Appendix A. Search Methodology for Studies Included in This Review

Database	Terms	Publication range	Hits	Original articles selected
EBSCOhost included hits from: (1) ASHA journals, (2) PsycINFO, (3) CINAHL Plus, (4) ERIC, and (5) Academic Search Premier*	(1) Augmentative and Alternative Communication (2) Aphasia	2005–2016	56	6
PubMed	(1) Augmentative and Alternative Communication (2) Aphasia	2005–2016	29	1
Science Direct	(3) Augmentative and Alternative Communication (4) Aphasia	2005–2016	44	1
Google Scholar	(1) Augmentative and Alternative Communication (2) Aphasia (3) Graphic symbol AND (4) Photographs	2005–2016	321	3

Note. This figure lists the search strategies and systematic steps required to identify relevant studies.

* Rico's outpatient center is affiliated with the local hospital that provides access to EBSCOhost, allowing him to simultaneously search five different databases, thereby decreasing his search time.

Appendix B. Empirical Articles, Experimental Conditions and Interventions, and Quality Ratings

Dietz, A., Weissling, K., Griffith, J., McKelvey, M., & Macke, D. (2014). The impact of interface design during an initial high-technology AAC experience: A collective case study of people with aphasia. ***Augmentative and Alternative Communication, 30*****(4), 314–328. doi:10.3109/07434618.2014.966207**	
Participants	*n* = 5; age range = 40–72 years; education = > 12 years; aphasia type = 3 Broca's, 1 Transcortical motor, 1 Transcortical sensory; post onset range = 21–252 months; 2 participants had prior AAC experience
Research design	Case series design
Interface design	Scene display
Experimental conditions	(1) Personally-relevant photographs with text, (2) personally-relevant photographs without text, (3) nonpersonally-relevant photographs with text, and (4) nonpersonally-relevant photographs without text
Outcome measure	Narrative retells to measure (1) expressive modality unit used: (a) spoken, (b) written, (c) drawn, (d) photograph, (e) text box, and (f) speak button; (2) repair trajectory or the average number of expressive modality units required to repair breakdown in conversation; and (3) perceived helpfulness of photographs.
Treatment integrity	99.25%–100%
Interrater reliability	80%–93% agreement
Outcomes	Residual natural speech used more than any other unit, followed by writing and personally-relevant pictures. Nonpersonally-relevant photos were more difficult to use for three out of five participants, possibly because unfamiliar information materials can be disorienting and frustrating. No clear pattern found for repair trajectory. PWA indicated that personally-relevant photographs were more beneficial to narrative retell than nonpersonally-relevant photographs.
Effect size	Unable to calculate
Quality rating	Level 4
Additional PICO information	Communication partner of PWA stated that personally-relevant photographs made the story retell more like a conversation. Personal photographs helped to explain the story. AAC did not hinder natural speech production.
Griffith, J., Dietz, A., & Weissling, K. (2014). Supporting narrative retells for people with aphasia using augmentative and alternative communication: Photographs or line drawings? Text or no text? ***American Journal of Speech-Language Pathology, 23*****(2), S213–S224. doi:10.1044/2014_AJSLP-13-0089**	
Participants	*n* = 4; age range = 42–70 years; education = > 12 years; aphasia type = Broca's; post onset range = 42–81 months; 1 participant had prior AAC experience
Research design	Case series design
Interface design	Scene display
Experimental conditions	Randomized presentation order of (1) personally-relevant photographs with text, (2) personally-relevant photographs without text, (3) line drawings with text, and (4) line drawings without text.
Outcome measure	Narrative retells to measure expressive modality units: (1) spoken, (2) picture (photos or line drawings), (3) text box, (4) synthesized speech, (5) written, and (6) drawn. Social validity data on perceived helpfulness of each experimental condition on narrative retell.
Treatment integrity	95%

Appendix B. (continued)

Interrater reliability	≥ 80% for all outcome measures
Outcomes	Residual natural speech most often used followed by technology-based AAC use (i.e., pictures, text box, and synthesized speech units). Nontechnology-based AAC (i.e., written and drawn units) was used least. Higher frequency of personally-relevant photographs used when compared to line drawings. PWA indicated that photographs and line drawings were helpful during narrative retell.
Effect size	Unable to calculate
Quality rating	Level 4
Additional PICO information	Technology-based AAC use did not hinder natural speech production.
Ho, K. M., Weiss, S. J., Garrett, K. L., & Lloyd, L. L. (2005). The effect of remnant and pictographic books on the communicative interaction of individuals with global aphasia. *Augmentative and Alternative Communication, 21*(**3), 218–232. doi:10.1080/07434610400016694**	
Participants	*n* = 2; age = 71 and 77 years; education = 12–18 years; aphasia type = global; post onset = 1.5–3 months; no AAC experience
Research design	Single-subject alternating treatment design
Interface design	Communication book grid display
Experimental conditions	No AAC, graphic symbols in communication book, and remnants in communication book
Outcome measure	Conversational discourse variables (e.g., number of conversational turns and initiations)
Treatment integrity	98%
Reliability	Intrarater reliability: 74%–100% for all outcomes Interrater reliability: 75%–98% for all outcomes
Outcomes	Both graphic symbols and remnants within communication books increased the number of conversational turns and initiations when compared to the no-AAC condition. However, slightly more communication occurred in the remnant book condition than the graphic symbol book condition.
Effect size	Unable to calculate
Quality rating	Level 4
Additional PICO information	Grids containing graphic symbols in communication books do facilitate communication and should be used when remnants are unavailable or there is a need for more complex messages.
Hough, M., & Johnson, R. K. (2009). Use of AAC to enhance linguistic communication skills in an adult with chronic severe aphasia. *Aphasiology, 23*(**7-8), 965–976. doi:10.1080/02687030802698145**	
Participants	*n* = 1; age = 56 years; education = not reported; aphasia type = nonfluent; post onset = 24 months; AAC experience not reported
Research design	Case study design
Interface design	Grid display

Appendix B. (continued)

Experimental intervention	AAC treatment protocol least to most prompt and cue hierarchy including some AAC modelling (Koul et al., 2005). Trial 1 = verbal model and demonstration Trial 2 = verbal cues + pointing + gestures + pantomime Trial 3 = yes/no questions Trial 4 = question the identity of the pictures Trial 5 = preparatory set Trial 6 = state prompt + silent demonstration Trial 7 = state prompt verbally and manually demonstrate
Outcome measure	Graphic symbol identification, navigation of all symbols, scenario role-playing (i.e., answer questions about daily living activities), and sentence-construction tasks. Pre- and post-intervention scores: WAB–R score (Kertesz, 2006), ASHA Functional Assessment of Communication Skills (Frattali et al., 1995), ASHA Quality of Life Communication Scale (Paul et al., 2004), and Communicative Effectiveness Index (Lomas et al., 1989).
Treatment integrity	Not reported
Interrater reliability	Not reported
Outcomes	Participant was able to locate/identify Level 1 though Level 4 individual graphic symbols independently with 80% accuracy. Independently navigated to all symbols with 80% accuracy. Answered daily living activities questions independently with at least 80% accuracy using graphic symbols. Independently generated graphic symbol sentences with at least 80% accuracy. Post-intervention gains noted for all four communication indexes.
Effect size	Unable to calculate
Quality rating	Level 4
Additional PICO information	Participant was capable of generating short graphic symbol messages for functional communication. However, the participant answered questions in a structured conversation. Typical conversations are not question-and-answer formats.
Hux, K., Buechter, M., Wallace, S., & Weissling, K. (2010). Using visual scene displays to create a shared communication space for a person with aphasia. ***Aphasiology, 24*****(5), 643–660. doi:10.1080/02687030902869299**	
Participants	*n* = 10 **Participant with aphasia:** age = 61 years; education = 12 years; anomic aphasia; post onset = 24 months; prior AAC experience **Typical communication partners:** *n* = 9; age range = 33–62 years; no aphasia experience; AAC experience not reported
Research design	Repeated measures design
Interface design	Scene display
Experimental conditions	Communication partners were assigned to a counterbalanced scene display sequence: (a) shared-scene displays, (b) nonshared scene displays, and (c) no-scene displays. Partners interacted with participant with aphasia in each condition for 4.5 minutes.

Appendix B. (continued)

Outcome measure	Discourse analyses: (a) the number of conversational turns, (b) the number initiations and responses, (c) the complexity of utterances; and (d) content units (e.g., correct information conveyed)
Treatment integrity	Not reported
Interrater reliability	77%–94% for all outcome measures
Outcomes	Greater number of conversational turns taken in shared-scene display condition than in the nonshared-scene display and no-scene display conditions. Similar results for the number of initiations and responses and correct content units; however, negligible differences noted in utterance complexity across all conditions.
Effect size	Unable to calculate
Quality rating	Level 4
Additional PICO information	PWA have relatively intact long-term (episodic) memory, making shared-scene displays a useful tool for facilitating communication.
Johnson, R. K., Hough, M. S., King, K. A., Vos, P., & Jeffs, T. (2008). Functional communication in individuals with chronic severe aphasia using augmentative communication. ***Augmentative and Alternative Communication, 24*****(4), 269–280. doi:10.1080/07434610802463957**	
Participants	*n* = 3; age range = 57–77 years; education = 16–21 years; aphasia type = 1 mixed, 2 Broca's; post onset range = 27–93 months; some low-technology-based AAC experience
Research design	Case series design
Interface design	Grid display
Experimental intervention	AAC treatment protocol least to most prompt and cue hierarchy including some AAC modelling (Koul et al., 2005). Trial 1 = verbal model and demonstration Trial 2 = verbal cues + pointing + gestures + pantomime Trial 3 = yes/no questions Trial 4 = question the identity of the pictures Trial 5 = preparatory set Trial 6 = state prompt + silent demonstration Trial 7 = state prompt verbally and manually demonstrate
Outcome measure	Graphic symbol identification, navigation of all symbols, scenario role-playing (i.e., answer questions about daily living activities), and sentence-construction tasks were completed using a grid display with four levels. Pre- and post-intervention scores: WAB–R score (Kertesz, 2006), ASHA Functional Assessment of Communication Skills (Frattali et al., 1995), ASHA Quality of Life Communication Scale (Paul et al., 2004), and Communicative Effectiveness Index (Lomas et al., 1989).
Treatment integrity	Not reported
Interrater reliability	Not reported

Appendix B. (continued)

Outcomes	Participant was able to locate/identify Level 1 though Level 4 individual graphic symbols independently with 80% accuracy. Independently navigated to all symbols with 80% accuracy. Answered activities of daily living questions independently with at least 80% accuracy using graphic symbols. Independently generated graphic symbol sentences with at least 80% accuracy. Post-intervention gains noted for all four communication indexes.
Effect size	Unable to calculate
Quality rating	Level 4
Additional PICO information	Caregivers were trained to use the intervention protocol and the AAC system. Anecdotal evidence indicated that caregiver training facilitated more accurate information exchange between caregivers and PWA. Increase in WAB–R auditory comprehension scores post- intervention may have been secondary to multimodality AAC treatment.
Koul, R., Corwin, M., & Hayes, S. (2005). Production of graphic symbol sentences by individuals with aphasia: Efficacy of a computer-based augmentative and alternative communication intervention. ***Brain and Language, 92*****(1), 58–77. doi:10.1016/j. bandl.2004.05.008**	
Participants	*n* = 10; age range = 32–86 years; education = < 15 years; aphasia type = 7 Broca's, 2 global, 1 normal language post-stroke; post onset range = 12–124 months
Research design	Multiple baseline design across behaviors (i.e., sentence complexity Levels I, II, III, IV, V)
Interface design	Grid display
Experimental intervention	Phase I: identification of all symbols Phase II: train participants to produce sentences of increasing grammatical sentences using a prompting and cue hierarchy: Trial 1 = verbal model and demonstration Trial 2 = verbal explanation Trial 3 = verbal cues + pointing + gestures + pantomime Trial 4 = yes/no questions Trial 5 = question and mand Trial 6 = preparatory sets Trial 7 = state prompt + silent demonstration Trial 8 = state prompt + state answer + silent demonstration Trial 9 = state prompt verbally and manually demonstrate Trial 10 = state prompt + step-by-step instructions with demonstration
Outcome measure	Identification of graphic symbols on Gus software; graphic symbol sentence production (Level I–V) Level I = agent + action or object + object ("boy eat") Level II = morphological inflections ("dog eats") Level III = agent + action + object or object + preposition + object ("girl eating the soup") Level IV = passive sentence or compound sentences ("The trash was dumped by the boy.") Level V = sentences containing nouns clauses, noun–phrase descriptors, or compound verb phrases ("The boy who had the blue jacket walked a dog.")
Treatment integrity	100%

Appendix B. (continued)

Interrater reliability	100% for all outcome measures
Outcomes	Individuals with severe Broca's or global aphasia are able to identify and combine graphic symbols to form sentences of varying syntactical complexity in experimental contexts. Five PWA produced Level III sentences. Three PWA produced Level II sentences. One participant produced no sentences correctly. Generalization probe data revealed poorer performance for all PWA. Participant without aphasia produced sentences from all levels.
Effect size	Unable to calculate without raw data
Quality rating	Level 3
Additional PICO information	Individuals with nonfluent aphasia are capable of producing graphic symbol sentences using a technology-based AAC system in an experimental context. Further data is required to determine how PWA generalize technology-based AAC systems outside of experimental contexts.
Koul, R., Corwin, M., Nigam, R., & Oetzel, S. (2008). Training individuals with chronic severe Broca's aphasia to produce sentences using graphic symbols: Implications for AAC intervention. ***Journal of Assistive Technologies, 2*****(1), 23–34. doi:10.1108/17549450200800004**	
Participants	*n* = 3; age range = 63–73 years; education = < 12 years; aphasia type = Broca's aphasia; post onset range = 12–106 months; no AAC experience
Research design	Multiple baseline design across behaviors (i.e., sentence complexity Levels I, II, III, IV, V)
Interface design	Grid display
Experimental intervention	Phase I: identification of all symbols Phase II: train participants to produce sentences of increasing grammatical sentences using a prompting and cue hierarchy: Trial 1 = verbal model and demonstration Trial 2 = verbal explanation Trial 3 = verbal cues + pointing + gestures + pantomime Trial 4 = yes/no questions Trial 5 = question and mand Trial 6 = preparatory sets Trial 7 = state prompt + silent demonstration Trial 8 = state prompt + state answer + silent demonstration Trial 9 = state prompt verbally and manually demonstrate Trial 10 = state prompt + step-by-step instructions with demonstration
Outcome measure	Identification of graphic symbols using a DynaMyte 3100 (Tobii Dynavox); graphic symbol sentence production (Level I–V) Level I = agent + action or object + object ("boy eat") Level II = morphological inflections ("dog eats") Level III = agent + action + object or object + preposition + object ("girl eating the soup") Level IV = passive sentence or compound sentences ("The trash was dumped by the boy.") Level V = sentences containing nouns clauses, noun–phrase descriptors, or compound verb phrases ("The boy who had the blue jacket walked a dog.")

Appendix B. (continued)

Treatment integrity	Not reported
Interrater reliability	100% for all outcome measures
Outcomes	PWA are able to identify and combine graphic symbols to produce sentences of varying syntactical complexity in experimental contexts. One participant produced Level III sentences. One participant produced Level IV sentences. One participant produced Level V sentences.
Effect size	Unable to calculate without raw data
Quality rating	Level 4
Additional PICO information	The results were variable across participants. Research needs to determine if experimental production of graphic symbol sentences can be generalized to typical communicative interactions.
McKelvey, M. L., Hux, K., Dietz, A., & Beukelman, D. R. (2010). Impact of personal relevance and contextualization on word-picture matching by people with aphasia. ***American Journal of Speech-Language Pathology, 19*****(1), 22–33. doi:10.1044/1058-0360**	
Participants	*n* = 8; age range = 25–86 years; education = 8–18 years; aphasia type = Broca's aphasia; post onset range = 4–234 months; some low-technology and high-technology AAC experience
Research design	Repeated measures design
Interface design	N/A; photographs and graphic symbols
Experimental conditions	Personally-relevant photographs, nonpersonally-relevant photographs, and graphic symbols
Outcome measure	Word-picture matching accuracy and picture stimuli preference
Treatment integrity	Not reported
Interrater reliability	Not reported
Outcomes	PWAs' word-picture matching performance significantly increased when presented with personally-relevant photographs when compared to nonpersonally-relevant photographs and graphic symbols. PWA preferred personally-relevant photographs.
Effect size	Word-picture matching (W = .875); Picture preference (W = .412)
Quality rating	Level 4
Additional PICO information	PWA preference for personally-relevant photographs supports the notion that autobiographical memory and recognition memory are relatively intact and can be used for communication purposes.
Petroi, D., Koul, R. K., & Corwin, M. (2014). Effect of number of graphic symbols, levels, and listening conditions on symbol identification and latency in persons with aphasia. ***Augmentative and Alternative Communication, 30*****(1), 40–54. doi:10.3109/07434618.2014.882984**	
Participants	*n* = 20 **PWA:** *n* = 10; age range = 46–68 years; education = 8–18 years; aphasia type = Broca's aphasia; post onset range = 26–123 months; nontechnology-based AAC experience **Matched controls:** *n* = 10; mean age = 57.42; education (mean years): 13.70 Independent t test indicated no significant (p < .05) differences between groups

Appendix B. (continued)

Research design	Mixed design
Interface design	Grid display
Experimental conditions	To determine the how the variables below effect the identification accuracy and response latency of single graphic symbols and subject-verb-object sentences: (1) Effect of the number of symbols per screen (4, 8, 12, and 16) (2) Effect of a three-level hierarchical grid display (Levels 1, 2, 3) (3) Effect of listening conditions (sustained attention, focused attention, divided attention)
Outcome measure	Identification accuracy, response latency, and participants' perceived difficulty
Treatment integrity	100%
Interrater reliability	100% for all outcome measures
Outcomes	Normal controls performed better than PWA on all tasks. Identification accuracy for single symbols and sentences decreased as the level of location of a symbol and number of symbols per screen increased. Response latency increased as the level of location of a symbol and number of symbols per screen increased. PWA perceived greater levels of task difficulty than controls.
Effect size	Partial Eta Squared: Group and the number of symbols per screen explained 53% (large effect) and 9% (small effect) of the single symbol identification variance, respectively. Group and level of location explain 51% (large effect) and 14% (medium effect) of the single symbol identification variance, respectively.
Quality rating	Level 3
Additional PICO information	Level of location explained more of the variance than number of symbols indicating that navigation across screens is more difficult than processing the number of symbols per screen.
Wallace, S. E., Dietz, A., Hux, K., & Weissling, K. (2012). Augmented input: The effect of visuographic supports on the auditory comprehension of people with chronic aphasia. ***Aphasiology, 26*****(2), 162–176. doi:10.1080/02687038.2011.628004**	
Participants	*n* = 21; age range = 37–85 years; education = 11.5–18 years; aphasia type = 9 Anomic, 5 Broca's, 3 Wernicke's, 2 Conduction, 2 Transcortical motor; post onset range = 6–120 months; some low-technology and high-technology AAC experience
Research design	Cohort repeated measures design
Interface design	N/A, photographs
Experimental conditions	No context photographs, low-context drawing with embedded no-context photographs, high-context photographs, and no photographs
Outcome measure	Auditory comprehension response accuracy
Treatment integrity	100%
Interrater reliability	Not reported
Outcomes	No significant differences in any conditions. Inspection of individual participant data revealed no patterns.

Appendix B. (continued)

Effect size	Partial Eta Squared = .057
Quality rating	Level 4
Additional PICO information	Photograph stimuli were not personally relevant
Wallace, S. E., & Hux, K. (2014). Effect of two layouts on high technology AAC navigation and content location by people with aphasia. ***Disability and Rehabilitation: Assistive Technology, 9*****(2), 173–182. doi:10.3109/17483107.2013.799237**	
Participants	*n* = 2; age range = 50 & 60 years; education: 16 years each; aphasia type = 1 nonfluent aphasia, 1 fluent aphasia; post onset = 17 & 15 months; no AAC experience
Research design	Single subject, phase change design (BCB'C')
Interface design	Scene display and grid display
Experimental intervention	Backward chaining with vanishing cues to facilitate navigation within each display
Outcome measure	Maximally Efficient Accuracy Score, Combine Accuracy Score, and Navigation Efficiency Score
Treatment integrity	Not reported
Interrater reliability	99.97%–99.97% for all outcome measures
Outcomes	Higher Maximally Efficient Accuracy Scores in scene display condition indicating a greater number of errorless navigations to a selected picture. Higher Combined Accuracy Scores in scene display indicating successful navigation. Higher Navigation Efficiency Scores in grid display condition indicating more difficulty.
Effect size	Nonoverlap of All Pairs (NAP): Participant 1: medium (66%–92%) to large (93%–100%) effect for scene display; weak (0%–65%) to medium (66%–92%) effect for grid display Participant 2: weak (0%–65%) to medium (66%–92%) effect for scene display; weak (0%–65%) effect for grid display Percent Nonoverlapping Data (PND): Participant 1: Questionable effectiveness for scene display (50%–70%); Not effective for grid display (0%) Participant 2: unreliable (< 50%) to high effectiveness (> 90%) for scene display; unreliable effectiveness (< 50%) for grid display
Quality rating	Level 4
Additional PICO information	Navigation was more transparent in the scene display condition. May lead to better communication secondary to being an easier to use interface.

Note. WAB–R (Kertesz, 2006), Western Aphasia Battery–Revised. Aphasia severity for all study participants was moderate to severe as rated by standardized measures [e.g., Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 1983) and WAB–R)].