Sun Astronaut Solar system Fun
Joanna, 10, fourth, autism	Communication 62 (1%) Daily living 63 (1%) Socialization 71 (3%) Motor skills 75	Board games (Jenga, matching game, Kerplunk, Chickyboom, Go Fish, Uno)	Same Different Play Look Like Top Out On Again No	Scared Game Match Loud Fall down My turn Your turn Good job Happy Fun

[a]Standard scores and percentiles from the teacher rating of the Vineland Adaptive Behavior Scales, Second Edition. Standard scores for the motor-skills domain are estimated for children 7 years and older; therefore, percentiles are not calculated.

affection, and direct attention. Across communication samples, Sara had an average of 13 communicative acts per 30 min; the majority were to adults (71%) and nonsymbolic (66%). Nearly all symbolic communicative acts were in the special education classroom with adults, and more than half (62%) were prompted.

Grace. Grace was a 9-year-old White-Hispanic female in the third grade. She received a medical diagnosis of autism at 2 years of age. Her

family spoke English at home. Grace spent about 2.5 hr each school day in a special education classroom and the remainder in general education settings with one-to-one paraprofessional support throughout the day. She communicated using gestures, speech, and an iPad with Proloquo2Go. Her speech often involved echolalia and a sing-song voice. She had used Proloquo2Go for approximately 2 years, and it was programmed with nearly 300 graphic symbols across "home" and "school" pages. She used only five symbols independently, always to request desired objects or activities. The district owned the iPad, but Grace took it home regularly. Grace's communication-related IEP goals focused on requesting, protesting, commenting, and interacting with her peers. Communication Matrix ratings indicated Grace used symbolic communication to refuse and obtain items, and only occasionally used gestures to request attention and show affection. Across communication samples, Grace had an average of two communicative acts per 30 min; the majority were to adults (72%) and nonsymbolic (57%). During observations, Grace frequently did not respond when teachers or peers interacted with her.

Jeremy. Jeremy was a 10-year-old White male in the fourth grade. Jeremy was diagnosed with Down syndrome at birth and received a medical diagnosis of autism at 6 years of age. According to educational records, he had not participated in an assessment of intellectual functioning since preschool, when scores on the Mullen Scales of Early Learning indicated significant delays across all areas of functioning. Jeremy spent about 2 hr each day in a special education classroom and the remainder in general education settings with one-to-one paraprofessional support throughout the day. He communicated using gestures, vocalizations, and speech; however, his speech was typically unintelligible even to familiar partners. Jeremy had used a QuickTalker23 speech-generating device for 4 years, but he rarely used it outside of structured language therapy and did not take it home. The speech-generating device had one static communication page displaying 23 color, line-drawn symbols, but he did not use any symbols independently. Jeremy's communication-related IEP goals focused on using multiple communication modes (e.g., aided AAC, speech) to communicate wants and needs; to comment about objects, pictures, or events; and to interact with peers during play. Communication Matrix ratings indicated Jeremy used single words to refuse and obtain things and nonsymbolic communication to request attention, show affection, and direct attention. Across communication samples, Jeremy had an average of 19 communicative acts per 30 min; the majority (84%) were with his peers and nonsymbolic (88%). Jeremy frequently engaged in back-and-forth unconventional social routines with his peers, such as taking turns imitating one another's body movements (e.g., waving both pointer fingers from side to side) and nonword vocalizations (e.g., "oh-cha").

Joanna. Joanna was a 10-year-old Hispanic female in the fourth grade. She was medically diagnosed with autism and a seizure disorder at 2 years of age. Her family spoke both English and Spanish, and her parents indicated she had comparable skills in both languages. According to educational records, she received a nonverbal intelligence standard score of 59 when evaluated with the CTONI-2 in kindergarten. Joanna received one-to-one paraprofessional support throughout the day. She spent most of the day in a special education classroom with the exception of related arts classes (e.g., physical education, art), lunch, recess, and 1 hr of academic instruction. She communicated using gestures and speech; however, her speech was at a low volume with limited intelligibility to unfamiliar partners. For several years she had used line-drawn symbols to communicate in the special education classroom. These symbols were organized in a communication book just prior to the start of the study, but she rarely used it outside of therapy with the SLP. Joanna's communication-related IEP goals focused on using phrases and sentences to request objects or actions and using aided AAC or speech to comment about activities. Communication Matrix ratings indicated Joanna used combinations of two or more words to refuse

and obtain items and was beginning to use early-emerging symbolic communication across social and information functions (e.g., greeting, showing affection, naming things or people, asking questions). During communication samples, Joanna had an average of 10 communicative acts per 30 min; nearly all (92%) were with adults, and just over one half (58%) were symbolic, using speech.

Peer Network Facilitators and Planning Team Members

Paraprofessionals who worked with each student facilitated the peer networks; a substitute paraprofessional participated when Joanna's facilitator was on leave (see Supplementary Table 1, which is available online). All reported they had not received training in the previous 2 years related to AAC or supporting peer interaction. Each student also had a planning team consisting of a facilitator, parent(s), special educator, and SLP. Jeremy's general educator also participated. Sara and Joanna had the same special educator, and Grace and Sara had the same SLP.

Peer Network Members

Immediately prior to the implementation of the peer network intervention, each planning team identified two or more peers without severe disabilities to be peer network members. Peers had to be in the inclusive setting identified for the intervention and within one grade level of the student. We encouraged teams to ask students for input and identify peers who had consistent school attendance, had positive interactions with the student, got along with one another, and were likely to enjoy the network. Planning teams invited 13 peers, and all participated (see Supplementary Table 1, available online). In addition to peer network members, other peers often informally joined activities and interactions during Jeremy's and Sara's network meetings.

Settings

Students attended two racially and ethnically diverse elementary schools in an urban school district. Both served over 600 students, of which more than one quarter received free or reduced-price meals and approximately one tenth were English language learners. Peer network meetings took place in an inclusive, nonacademic setting that occurred daily and was identified by each student's special educator. For Sara, Grace, and Joanna, meetings took place during 30-min lunch periods. Due to high noise levels and limited space in the cafeteria, each facilitator opted to find another location (e.g., open lobby space near the cafeteria). Jeremy's network took place during a 25-min indoor recess in his general education classroom, during which 19 students and three adults (i.e., general educator, paraprofessional, American Sign Language [ASL] translator) were present in the room.

Experimental Design and Procedures

We used a multiple-probe-across-participants design with a baseline and two intervention phases (i.e., A-B-BC) to sequentially evaluate the effects of the peer network intervention (B) and an added aided AAC modeling component (BC) on students' overall interaction and nonprompted symbolic communication with peers. We hypothesized that (a) the peer network would increase overall interaction (but not symbolic communication) and (b) peer instruction on aided AAC modeling would increase students' symbolic communication through their peers' use of aided AAC modeling. Thus, we made phase change decisions based on rates of students' overall interaction for the first intervention phase and rates of nonprompted symbolic communication and peer aided AAC models for the second intervention phase. We used visual analysis to determine functional relations by examining data for changes in level, trend, and variability while considering overlap, immediacy of effect, and consistency across cases.

Baseline phase (A). We observed the setting in which the peer network would be established two to four times per week and asked adults to support the student as they ordinarily did. All

Table 2. Descriptive Summary by Participant and Study Phase.

	Sara			Grace			Jeremy			Joanna		
Variable	BL	PN	PN+M	BL	PN	PN+M	BL	PN	PN+M	BL	PN	PN+M
Student communication[a]	<1 (0–2)	18 (6–30)	22 (15–27)	4 (0–8)	13 (6–24)	17 (9–30)	12 (0–26)	31 (9–59)	40 (15–81)	<1 (0–1)	28 (13–38)	37 (23–51)
Independent symbolic	0 (0–0)	1 (0–6)	10 (5–15)	<1 (0–3)	1 (0–3)	5 (2–8)	1 (0–8)	4 (0–8)	23 (10–44)	<1 (0–1)	12 (7–21)	20 (6–30)
Imitated symbolic	0 (0–0)	<1 (0–2)	2 (0–4)	1 (0–4)	1 (0–5)	3 (0–7)	<1 (0–2)	1 (0–4)	3 (0–8)	0 (0–0)	10 (0–20)	14 (5–25)
Prompted symbolic	0 (0–0)	3 (0–7)	<1 (0–1)	<1 (0–2)	1 (0–4)	1 (0–2)	0 (0–0)	7 (0–14)	3 (0–6)	0 (0–0)	1 (0–2)	<1 (0–1)
Independent nonsymbolic	<1 (0–2)	12 (4–18)	9 (5–14)	1 (0–3)	10 (3–17)	8 (2–12)	7 (0–14)	16 (4–28)	6 (1–19)	0 (0–0)	5 (1–9)	3 (0–6)
Imitated nonsymbolic	0 (0–0)	1 (0–4)	<1 (0–1)	2 (0–6)	0 (0–0)	0 (0–0)	3 (0–12)	3 (0–6)	5 (0–10)	0 (0–0)	<1 (0–1)	0 (0–0)
Prompted nonsymbolic	0 (0–0)	2 (0–7)	<1 (0–3)	<1 (0–1)	0 (0–0)	0 (0–0)	1 (0–6)	1 (0–2)	<1 (0–2)	0 (0–0)	0 (0–0)	0 (0–0)
Peer behaviors[a]												
Peer interaction	6 (2–8)	49 (26–71)	46 (34–59)	12 (0–22)	39 (27–53)	43 (25–57)	53 (0–78)	81 (21–117)	88 (56–137)	<1 (0–2)	83 (47–115)	78 (58–100)
Aided AAC models	0 (0–0)	<1 (0–4)	26 (12–53)	0 (0–0)	<1 (0–3)	10 (4–17)	0 (0–0)	3 (0–9)	17 (5–35)	0 (0–0)	9 (0–25)	17 (6–32)
Proximity[b]												
Network members	—	96 (88–100)	97 (91–100)	—	94 (73–100)	98 (91–100)	—	79 (51–99)	91 (75–99)	—	99 (92–100)	100 (99–100)
Other peers	88 (68–99)	57 (0–100)	75 (0–100)	97 (88–100)	0 (0–0)	0 (0–0)	76 (5–100)	60 (31–92)	64 (1–96)	84 (13–100)	0 (0–0)	0 (0–0)
Adult support	68 (33–95)	80 (55–99)	82 (60–97)	97 (90–100)	91 (50–100)	74 (26–100)	18 (0–60)	71 (19–93)	75 (40–91)	95 (79–100)	99 (95–100)	96 (85–100)
Aided AAC	84 (35–100)	97 (89–100)	97 (92–100)	90 (0–100)	82 (58–99)	98 (90–100)	0 (0–0)	55 (7–91)	86 (56–100)	0 (0–0)	80 (11–100)	96 (77–100)
Communication modes[d]												
Intelligible speech	Never	Sometimes	Sometimes	Sometimes	Sometimes	Sometimes	Sometimes	Sometimes	Often	Never	Often	Often
Aided AAC	Never	Sometimes	Often	Never	Never	Often	Never	Sometimes	Often	Never	Never	Sometimes
Vocalizations	Never	Sometimes	Sometimes	Never	Never	Never	Sometimes	Sometimes	Sometimes	Never	Never	Never
Unintelligible speech	Never	Sometimes	Sometimes	Never	Never	Never	Sometimes	Sometimes	Sometimes	Never	Sometimes	Sometimes
Gestures	Never	Often	Often	Sometimes	Often	Often	Sometimes	Often	Often	Never	Sometimes	Sometimes

Note. AAC = augmentative and alternative communication; BL = baseline phase; PN = peer network intervention phase; PN+M = peer network with aided AAC modeling intervention phase. Dash indicates *not assessed* (proximity and target words) or *undiscernible* (quality ratings).

[a]Numbers represent means (ranges) of frequency per 30-min session.

[b]Numbers represent means (ranges) of percentage of observational time.

[c]Numbers represent means (ranges) of unique target vocabulary used by the student on the AAC device or modeled by peers.

[d]Median observer rating.

four students were in proximity to peers the majority of time (see Table 2). Only Sara and Grace were in proximity to their AAC device the majority of time. Jeremy's speech-generating device was in the classroom but left on a shelf, and Joanna did not bring her communication book into the cafeteria. Paraprofessionals almost never encouraged interaction between the students and their peers (see Procedural Fidelity).

Peer network intervention (B). Each peer network was a social group involving a student and three to four peers who met regularly to engage in a shared activity, learned strategies to support positive interactions, and received regular guidance from the facilitator. Setting up the peer network involved (a) a collaborative planning meeting, (b) training for the facilitator, and (c) an initial orientation meeting. Peer network meetings were held two times per week over 4 months (i.e., one fall semester), as allowed by school schedules.

Planning meeting. After consistent baseline data, an intervention coach (i.e., member of the research team) met with all adult members of a student's collaborative planning team (see Supplementary Table 1, available online); meetings ranged from 55 to 75 min ($M = 63$). The coach facilitated the meeting by providing materials, offering suggestions, keeping everyone on task, and taking notes. Teams followed an agenda with 16 steps across three components to (a) discuss intervention goals, (b) use student preferences to select an overarching theme for the network and plan specific activities (see Table 1), and (c) identify vocabulary for the aided AAC device. Teams selected 10 to 20 target symbols representing activity-related and core vocabulary (see Table 1). *Core vocabulary* refers to high-frequency words or messages that are often abstract in nature (e.g., *like, do, not, more*; Beukelman & Mirenda, 2013). Teams identified target core vocabulary using published lists of vocabulary-use patterns as examples. *Activity-related vocabulary* (i.e., fringe vocabulary) refers to words or messages that are specific to individuals or activities (Beukelman & Mirenda, 2013). Teams identified target activity-related vocabulary by brainstorming words or messages relevant to the identified theme or activities that did not appear on core vocabulary lists. To be selected as a target, all vocabulary had to (a) be relevant to interactions that could take place during the peer network, (b) not be the focus of other instruction for the student, and (c) not be in the student's expressive repertoire (i.e., using speech, a graphic symbol, or a sign). Teams were observed to complete 100% of the steps comprising the three components of the planning meeting (checklist available within online supplementary materials). In addition, team members worked together either formally during the planning meeting or informally after the meeting to identify peers to invite to participate in the peer network.

Training for facilitators. The coach individually trained each peer network facilitator, following a protocol with 14 steps across five training components to (a) present the rationale for the intervention, (b) explain how to recruit peers, (c) describe the components of the initial orientation for students, (d) discuss and model facilitation strategies to support interactions (e.g., prompting interaction, reinforcing interaction), and (e) answer questions. Facilitators received an intervention manual, and training ranged from 55 to 80 min ($M = 69$). The intervention coach was observed to complete 100% of the steps with each facilitator (checklist available within supplementary materials).

Orientation for students. Each facilitator followed a protocol with 20 steps to lead a 25- to 30-min ($M = 29$) orientation with the identified peers and the student during the first peer network session. Facilitators asked everyone to share about themselves, discussed the rationale for the network, introduced the AAC device, explained the procedures of the network (e.g., the chosen theme, possible activities, schedule of meetings, when peers should ask for assistance), and answered questions. During the second half of the orientation, facilitators used a visual

cue card (i.e., with text and graphic symbols), oral description, examples, modeling, and opportunities for practice to teach three interaction strategies: (a) "Ask each other questions" (i.e., ask open-ended questions and modify questions as needed by providing choices), (b) "Slow down and give everyone a turn to talk" (i.e., wait and look at another student to give them time to respond), and (c) "Encourage one another" (i.e., offer praise and use positive language). Peer network members practiced the strategies during a shared activity while receiving support from the facilitator through prompting and social praise. Facilitators were observed to complete 100% of the steps associated with orientation (checklist available within online supplementary materials).

Regular peer network meetings. Each peer network session consisted of the peers and student participating in a shared activity (see Table 1). Facilitators introduced the activity and encouraged students to use the interaction strategies by displaying the visual cue card and providing a reminder. Throughout each session, facilitators used strategies to support interaction (see Procedural Fidelity), fading involvement over time. The coach attended the first two sessions to encourage use of the facilitation strategies, provide feedback, and answer questions. Following the initial two sessions, coaching was provided if requested by a facilitator, if intervention fidelity dropped below 80%, or if the same fidelity item was not implemented for two consecutive sessions. Sara's and Grace's facilitators received four total coaching sessions; Jeremy's and Joanna's facilitators received five.

Peer network with peer-implemented aided AAC modeling (BC). The second intervention phase differed only in the addition of the peer-implemented aided AAC modeling component. Alongside the facilitator, the coach taught peers to use aided AAC modeling by (a) holding an initial training (M = 28 min; range 22–30 min) and (b) providing coaching for a minimum of two peer network sessions. During the initial training, the coach followed a protocol with 18 steps to provide a rationale, highlight target symbols, and teach peers to provide aided AAC models during interactions. To teach peers to be responsive to the student rather than directive when providing aided AAC models, the coach focused on three examples of ways to use the aided AAC device: (a) "Tell about me and what I am doing" involved peers using the device to talk descriptively about what they were doing during the activity. For example, when playing a board game, one of Joanna's peers could say, "It's my turn now," while pointing to *MY TURN* in the communication book. (b) "Tell about or ask about my friend" involved peers using the device to comment about what the student with the disability was doing or looking at during the activity or to ask a question. For example, while Grace put clothes on a paper doll, one of her peers could say, "She has a cool outfit," while pressing the symbols *SHE* and *OUTFIT* on the speech-generating device. (c) "Respond to what my friend says" involved peers using the device to respond to the student's communication through aided recasts or expansions. For example, if Jeremy pressed *ROCKET* on the speech-generating device while playing with a space station set, one of his peers could say, "The rocket can go to the moon!" and press *ROCKET, GO*, and *MOON* on the speech-generating device. During the training, the coach gave peers a handout, explained each of the three ways to provide responsive aided AAC models, demonstrated examples of each, and provided peers prompting, feedback, and social praise while they practiced providing aided AAC models. Finally, the coach answered questions and asked peers to verbally recall the rationale for using the AAC device and the three ways they could provide aided AAC models. The coach was observed to complete 100% of steps with each group (checklist available within online supplementary materials).

The coach also attended the next two peer network sessions to support peers. The coach told the student that peers would also be using the AAC device, reminded peers how to provide aided AAC models, and ensured the speech-generating device or communication

book was accessible to everyone. Throughout the two coaching sessions, the coach prompted peers to provide aided AAC models, offered feedback, and gave social praise. The coach faded support during the second session and answered questions at the end. The coach was observed to complete all steps for both coaching sessions across the four peer networks. Coaching for peers was reintroduced if they did not provide models at a rate of 10 per 30 min during the preceding session. Sara's peers received only the initial two coaching sessions, Grace's peers received four (i.e., initial two plus two more), and Jeremy's and Joanna's peers each received three.

Generalization probes. We assessed generalization in nonstructured, social contexts different from the intervention context in multiple ways (e.g., settings, activities, partners). We conducted generalization probes two to four times before the baseline phase and 1 to 4 weeks after the second intervention phase. For Sara, Grace, and Joanna, probes took place during lunch and outdoor recess. For Jeremy, probes took place during lunch, indoor recess, and outdoor recess. Network meetings did not occur, nor were instructions given to students, peers, or adults. Peer network members and other peers were not required to be in proximity to the student. During postintervention generalization probes, Grace, Jeremy, and Joanna were in proximity to both peer network members and other peers; Sara was in proximity almost exclusively with peers who were not peer network members.

Observational Data Collection

We observed each student two to three times per week during the baseline phase and during each peer network session (i.e., approximately two times per week). Observers collected frequency and duration data using live, timed-event behavior sampling with a tablet computer equipped with the Multi-Option Observation System for Experimental Studies (Tapp, Wehby, & Ellis, 1995). Observers followed operationally defined start and stop rules to ensure consistency across phases; the majority of observations were 30 min (M = 28 min, range 18–30 min). We converted frequency counts to rates per 30 min and duration measures to percentages of time. Measures were adapted from an earlier study (Biggs, Carter, & Gustafson, 2017).

Focus student interaction with peers. We defined an interaction with peers as a communicative act using any type or combination of modes directed to one or more peer(s) that had evidence of a purpose and awaited a response. Observers looked for behavioral indicators that a communicative act was directed to peers (e.g., joint attention, eye contact, gaining attention, responding contingently to a preceding interaction). Behaviors without a clear communicative purpose (e.g., echolalia, repetitive motor movements, noninteractive aided AAC use) were not coded. A separate act was coded each time (a) more than 5 s passed without interaction, (b) a communicative turn was taken by a peer, or (c) the student directed the act to a new peer. We coded each communicative act as either *symbolic* or *nonsymbolic*. Symbolic acts contained any use of intelligible verbal words, aided AAC, or conventional signs (ASL). Nonsymbolic acts comprised nonword vocalizations, unintelligible speech approximations, and gestures or body movements. We further designated each communicative act as *prompted, imitated*, or *independent.* Prompted acts were responses to peer or adult behaviors used to elicit a specific communicative response, such as pointing to a symbol on the AAC device. Communicative acts were imitated if the student spontaneously copied some or all of the immediately preceding interaction within 5 s, without adding anything to it. Communicative acts that were imitations of a model prompt were coded as prompted, not imitated. To be coded as independent, communicative acts had to be unprompted and nonimitated.

From the detailed coding, we constructed two variables related to student communication to address our research questions: (a) all interaction with peers and (b) nonprompted, symbolic communicative acts to peers. *All*

interaction comprised the sum of communicative acts to peers across the two types (i.e., symbolic and nonsymbolic) and three levels of independence (i.e., prompted, imitated, independent). Nonprompted, symbolic communicative acts comprised symbolic acts that were independent or imitated but not prompted.

Peer interactions and aided AAC models. We recorded the frequency of peers' interactions with the student using the previous definition of interaction. We also recorded the frequency of peer aided AAC models (i.e., a peer using a graphic symbol on the AAC device within an interaction). We coded a separate aided AAC model for each symbol used by the peer if (a) more than 5 s passed between instances when the same symbol was modeled or (b) the model occurred within a new interaction.

Focus student proximity. Observers recorded the duration of proximity to peer network members, other peers, adults, and the AAC device. We defined proximity to a peer or adult as being oriented toward and close to a person (i.e., within 5 ft) in a way that promoted opportunity for interaction. We defined proximity to aided AAC as the device being within an arm's reach of the student and easily accessible (e.g., working, not covered by materials).

Secondary descriptive measures. Observers used paper-and-pencil data sheets to record students' specific modes of symbolic and nonsymbolic communication using a rating scale of 0 = *not observed*, 1 = *sometimes observed* (i.e., fewer than 5 communicative acts), and 2 = *often observed* (i.e., 5 or more communicative acts). Observers also used a checklist of students' target symbols to indicate each symbol used at any point in the session by the student or by the peer.

Observer Training and Interobserver Agreement (IOA)

Four special education graduate students served as observers. Observers participated in three formal training sessions totaling 7.5 hr. Before collecting data, observers were required to attain 90% accuracy on a written test, 90% agreement on two videos, and 90% agreement in two consecutive live coding sessions. A second observer independently collected data in 33.1% of all sessions, balanced across participants and phases. We calculated point-by-point occurrence agreement for time-stamped, event-based student and peer behaviors using a 5-s window around the primary observer's coded data (i.e., agreements divided by the sum of agreements and disagreements, multiplied by 100%). For time-stamped duration variables, we compared codes for each second and calculated agreement using the same formula. We calculated point-by-point agreement for secondary descriptive variables on the observation summary sheet. IOA for each individual variable ranged from 82.6% to 100.0%. There was little variability in IOA for each variable across participants and study phases.

Procedural Fidelity

Observers assessed intervention fidelity of nine core intervention components during all sessions across the study phases; session fidelity averaged 96.1%. Observers also separately assessed peer use of interaction strategies, peer use of aided AAC modeling strategies, and paraprofessional use of facilitation strategies throughout the three experimental phases. For interaction and modeling strategies, observers used a rating scale of 0 = *not observed*, 1 = *sometimes observed* (i.e., fewer than 5 instances), and 2 = *often observed* (i.e., 5 or more instances). For paraprofessional facilitation strategies, observers marked each of nine facilitation strategies used at any point during an observation (i.e., prompt student to interact, prompt peers to interact, prompt use of interaction strategies, prompt student AAC use, praise peers for interacting, praise student for interacting, give information to support interaction, facilitate a role in the shared activity for the student or peers, encourage social interaction within the group). Supplementary Table 2, which is available online, displays detailed fidelity

data. IOA for all fidelity variables was collected in 33.1% of sessions and ranged from 80.1% to 100.0%.

Social Validity

At the end of the study we asked peer partners, students, and facilitators to share their views about the intervention using questionnaires (see Supplementary Table 3 for items, which is available as an online supplement). For focus students, a paraprofessional or special educator read the questions aloud and recorded the student's answers (e.g., gestures, aided AAC, or speech) as either *yes, no, I don't know*, or *unclear* (i.e., the student did not clearly communicate a response).

Results

Did the Peer Network Intervention Increase Interaction With Peers?

A functional relation was demonstrated between the peer network and increased interaction with peers (see Figure 1). Across students, data trends in the baseline phase were stable and fairly flat, with two primary patterns related to level. Sara and Joanna almost never interacted with peers, with mean rates of interactions of less than one per 30 min (range 0–2; see Table 2). Grace's rate was four interactions per 30 min (range 0–8), and Jeremy's was 12 (range 0–26). The introduction of the peer network corresponded with increased interaction. Sara's rate showed an immediate increase in level, with an increasing trend and no overlapping data points with the baseline phase (M = 18; range 6–30). Grace showed a more modest change in level and trend, with data points from two sessions overlapping with the baseline phase (28.5%). Her mean rate increased to 13 per 30 min (range 6–24). Jeremy showed a steep increasing trend with variability; three data points overlapped with the baseline phase (37.5%). His mean rate increased to 31 per 30 min (range 9–59). Joanna showed an immediate and substantial level change, with a decrease in the second session followed by an increasing trend and no overlapping data points. Her mean rate increased to 28 (range 13–38).

As expected, there was not a functional relation between the peer network and nonprompted, symbolic communication to peers. Only Joanna showed an increased level; for the other three students, increases in overall interaction were marked by increases primarily in independent nonsymbolic communication, such as gestures (see Table 2).

Was the Instructional Program Effective to Teach Peers to Provide Aided Models?

Peers did not model aided AAC during the baseline phase (see Figure 1). The rate of AAC models remained stable at a level near zero during the first intervention phase for peers with Sara, Grace, and Jeremy. When peers occasionally did model symbols, we observed they used models that functioned as prompts—which was not a targeted behavior—and almost never (with Sara and Grace) or never (with Jeremy) used aided AAC as a part of their natural interactions (see Table 2 for observer ratings). However, Joanna's peers frequently used the communication book prior to receiving instruction. They provided models at a rate of 25 per 30 min during the orientation meeting, with a decrease in level followed by a flat trend with little variability (i.e., approximately six to nine models per 30 min throughout the first intervention phase).

Peer instruction on aided AAC modeling corresponded with immediate increases in level for peers interacting with Sara, Grace, and Jeremy. The mean rate increased to 26 per 30 min for Sara (range 12–53), 10 for Grace (range 4–17), and 17 for Jeremy (range 5–35). There was no overlap with the first intervention phase for Grace and Sara, and one data point (12.5%) overlapped for Jeremy. For Joanna's peers, there was an immediate increase in aided AAC models when peers received coaching, followed by a lower level with stability when coaching ceased. However, nearly all (85.7%) data points from the second intervention phase overlapped with the first.

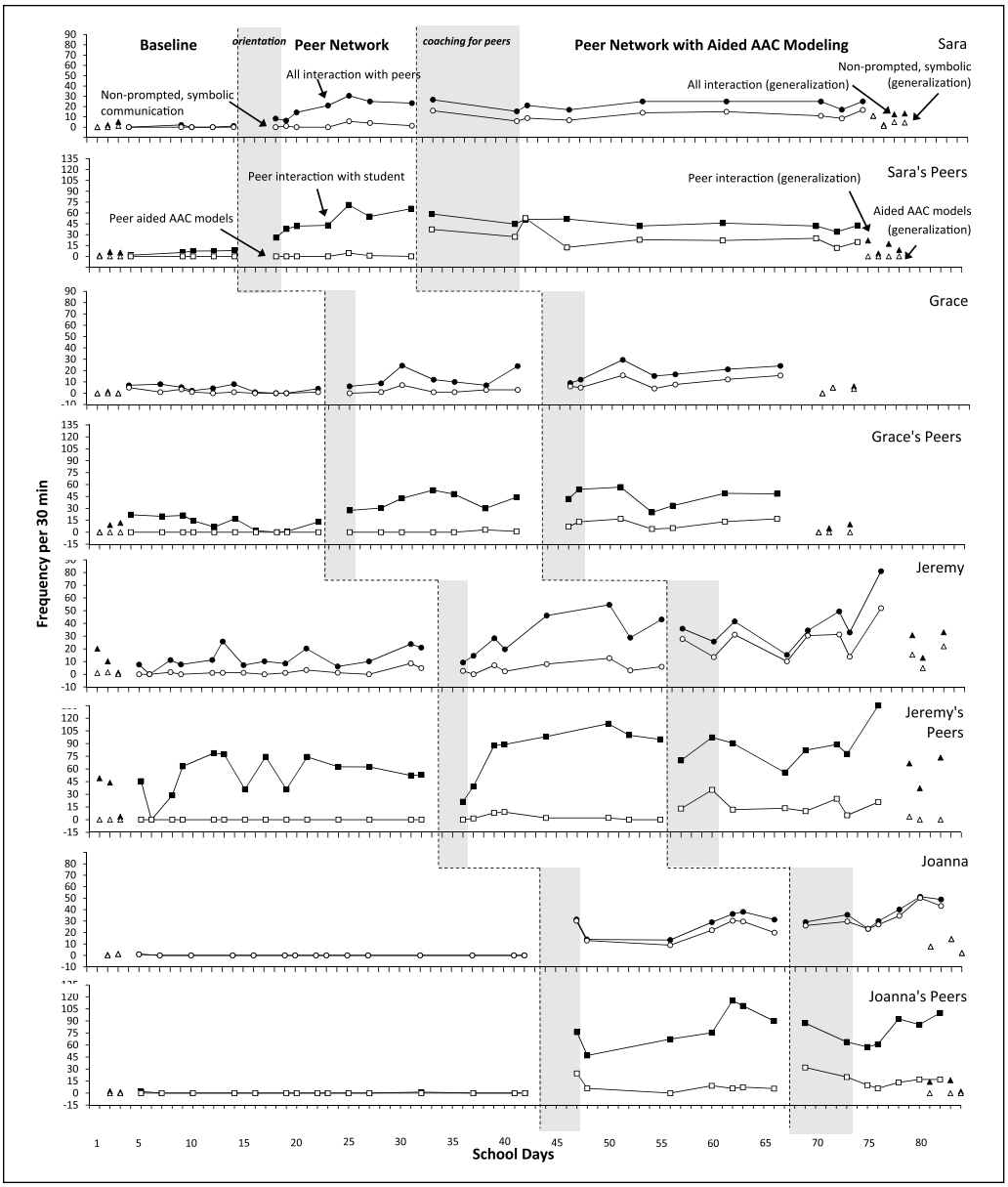

Figure 1. Frequency of all interaction with peers (filled circles); nonprompted, symbolic communicative acts to peers (open circles); peer interaction (filled squares); and peer aided AAC models (open squares) across study phases.

Peers interacting with all four students frequently used "Tell about me" and "Tell about or ask about my friend" models (i.e., 93.3% and 92.9% of sessions, respectively) but less frequently used "Respond to what my friend says" models (45.5% of sessions; see Supplementary Table 2, available online).

Peers in all four networks received ongoing support from the paraprofessional related to modeling aided AAC, which precluded the determination of whether the single training

and two coaching sessions would have been sufficient. Without instruction or support from the coach, paraprofessionals were observed to encourage peers to model AAC by modeling symbols on the device themselves, giving verbal prompts, and offering praise. We observed facilitators using these strategies in 100% of sessions in the second intervention phase for Sara ($n = 9$), 71.4% for Grace ($n = 5$), 87.5% for Jeremy ($n = 7$), and 42.9% for Joanna ($n = 3$).

Did Embedding Peer-Implemented Aided AAC modeling Increase Students' Nonprompted Symbolic Communicative Acts to Peers?

A functional relation was demonstrated between the addition of peer-implemented aided AAC modeling and nonprompted symbolic communication (see Figure 1). Sara, Grace, and Jeremy had low levels of nonprompted symbolic communication with flat trends and little variability during the first intervention phase. Sara's mean rate was two per 30 min (range 0–6), Grace's was 13 (range 6–24), and Jeremy's was five (range 0–13). Introducing aided AAC modeling corresponded with level increases, with a more modest change for Grace than for Sara and Jeremy. Sara's mean rate increased to 11 per 30 min (range 6–17) with no overlapping data points. Grace's increased to 17 (range 9–30) with three overlapping data points (42.9%). Jeremy's increased to 26 (range 10–52) with one overlapping data point (12.5%). Students' overall interaction with peers did not change; instead, the proportion of interaction that was nonprompted symbolic increased (see Figure 1 and Table 2). Across the two intervention phases, changes in the percentage of students' interaction that was nonprompted symbolic was from 10% to 52% for Sara, 18% to 52% for Grace, and 18% to 64% for Jeremy. Joanna's peers used aided AAC modeling during the first intervention phase, which prevented systematic control of the introduction of the added component to her network. Her nonprompted symbolic communication was at a high level with a flat trend and little variability during both intervention phases and composed the majority of her interaction.

Peer Modeling and Student Use of Target Symbols

On average, Joanna's peers modeled the greatest number of different target symbols per session ($n = 8$), followed by peers with Jeremy ($n = 6$), Sara ($n = 5$), and Grace ($n = 3$). Figure 2 displays the percentage of sessions each target symbol was used and modeled during the second intervention phase. Activity-related symbols were modeled and used more than core symbols. We observed students only used the symbols that had been modeled by peers.

Generalization

Across participants, students had fewer interactions with peers during generalization probes than during the intervention (see Figure 1). However, the mean rate of overall interaction with peers was higher during postintervention generalization probes than during pre-baseline probes and the baseline phase for all students, and a greater proportion of overall interaction was nonprompted symbolic.

Social Validity

Jeremy and Joanna indicated they (a) liked spending time with their peer network members, (b) liked it when their peers also used their aided AAC device, (c) considered their peer network members to be their friends, and (e) wanted to keep spending time with their peer network members. Sara's and Grace's responses were unclear. Peers and paraprofessionals also rated their experiences positively (see Supplementary Table 3, available online).

Discussion

Educators need practical and effective ways to help students with complex communication needs develop their communication skills while experiencing positive interactions with their peers. We evaluated the effectiveness of (a) using a peer network intervention to increase overall interaction and (b) adding peer-implemented aided AAC modeling to increase use of symbolic communication. Our

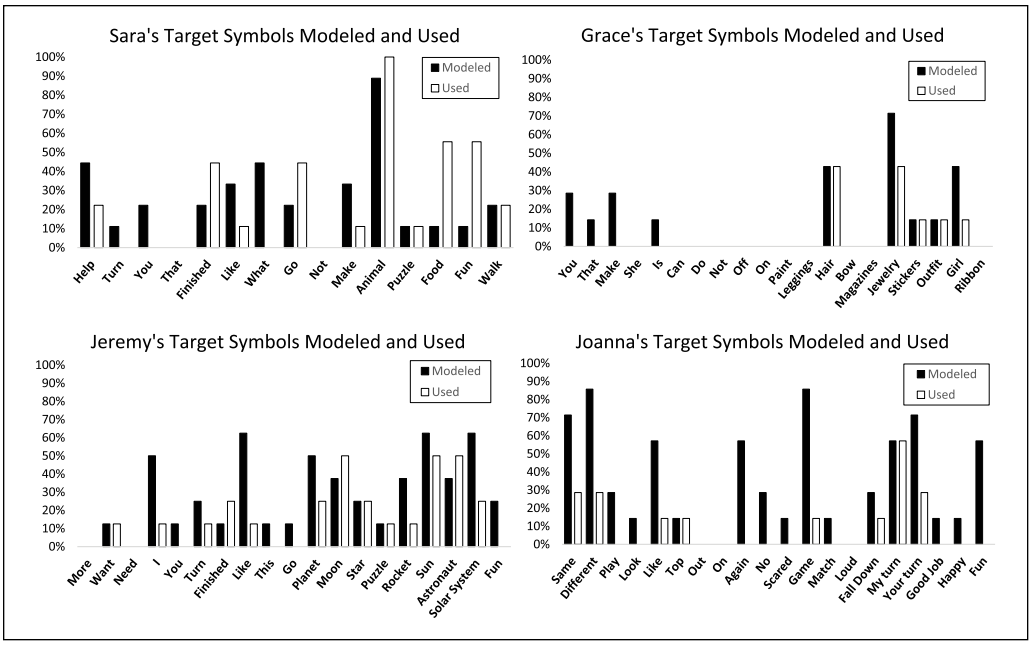

Figure 2. Percentage of sessions during the second intervention phase each target symbol was modeled by peers and used by the foot: Students.

findings extend the research literature by demonstrating that peer network interventions involving aided AAC modeling can be effective to improve the symbolic communication of students with complex communication needs while enhancing their social experiences with peers within inclusive school settings.

Our findings extend the research literature by demonstrating that peer network interventions involving aided AAC modeling can be effective to improve the symbolic communication of students with complex communication needs while enhancing their social experiences with peers within inclusive school settings.

First, the peer network intervention substantially increased students' interactions with peers during lunch and recess. This finding is consistent with other studies involving elementary students who use spoken language to communicate (Kamps et al., 2014, 2015; Mason et al., 2014), but it extends this literature by focusing specifically on students learning to use aided AAC—a group of students who have more intensive social and communication support needs than students in earlier investigations. The extent to which the network increased interaction may have been related to baseline differences in patterns of interaction. Sara and Joanna—the students who almost never interacted with peers—demonstrated more substantial and defined increases than Grace and Jeremy. Nevertheless, the intervention increased rates of interaction for all four students in meaningful and socially significant ways. Different components to the peer network intervention may have accounted for these positive outcomes: (a) motivating, shared activities provided a common context for interactions; (b) paraprofessionals began actively facilitating interactions; and (c) peers learned to use strategies to support positive interaction. Future research might focus on investigating how these different

components contribute to intervention effectiveness and explore how they might be extended into academic classrooms to promote students' social interaction and communication development across a variety of inclusive settings.

Second, embedding aided AAC modeling into the peer network sessions resulted in substantial increases in students' symbolic communication with peers. Few other studies have evaluated the effectiveness of interventions involving peer aided AAC modeling, and none have isolated it from other intervention components (Biggs et al., in press). Our findings demonstrated the unique effects of peer-implemented aided AAC modeling to increase symbolic communication because we had systematic control over its introduction for three of the four participants. Even more, our findings revealed salient patterns between the specific target symbols that peers modeled and students began using. Educational teams selected core and activity-related target vocabulary that were not the focus of other instruction and were not already in students' expressive repertoires. Students began using a number of different target symbols after relatively limited exposure through peer-implemented aided AAC modeling during the intervention context. These findings provide initial evidence that peer-implemented aided AAC modeling can be effective to help students acquire the expressive use of new graphic symbols within the context of natural interactions without relying on decontextualized, one-to-one teaching sessions (c.f., Garrison-Harrell et al., 1997). A related and noteworthy finding was that students were never observed to use target symbols that peers did not model.

These findings provide initial evidence that peer-implemented aided AAC modeling can be effective to help students acquire the expressive use of new graphic symbols within the context of natural interactions without relying on decontextualized, one-to-one teaching sessions (c.f., Garrison-Harrell et al., 1997).

At the same time, students did not begin using all target symbols modeled by peers. Although Sara and Jeremy used more than three quarters of the modeled target symbols, Grace and Joanna used only half. All students began using a greater percentage of activity-related versus core vocabulary, and Grace did not use any core words throughout the intervention. Future research is needed to explore the factors that might influence whether and how quickly students begin using new symbols modeled by their communication partners—including characteristics of students, graphic symbols, the nature of their referents, and ways in which they are modeled. Also of note, Grace had the most modest increase in symbolic communication, and her peers had the lowest rates of modeling. Although her peers modeled AAC in all sessions during the second intervention phase, they provided models at the targeted rate of 10 per 30 min in fewer than 60% sessions and used fewer than 50% of her target symbols in their models. These data leave many questions left to explore (e.g., What are optimal rates of AAC modeling to improve student communication? What factors influence peers' rates of aided AAC modeling and number of different symbols used in models?).

Third, we sought to evaluate the effectiveness of a single training and two sessions with coaching to teach peers to provide aided AAC models. Although peers learned to model AAC, they received more support than we originally anticipated because facilitators regularly encouraged them to use the aided AAC device by giving verbal prompts, modeling symbols themselves, and offering praise. Furthermore, the peers for Grace, Jeremy, and Joanna had at least one session when they did not provide models at a rate of at least 10 per 30 min, which led the coach to reintroduce support in the following session. Although we could not evaluate the effectiveness of the peer instruction program as it was designed, our findings do indicate peers

can learn to model AAC during their interactions through training combined with ongoing adult support. Interestingly, Joanna's peers began independently modeling symbols in the communication book during their natural interactions before they received training or coaching on aided AAC modeling. Why did peers in this group respond differently? Although we cannot be certain, it may be influenced by characteristics of the peers themselves or by differences in technology between the communication book and the speech-generating devices used by other students. Because the communication book was relatively new to Joanna and the peers, it may also have seemed less like *her* communication book and more like a "shared means of communication" for everyone in the group (Von Tetzchner, Brekke, Sjothun, & Grindheim, 2005). Additional research is needed to learn more about the factors influencing peers' natural tendencies to use different types of aided AAC as a shared means of communication with a schoolmate with complex communication needs and the types and extent of guidance peers need to be successful in learning to use aided AAC.

Fourth, participants affirmed the social validity of the intervention. Peers' ratings indicated they enjoyed being a peer network member and learning to use aided AAC modeling. Peers' satisfaction may be crucial because they are more likely to stay invested and engaged if they enjoy what they are doing. With Jeremy and Sara, other peers regularly joined without being invited or encouraged by an adult. Peer network members independently demonstrated how to model AAC and offered suggestions to these other peers, and we observed these other peers also used AAC during their interactions, despite the fact they did not participate in formal training or coaching. In addition, school staff and parents—not researchers—took primary responsibilities for planning and implementing the intervention. The enthusiasm of facilitators was more tempered than peers', but each indicated the time investment was reasonable. However, in order to maximize experimental control of the added modeling component, we designed the study in such a way that a member of the research team took the primary role training and coaching peers to provide aided AAC models. Therefore, we do not know whether school personnel would be similarly effective in these roles.

Peers' satisfaction may be crucial because they are more likely to stay invested and engaged if they enjoy what they are doing.

Limitations and Future Research

Several study limitations warrant consideration for future research. First, the use of timed-event behavior sampling in live observations limited our ability to collect detailed information about students' communication. Although we were able to reliably code distinctions between the type (i.e., symbolic or nonsymbolic) and level of independence (i.e., prompted, imitated, or independent) of each communicative act, we did not collect data at the level of each communicative act regarding communication modes or symbols used. Future researchers could use video recording to capture more nuanced coding distinctions.

Second, although all students were learning to use aided AAC prior to the study, the extent to which students' educational teams were implementing AAC services and instruction varied. For example, we found that Jeremy and Joanna were rarely in proximity to their speech-generating device or communication book during the identified setting during the baseline phase. We did not require adults providing support to ensure access to aided AAC during the baseline phase because our goal was to assess interactions with peers under ordinary (i.e., regularly occurring) circumstances; however, it is possible that patterns of baseline data may have been different for these two students had they been in proximity to aided AAC.

Third, we were unable to isolate the impact of the peer-implemented aided AAC modeling for Joanna. Because her peers independently began using the communication book before receiving training and coaching, we did not have systematic control over the introduction of the AAC modeling component. Nonprompted symbolic communication constituted most of Joanna's overall interaction

with peers during peer network meetings. However, we are unable to determine if this is because of differences in student-related characteristics (e.g., more developed symbolic communication skills prior to the study), because she benefited immediately from the peer aided AAC modeling in the first intervention phase, or because of other factors.

Fourth, the peer networks focused on increasing interactions within the context of a single setting (i.e., lunch, recess). During generalization probes, we did not find evidence of generalization across partners, settings, and activities in nonstructured social contexts. However, it is important to note the complexity involved in achieving a reliable estimate of students' generalized communication when interaction is influenced heavily by contextual factors. Our generalization observations were ecologically valid (i.e., in a naturally occurring setting), but using nonstructured measurement settings can increase the likelihood of concluding that outcomes do not generalize, even if there might actually be an impact. Future researchers interested in generalization could consider a more structured measurement context to reduce variability.

Conclusion

There is growing evidence on the effectiveness of peer network interventions to improve peer interaction for students with severe disabilities. Our results extend this literature by demonstrating paraprofessional-facilitated peer networks are effective for students learning to use aided AAC—a group of students with significant social and communication needs. Even more, our findings demonstrate embedding peer-implementing aided AAC modeling within the intervention can improve students' symbolic communication skills within the context of positive interactions with peers. Educators can use peer network interventions involving aided AAC modeling to improve both students' inclusive social experiences and their communication skills.

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