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COMPARING AUGMENTATIVE AND ALTERNATIVE
COMMUNICATION INTERVENTIONS ON
REQUESTING SKILLS FOR CHILDREN WITH
COMPLEX COMMUNICATION NEEDS

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Structured Abstract

Clinical Question: Do children with complex communication needs show greater improvement in requesting behaviors with the Picture Exchange Communication System® (PECS®) versus a speech-generating device (SGD)?

Method: Systematic Review

Sources: Cumulative Index to Nursing and Allied Health Literature (CINAHL), Education Resources Information Center (ERIC), Linguistics and Language Behavior Abstracts (LLBA), PsycINFO

Search Terms: AAC OR augmentative and alternative communication OR complex communication needs OR communication aids OR assistive technology devices OR communication aids (for disabled) OR total communication OR augmentative communication systems; AND PECS OR picture exchange communication OR low-tech AAC OR aided symbol systems OR nonverbal communication; AND SGD OR speech generating device OR VOCA OR voice output communication aid OR high-tech

Number of Studies Included: 4

Primary Results: Overall, PECS and SGD were equally effective methods to teach children with complex communication needs to make requests.

Conclusion: Children with complex communication needs can learn to make requests using either PECS or an SGD. Some children preferred one method over another. It is important to take client and family preferences into account when deciding whether to pursue a high-tech (i.e., SGD) or low-tech (e.g, PECS) intervention. Because preferences may change after exposure to both interventions, it may be helpful to introduce both methods before deciding which method to pursue long-term.

Comparing Augmentative and Alternative Communication Interventions on Requesting Skills for Children With Complex Communication Needs

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Clinical Scenario

Elsa is a first-year graduate student clinician earning her master's degree in speech-language pathology. She has recently been assigned a client, Fred, who has a diagnosis of autism spectrum disorder (ASD). Fred is a 2-year, 7-month-old boy who Elsa sees once weekly for 45 minutes at an outpatient clinic. During assessment, Elsa administered The Rossetti Infant-Toddler Language Scale™ (Rossetti, 2006). Receptive skills were scored within normal limits, but Elsa had difficulty eliciting verbal behaviors. She interviewed Fred's mother to supplement her findings. Per parent report, his expressive vocabulary is limited to 10 spoken words and 5 manual signs, which he uses inconsistently. For example, his mother stated that while playing Fred will occasionally verbalize "ba," which she interprets to mean "ball." According to his mother, Fred "understands everything we say to him." Fred's main form of communication is gesturing toward a desired item. Fred's parents report that when a desired item is not within sight or reach, he relies on tantrum behaviors. Elsa has noted that Fred shows difficulty giving up his tablet computer when transitioning to therapy sessions. His parents would like him to request objects more consistently, specifically those not in sight, to reduce the number of tantrums.

From her coursework, Elsa has heard of two potential interventions for Fred, the Picture Exchange Communication System (PECS; Frost & Bondy, 2002) and speech-generating devices (SGDs). Elsa and her supervisor have discussed that as many as 30% of children with a diagnosis of ASD may remain functionally nonspeaking (i.e., they produce no or few consistent words in the vocal modality; Anderson et al., 2007). These children may be candidates for augmentative and alternative communication (AAC) to support their existing expressive communication (Mirenda, 2003). She has also learned that PECS and

SGDs are commonly used to support the communication of children with ASD. Elsa's supervisor has recommended consulting the literature to determine which intervention would be best for Fred.

Background Knowledge

Bondy and Frost developed the Picture Exchange Communication System (PECS) in 1985 to support children who have not acquired functional speech to initiate requests and make comments. PECS is a physical exchange of a graphic symbol or picture to make a request. It involves the systematic instruction of self-initiated communication skills using six phases (Bondy & Frost, 1994, 1998, 2001). The PECS training protocol was designed to systematically build on each learned behavior to achieve more communicative independence (Boesch et al., 2013). Phase 1 includes teaching the child the nature of communication: approaching a person, directing an action, and receiving a desired outcome (Bondy & Frost, 2001). In subsequent phases, the child gains independence through increasing the distance from communication partner (phase 2), discriminating between multiple images (phase 3), combining images to form sentences (phase 4), responding to questions (phase 5), and commenting (phase 6; Bondy & Frost, 2001).

An SGD is an electronic communication aid that produces digitized or synthesized speech upon activation (Lloyd et al., 1997). SGDs can vary greatly in terms of features, cost, and appearance, and have been suggested as viable alternatives to exchange-based approaches such as PECS (Boesch et al., 2013). Recent trends in AAC include mobile technologies that are used as SGDs, such as AAC applications (apps) installed on Android™ tablets, touchscreen phones, and iPad® devices. There are several

advantages to using tablets as SGDs, including their relatively low cost, mainstream appeal, and portability compared to other SGDs (McNaughton & Light, 2013).

Elsa has learned in her classes that PECS can be an effective tool to teach requesting for children with ASD but wonders if it would be better to use an SGD given Fred's familiarity with technology. To help Elsa decide which approach would be better for Fred, her clinical supervisor has suggested that she search the literature for studies that compare the outcomes of these two intervention approaches.

Clinical Question

Elsa used the PICO (population, intervention, comparison, outcome) framework to develop the following clinical question: Do children with complex communication needs (P) show greater improvements with the Picture Exchange Communication System (PECS) (I) versus a speech-generating device (SGD) (C) as shown by improvements in requesting behaviors (O)?

Search for Evidence

Elsa's search for evidence had five steps: 1) database search, 2) title review, 3) abstract review, 4) article skim, and 5) full article read. Elsa decided to use four research databases that have been identified as good resources for information on AAC (Schlosser et al., 2005): Cumulative Index to Nursing and Allied Health Literature (CINAHL), Education Resources Information Center (ERIC), Linguistics and Language Behavior Abstracts (LLBA), and PsycINFO. She used the following search strategy to identify articles for her review. First, she searched each database using the terms AAC OR augmentative and alternative communication OR complex communication needs OR communication aids OR assistive technology devices OR communication aids (for disabled) OR total communication OR augmentative communication systems. She performed a second search using the terms PECS OR picture exchange communication OR low-tech AAC OR aided symbol systems OR nonverbal communication. Third, she used the following terms as search criteria: SGD OR speech generating device OR VOCA OR voice output communication aid OR high-tech. Finally, she combined the results of these three searches using the Boolean term AND.

The search covered all sources published through 2018. The database search yielded 211 sources: 23 from CINAHL, 11 from ERIC, 131 from LLBA, and 46 from PsycINFO. After removing duplicates, 180 sources remained for review. Elsa screened the titles of the remaining sources and only retained articles with AAC, PECS, SGD, or VOCA in the title. The title screen eliminated 32 sources. From there, Elsa read the abstracts of the 148 remaining sources. To be included in the review at this stage, the abstract needed to mention comparing PECS and SGD interventions specifically. Sources that only mentioned one of the two interventions were excluded. This abstract review excluded 112 sources and yielded 36 articles. After reviewing the abstracts, Elsa skimmed through these 36 articles to ensure they addressed requesting skills and a comparison of PECS and SGD. After skimming the articles, Elsa was left with 17 articles to read thoroughly. Four of the articles met the following criteria to help her address her clinical question: a) articles were published in peer-reviewed journals, b) studies included children who had complex communication needs, c) studies compared PECS and SGDs, and d) studies assessed the effectiveness of PECS and SGDs on requesting skills. Through the five levels of review, Elsa found four peer-reviewed research articles that examined the effectiveness of PECS versus SGDs on requesting skills in children who have complex communication needs.

Evaluating the Evidence

Four studies published between 2005 and 2016 met the criteria for inclusion in this review (Agius & Vance, 2016; Bock et al., 2005; Boesch et al., 2013; Son et al., 2006). All the studies used single-subject experimental designs—specifically an alternating treatment design (ATD)—and two studies paired the ATD with a multiple baseline across participants design. Given the heterogeneity of the population, single-subject experimental designs are well suited for evaluating the efficacy of AAC interventions because each participant serves as his/her own control (Light, 1999).

Table 1 presents descriptions of the four studies included in the review, their research designs, and their research questions. Elsa calculated effect sizes for each study using the percentage of nonoverlapping data (PND), which was calculated by determining the percentage of data points in all intervention phases that exceeded the single

highest data point in baseline for each condition for each participant (Scruggs & Mastropieri, 1998). Table 2 presents the average effect sizes for each condition in each study. Scruggs and Mastropieri (1998) state that interventions with PND > 70% are considered effective and those with PND > 90% are very effective. Interventions with PND between 50% and 70% have questionable effectiveness, and those with PND < 50% are not effective. One study (Son et al., 2006) had average PND scores that indicated questionable effectiveness for both PECS and SGD. The PNDs for the Bock et al. (2005) study fell in the effective range for both interventions, whereas the PNDs for the remaining studies (Agius & Vance, 2016; Boesch et al., 2013) indicated that both interventions were very effective.

Table 2 also presents information about the studies including descriptions of the participants, intervention, dependent measures, and results. The studies included 15 children between the ages of 3 and 12 years old who had been diagnosed with ASD or a related developmental disorder. Agius & Vance (2016) compared the efficacy of PECS and an iPad/SGD on requesting skills with three children between 3 and 4 years old. They wanted to determine a) if preschoolers with ASD could be taught to use both PECS and an iPad as an SGD to request, b) which AAC system resulted in a faster rate of acquisition of requesting skills, c) if preschoolers with ASD demonstrated a preference for either of these AAC modes prior to and during intervention, and d) if preschoolers with ASD could learn advanced operations involving navigation on the iPad. All sessions were carried out in an intervention room at a community agency. Participants received six sessions of intervention over a 4-week period in each condition. For the PECS condition, researchers followed the standard PECS protocol for phases 1–3 (Frost & Bondy, 2002). The iPad/SGD condition utilized an adapted PECS protocol. Baseline sessions were conducted first, followed by intervention, postintervention, and follow-up. The results indicated that the children learned to use both AAC options for requesting. The three participants were able to achieve the mastery criterion within a comparable period, suggesting that the two AAC options were equally effective. There was a lack of a clear pattern of preference of modality. All children at baseline and intervention showed a preference for the iPad; however, during the follow-up session only one child still preferred the iPad. All participants were able to learn to request using a three-step navigation sequence that was part of the adapted PECS protocol used to teach iPad use

(Agius & Vance, 2016). Two of the participants had 100% nonoverlapping data for both interventions, indicating that both were highly effective. One participant had 100% PND for PECS and 83% for the SGD, indicating the SGD intervention was effective and PECS was very effective.

The participants in the study by Boesch et al. (2013) were children between 6 and 10 years old who had a diagnosis of ASD. The researchers wanted to evaluate the efficacy of an SGD (i.e., Logan® ProxTalker®) when compared to the traditional PECS intervention in developing requesting skills. They also wanted to validate a modification of the PECS protocol for infusing speech output technology in the PECS instructional framework. For two participants, all sessions were carried out in an intervention room at a university speech and language clinic. Due to scheduling conflicts, one participant received intervention in his home. Participants received 20- to 30-minute sessions two or three times per week. The number of sessions varied from 53–71 total sessions depending on family schedules. Like Agius and Vance (2016), they followed the standard PECS protocol for phases 1–3 (Frost & Bondy, 2002) and an adapted PECS protocol for the SGD. They found that PECS and SGDs were equally effective for developing initial requesting skills and that successful implementation of either AAC strategy was achievable when appropriate instructional strategies were used (Boesch et al., 2013). Analysis of PND data revealed that both interventions were very effective for two of the participants (i.e., PND > 90%). The data for the third participant indicated that the SGD was very effective (PND = 94%) and PECS was effective (PND = 81%).

Bock et al. (2005) asked the question “Which communication strategy, PECS or SGD, results in more rapid acquisition of requesting skills for preschool children?” To answer this question, they studied six 4-year-old boys who had developmental delays and were nonspeaking. The subjects were preschoolers at two different Illinois schools. The study measured the children’s ability to make a correct response, which was defined based on the intervention being used. For PECS, a correct response meant exchanging a picture for the desired stimulus with no gestural or verbal prompt. For the SGD condition, a correct response meant positioning the device in an accessible way and selecting a picture to produce a digitized speech for the desired stimulus. Children were given 10 opportunities or 15 minutes (whichever came first) to make requests with PECS and then the method was repeated with SGD. The

order of intervention rotated between sessions; if a child's therapy began with PECS during their first session, they would receive SGD first during their second session. The intervention was given 2 days a week for children at school B and 3 days a week for children at school A for 4 and a half weeks. Three of the children acquired PECS slightly faster than the SGD. The other three children acquired PECS and the SGD at the same rate. The PECS intervention was very effective for four participants (i.e., $PND > 90\%$) and effective for the other two participants (i.e., $90\% > PND > 70\%$); the SGD was effective for five participants and questionably effective for one (i.e., $50\% > PND > 70\%$).

Son et al. (2006) studied three children between 3 years and 5 years, 6 months old. Two children had been diagnosed with ASD, and one child had been diagnosed with a pervasive developmental disorder. The researchers wanted to compare the acquisition of requesting responses using PECS versus SGD and determine if there was a preference for either AAC mode. Intervention occurred in each child's family home. Participants received a varying number (22–29 sessions) of 10-minute sessions per week because of differences in family schedules. The children completed baseline trials followed by intervention consisting of discrete trials (similar to the PECS protocol). The results indicated that overall the children learned to use both communication systems with comparable ease and speed. The preferences for AAC mode were varied. One child preferred the SGD, while two children preferred PECS. Overall, the effect sizes as measured by PND for this study were in the questionable range. However, two PNDs were greater than 70%, indicating that those interventions were effective; PECS was the effective intervention for one child and SGD was effective for a different child.

The Evidence-Based Decision

Elsa completed this review to determine if she should introduce PECS or an SGD to her preschool client. The four studies that Elsa examined contained outcome measures for requests, preferences, and generalization. The evidence suggests that both interventions equally and effectively promote the acquisition of requesting behaviors. All four studies determined that PECS and SGDs were equally efficient at improving requesting skills. Therefore, to assist her decision making, Elsa analyzed the PND data more closely to evaluate the effectiveness of each intervention for individual study participants.

Elsa's analysis of PND revealed that both PECS and SGD interventions were effective (i.e., $PND > 70\%$) for 11 of the 15 children. For one child, both interventions had questionable effect sizes (i.e., $50\% > PND > 70\%$). The PND calculations for two children indicated that PECS was effective but the effectiveness of the SGD was questionable. The converse was true for a different child—the SGD intervention was effective and PECS was questionable. There were no consistencies in the age of participants or the severity of their diagnoses to determine which intervention was better for them.

Because the PND data did not lead to a clear conclusion, Elsa looked to the literature for other factors to aid her decision making. All four studies found that preferences of high-tech (i.e., SGD) versus low-tech (i.e., PECS) communication modalities varied across children. During baseline, many children preferred the SGD to PECS. This is likely due to the inherently motivating features of the SGD (e.g., voice output and dynamic visual display). It may also be due to the children's previous experiences with a tablet for leisure purposes (Agius & Vance, 2016). However, when preferences were assessed after intervention, two of the three children in the Agius and Vance (2016) study chose to use the PECS book more often. Son et al. (2006) found similar varying results of preferences. A true personal preference was consistent for each child but variable among the three children (Son et al., 2006). There may be something about the two options themselves (e.g., shape, size, color) or the way in which the two systems were used (e.g., pressing a panel on the SGD or handing a picture to an adult with PECS) that proved more or less appealing to each child (Son et al., 2006). This lack of a clear pattern of preference suggests that clinicians might try multiple methods prior to choosing an AAC modality for a child. It is possible that preferences change and only become stable once an individual has achieved proficiency in each communication mode (Agius & Vance, 2016).

After reviewing all of the evidence, Elsa concluded that both interventions increase requesting skills for children with complex communication needs. For many children, both interventions were equally effective; however, a few children performed better with one intervention than the other (as rated by PND). Elsa discussed these results with her clinical supervisor. They decided to introduce both methods of communication to Fred and conduct their own alternating treatment single-subject study to determine which approach would be best for him. If Fred learned both

methods with similar efficiency, they would then determine which method Fred and his family preferred to pursue for continued communication intervention.

Authors' Note

Shelley K. Lund is an associate professor of communication sciences and disorders at the University of Wisconsin-Milwaukee. Dr. Lund's research focuses on augmentative and alternative communication (AAC), assessment, and outcomes. She has been the principal investigator on a federally funded grant to develop materials to assist speech-language pathologists with AAC assessments. She teaches courses in AAC, autism, and intellectual and developmental disorders.

Emily Keis is a graduate student in her second year of studying speech-language pathology at the University of Wisconsin-Milwaukee. She received her bachelor of science from the University of Wisconsin-Madison. She is pursuing her master of science with a certificate in assistive technology. Emily participated in the Interdisciplinary Technology Instruction Program for Individualized Technology Implementation Planning (ITIP2) training program, which is funded by the U.S. Department of Education, Office of Special Education Programs. After graduation, she plans to work with children with complex communication needs and children who have feeding disorders.

Kaitlin SanFelippo is a graduate student studying speech-language pathology. She received her bachelor of science with a certificate in education and educational services from the University of Wisconsin-Madison. She is pursuing her master of science with a certificate in assistive technology from the University of Wisconsin-Milwaukee. Kaitlin participated in the Interdisciplinary Technology Instruction Program for Individualized Technology Implementation Planning (ITIP2) training grant. After graduating, she plans to work with children with complex communication needs in the school setting.

References

- Anderson, D. K., Lord, C., Risi, S., DiLavore, P. S., Shulman, C., Thurm, A., Welch, K., & Pickles, A. (2007). Patterns of growth in verbal abilities among children with autism spectrum disorder. *Journal of Consulting and Clinical Psychology, 75*(4), 594–604. <https://doi.org/10.1037/0022-006X.75.4.594>
- Agius, M. M., & Vance, M. (2016). A comparison of PECS and iPad to teach requesting to pre-schoolers with autistic spectrum disorders. *Augmentative and Alternative Communication, 32*(1), 58–68. <https://doi.org/10.3109/07434618.2015.1108363>
- Bock, S. J., Stoner, J. B., Beck, A. R., Hanley, L., & Prochnow, J. (2005). Increasing functional communication in non-speaking preschool children: Comparison of PECS and VOCA. *Education and Training in Developmental Disabilities, 40*(3), 264–278. <https://www.jstor.org/stable/23879720>
- Boesch, M. C., Wendt, O., Subramanian, A., & Hsu, N. (2013). Comparative efficacy of the Picture Exchange Communication System (PECS) versus a speech-generating device: Effects on requesting skills. *Research in Autism Spectrum Disorders, 7*(3), 480–493. <https://doi.org/10.1016/j.rasd.2012.12.002>
- Bondy, A., & Frost, L. (2001). The Picture Exchange Communication System. *Behavior Modification, 25*(5), 725–744. <https://doi.org/10.1177/0145445501255004>
- Bondy, A. S., & Frost, L. A. (1994). The Picture Exchange Communication System. *Focus on Autistic Behavior, 9*(3), 1–19. <https://doi.org/10.1177/108835769400900301>
- Bondy, A. S., & Frost, L. A. (1998). The Picture Exchange Communication System. *Seminars in Speech and Language, 19*(4), 373–389. <https://doi.org/10.1055/s-2008-1064055>
- Frost, L., & Bondy, A. (2002). *The Picture Exchange Communication System training manual* (2nd ed.). Pyramid Educational Consultants, Inc.

- Light, J. (1999). Do augmentative and alternative communication interventions really make a difference? The challenges of efficacy research. *Augmentative and Alternative Communication, 15*(1), 13–24. <https://doi.org/10.1080/07434619912331278535>
- Lloyd, L. L., Fuller, D. R., & Arvidson, H. H. (1997). *Augmentative and alternative communication: A handbook of principles and practices*. Allyn and Bacon.
- McNaughton, D., & Light, J. (2013). The iPad and mobile technology revolution: Benefits and challenges for individuals who require augmentative and alternative communication. *Augmentative and Alternative Communication, 29*(2), 107–116. <https://doi.org/10.3109/07434618.2013.784930>
- Mirenda, P. (2003). Toward functional augmentative and alternative communication for students with autism: Manual signs, graphic symbols, and voice output communication aids. *Language, Speech, and Hearing Services in Schools, 34*(3), 203–216. [https://doi.org/10.1044/0161-1461\(2003/017\)](https://doi.org/10.1044/0161-1461(2003/017))
- Rossetti, L. (2006). *The Rossetti Infant-Toddler Language Scale examiner's manual*. Pro-Ed.
- Schlosser, R. W., Wendt, O., Angermeier, K. L., & Shetty, M. (2005). Searching for evidence in augmentative and alternative communication: Navigating a scattered literature. *Augmentative and Alternative Communication, 21*(4), 233–255. <https://doi.org/10.1080/07434610500194813>
- Scruggs, T. E., & Mastropieri, M. A. (1998). Summarizing single-subject research: Issues and applications. *Behavior Modification, 22*(3), 221–242. <https://doi.org/10.1177/01454455980223001>
- Son, S. H., Sigafoos, J., O'Reilly, M., & Lancioni, G. E. (2006). Comparing two types of augmentative and alternative communication systems for children with autism. *Pediatric Rehabilitation, 9*(4), 389–395. <https://doi.org/10.1080/13638490500519984>

Table 1. Description of Articles Included in Review

Source	Design	Research questions/Objectives
Agius & Vance (2016)	Multiple baseline across participants with an adapted alternating treatment design	(1) Can preschoolers with ASD be taught to use both PECS and an iPad as an SGD to request? (2) Which AAC system results in a faster rate of acquisition of requesting skills? (3) Do preschoolers with ASD demonstrate a preference for either of these AAC modes prior to and during intervention? (4) Can preschoolers with ASD be taught advanced operations involving navigation on the iPad?
Bock et al. (2005)	Alternating treatment design	(1) Which communication strategy, PECS or VOCA, results in a more rapid rate of acquisition of requesting skills for preschool children? (2) To what extent do communication behaviors utilizing PECS and VOCA generalize from a pullout setting to the classroom setting?
Boesch et al. (2013)	Multiple baseline across participants combined with an alternating treatment design	(1) Evaluate the efficacy of an SGD (ProxTalker) when compared to the traditional PECS intervention in developing requesting skills for children with autism. (2) Validate a modification of the PECS protocol for infusing speech output technology in the PECS instructional framework.
Son et al. (2006)	Alternating treatment design	(1) Compare acquisition of requesting responses using picture exchange vs. a VOCA. (2) Is there a preference for either AAC mode?

Table 2. Summary of Findings

Source	Participants	Intervention and duration	Dependent measures	Results	Average PND <i>M</i> (range)
Agius & Vance (2016)	3 preschool-aged children with ASD	PECS protocol for phases 1–3 (adapted PECS protocol for iPad condition) Six (20-min) sessions of intervention over 4 weeks per condition (8 weeks total)	(a) The number of independent requests (b) The number of trials to criterion (c) Modality preference data	Both AAC options were acquired for requesting. All three participants were able to achieve the mastery criterion within a comparable period of time, suggesting that the two AAC options were equally effective (but all participants required more prompted trials and sessions for the iPad condition). No clear preference for either mode. All participants were able to learn to request using a three-step navigation sequence.	PECS = 100% SGD = 94% (83%–100%)
Bock et al. (2005)	Six 4-year-old boys with developmental delay who were nonspeaking	The researchers predetermined that in each session a child would have 10 opportunities or 15 minutes, whichever came first, to request items or activities using VOCA and 10 opportunities or 15 minutes to request items or activities using PECS. 3 days/week for children at school A and 2 days/week for children at school B. 4 ½ weeks of intervention	Correct response operationally defined PECS: exchanging a picture for a desired item without a gestural or verbal prompt VOCA: independently positioning the VOCA correctly and accessing a picture to produce digitized speech	All children met criterion in Phase I for advancement to Phase II with both VOCA and PECS. Five children met the criterion to move to Phase III of PECS. Two children met criterion to move to Phase III with VOCA. Two children completed Phase III of PECS, and one child completed Phase III of VOCA.	PECS = 90% (73%–100%) SGD = 78% (67%–89%)
Boesch et al. (2013)	3 elementary-aged children with ASD	PECS protocol for phases 1–3 (adapted PECS protocol for iPad condition) 2–3 times per week (20- to 30-min sessions) 53–71 total sessions depending on family schedule	Independent requests	(1) PECS and SGDs are equally appropriate for developing initial requesting skills. (2) Successful implementation of either AAC strategy is achievable when appropriate instructional strategies are used.	PECS = 94% (81%–100%) SGD = 95% (92%–100%)
Son et al. (2006)	3 preschool-aged children (2 with ASD, 1 with pervasive developmental disorder)	Discrete trials (10-min sessions) Number of sessions varied based on differences in family schedules (from 22–29 sessions)	(1) A correct independent request (2) Modality preference data	(1) Overall, the children learned both communication systems with comparable ease and speed, suggesting that each was a viable AAC option. (2) 1 child preferred VOCA, 2 children preferred picture exchange.	PECS = 63% (50%–73%) SGD = 69% (67%–75%)

Note. PND = percentage of nonoverlapping data for each intervention.

Figure 1. Search for Evidence

