



## The effect of AAC training programs on professionals' knowledge, skills and self-efficacy in AAC: a scoping review

Cathy Flores  and Shakila Dada 

Centre for Augmentative and Alternative Communication, University of Pretoria, Hatfield, South Africa

### ABSTRACT

Since effective and successful AAC service delivery relies on the knowledge and competence of professionals in the field of AAC, sufficient training in AAC will equip professionals to provide quality AAC service delivery. However, many professionals lack training in AAC and structured opportunities for professional development are sorely needed. As there is no consensus on the amount, mode of delivery and content of AAC training, the purpose of this scoping review was to identify AAC training programs for professional development and to describe the characteristics and effects of such programs. A five-pronged search strategy was used to identify relevant studies. The certainty framework was used to appraise the quality of included studies. Charted data included general study characteristics; participant characteristics; training characteristics (i.e., training goals; instructional materials and strategies; training duration); quality appraisal; and reported effects of the training. The scoping review identified 34 studies for inclusion. The results showed the potential of AAC training programs for continuous professional development to increase professionals' skills in AAC intervention. A range of training characteristics was identified to guide the development of future training programs. Gaps in the research related to the training of AAC professionals were also identified to guide future research.

### ARTICLE HISTORY

Received 28 March 2024  
Revised 26 June 2024  
Accepted 11 July 2024

### KEYWORDS

Augmentative and alternative communication; professional development; training; scoping review



The field of augmentative and alternative communication (AAC) is multi-professional in nature due to the wide range of individual and contextual factors that impact communication by means of AAC methods (Beukelman & Light, 2020; Costigan & Light, 2010). Based on these factors, individuals who use AAC are typically seen by a collaborative team of professionals from a range of disciplines. Professionals participate in the team as needed, according to the expertise required to meet the unique needs of the individual involved. This multi-professional team includes, among others, speech-language pathologists (SLPs), occupational therapists (OTs) and special education teachers (SETs) (Beukelman & Light, 2020). Importantly, the AAC team should also include the individual who uses AAC, family members and significant others, such as peers. Together with the multi-professionals, such a team will allow for a scope of expertise for AAC service delivery (Beukelman & Light, 2020).


According to Dada et al. (2017) and Murray et al. (2020), effective and successful AAC service delivery relies inter alia on the professionals' AAC competence and knowledge. Professionals within the AAC team therefore need sufficient training in AAC to provide quality service to the individual requiring AAC. Research however shows that many of these professionals lack training in AAC. For example, a study by Barman et al. (2023) indicates that graduate speech-language

pathologists do not feel prepared or confident to work with individuals who use AAC. Furthermore, Douglas et al. (2020) emphasize the lack of pre-service and in-service training opportunities for AAC practitioners. A study by Tönsing and Dada (2016), investigating teachers' perceptions of AAC in South Africa, found that almost all teachers wanted further AAC training. Similarly, speech-language pathologists in the South African context also perceive a lack of evidence-based training in AAC (Dada et al., 2017).

A review by Costigan and Light (2010) showed that there is minimal to no pre-service AAC training for speech-language pathologists, special education teachers and occupational therapists. Moreover, pre-service AAC training is typically optional and often provided by faculty members with little experience in AAC. Consequently, less than half of graduating students were competent in AAC service delivery (Costigan & Light, 2010). Despite recent improvements in pre-service AAC programs, there is still a perceived need for improved training and suggestions have been made for the revision of course offerings in AAC (Da Fonte et al., 2022; Douglas et al., 2020; Pitt et al., 2023; Sanders et al., 2021).

Apart from curriculum reform aimed at ensuring sufficient service delivery in AAC, there is a need for training that is specific to the needs of professionals (Marvin et al., 2003). Continuing professional development is critical for the

**CONTACT** Cathy Flores  [cathy.mackintosh@gmail.com](mailto:cathy.mackintosh@gmail.com)  Centre for Augmentative and Alternative Communication, University of Pretoria, Hatfield, Pretoria 0028, South Africa

 Supplemental data for this article can be accessed online at <https://doi.org/10.1080/07434618.2024.2381462>.

© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group  
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

refining of specialized skills required for the implementation of AAC (Sanders et al., 2021). Ongoing education after graduation ensures that the knowledge and skills of professionals are maintained, improved and adapted according to the latest evidence, and that safe and effective services are provided. The use of training programs refers to structured sets of activities that aim to develop specific knowledge, skills or competencies, address specific learning objectives and can be developed according to the needs of the target population (Noe, 2017). According to Dada et al. (2017) and Dada et al. (2024), models for training and professional development in AAC are needed. Professionals in AAC typically self-initiate their professional development through on-the-job training and self-study by approaching more experienced professionals, attending local conferences, and using Internet resources such as websites and blogs related to AAC. However, they often do not seek out evidence-based practices through research literature, which highlights a gap between research and practice (Douglas et al., 2020; Marvin et al., 2003). Structured opportunities for professional development – beyond traditional lecture-based programs, conference presentations and journal article repositories, with researchers making a concerted effort to share their findings with practitioners – are required to support practicing professionals in implementing current, evidence-based clinical practice (Dada et al., 2017; Douglas et al., 2020).

For the working professional with multiple demands, it is important to consider the training method (Costigan & Light, 2010). The use of technology has been shown to make the learning material more accessible and appealing. It provides an active learning environment that caters to those professionals who are geographically distant from learning centers and allows AAC experts to train larger numbers of professionals (Dhawan, 2020). Using methods such as online learning has become a powerful tool for professional development (Feldacker et al., 2017) and has gained even greater significance during the COVID-19 pandemic when online learning became a necessity (Dhawan, 2020; Khoza-Shangase et al., 2021). The pandemic initiated a re-imagining of how professional development can be provided (Khoza-Shangase et al., 2021).

Despite the recognition of the importance of continuous professional development for professionals in AAC, there is no consensus on the amount, mode of delivery and content of such training in AAC (Wallis et al., 2017). A synthesis of the availability, characteristics and effectiveness of professional development in AAC will guide the development and implementation of professional AAC training programs to ensure appropriate AAC service delivery to people with complex communication needs (CCN). A scoping review was conducted to ensure comprehensive coverage of the literature in AAC training programs for professionals. This allowed for the integration of research on available AAC training programs, for qualified professionals specifically, to guide the development and implementation of future training programs. The scoping review attempted to answer the following question: *What are the characteristics and effects of AAC training programs for professionals in the field of AAC?* The

review had the following specific aims: (a) to analyze and integrate the research on available AAC training programs for professionals in AAC; (b) to describe the AAC training programs in terms of content, instructional strategies, instructors, method of training, duration, and instructional material; and (c) to describe the effects of the AAC training programs on professionals' knowledge, skills and/or self-efficacy in AAC.

## Method

### Research design

A scoping review design was used in this study as it makes provision for a broad investigation to identify key concepts and characteristics of AAC training for professionals. It also allows sources of evidence to be obtained to inform practice (Daudt et al., 2013; Schlosser & Koul, 2015; Tricco et al., 2018). The current scoping review was guided by the framework developed by Arksey and O'Malley (2005), and the PRISMA Extension for Scoping Reviews (PRISMA ScR) checklist (Tricco et al., 2018) was used to guide methodological quality and transparency (Page et al., 2021; Peters et al., 2022; Tricco et al., 2018). This study was approved by the ethics committee of the University of Pretoria.

### Search strategy

A pilot search was conducted to determine the feasibility of the review question and to refine the search terms. Study eligibility criteria and the data extraction template were also refined in accordance with the pilot search (Peters et al., 2022). To identify potential studies, a five-pronged search strategy was used. First, eight electronic databases were searched, namely Academic Search Complete; Cumulative Nursing and Allied Health Literature (CINHAL); Educational Resources Information Center (ERIC); Linguistics Database; MEDLINE; PsychINFO; Scopus; and Africa-Wide Information. Next, all studies identified in the electronic search were included in a forward citation search. Thirdly, ancestry searches of the reference lists of included studies were conducted. The following journals were hand-searched between 1985 and October 2023: *American Journal of Occupational Therapy*; *American Journal of Speech-Language Pathology*, *Assistive Technology*, *Augmentative and Alternative Communication*; and *Speech and Hearing Services in Schools* (cf. Costigan & Light, 2010). Finally, a search of ProQuest Dissertations and Theses Global was conducted.

The search terms were developed from the main research question with regard to the population, exposure and outcome (PEO) format (Moola et al., 2015) and guided by the review by Costigan and Light (2010). The following search terms were used in all database searches and were developed in consultation with an information specialist: "augmentative and alternative communication" or "AAC" and "training" or "education" or "development" or "learning" and "professional". The search results were imported via a RIS link format into Covidence (Version 2), a systematic review management software platform (Egan et al., 2017).

### Eligibility criteria

To be included in the review, a study had to (a) include qualified professionals typically involved in AAC service delivery (e.g., speech-language pathologists, occupational therapists, special education teachers, paraprofessionals, teaching/therapy assistants); (b) report on training that falls within the scope of AAC, which aims to augment or replace natural speech and/or handwriting using unaided strategies (e.g., gestures) and/or aided strategies (e.g., speech-generating devices; Beukelman & Light, 2020; Chavers et al., 2022); (c) report on the characteristics of the training and the effectiveness of the training; (d) employ single-case experimental designs (SCED) or an experimental or quasi-experimental group design; (e) be published between January 1985 and October 2023; and (f) be published in English in peer-reviewed journals or be approved as a doctoral dissertation (included in ProQuest Dissertations and Theses Global).

Nonprofessionals in the AAC team (e.g., family members) and professionals not typically involved in an educational AAC team (e.g., hospital nurses) were excluded. Studies that considered pre-service training programs and studies that reported on professionals' perceptions, experiences, or perspectives of AAC training programs were excluded. Additionally, pre-experimental designs, one group, pretest only or posttest only group designs were excluded. Descriptive studies (e.g., case studies), qualitative method designs, mixed method designs, as well as systematic, scoping or literature reviews, and meta-analyses were excluded. Studies that did not meet the eligibility criteria were excluded from the scoping review.

### Initial screening

The two authors independently screened the articles at the title and abstract level. The degree of agreement between the title and abstract level on Covidence (Version 2) was calculated using Cohen's Kappa. The score ( $k=0.94$ ) indicated near perfect agreement (McHugh, 2012). Discrepancies were rectified by discussion until a consensus was reached.

### Full-text screening

The two authors independently screened the articles at the full-text level. Again, the degree of agreement was calculated using Cohen's Kappa, and the score ( $k=0.92$ ) indicated near perfect agreement (McHugh, 2012). Discrepancies were rectified by discussion until a consensus was reached.

### Data extraction

A data extraction form was developed in Covidence, based on the work of Schlosser and Koul (2015). Data were extracted for each included study on (a) general characteristics (Covidence number, authors, title, date of publication, aims and design); (b) participant characteristics (age, gender, profession, and years of experience); (c) independent variables (characteristics and details of the AAC training, goals,

instructional materials, instructional strategies, length of training, and instructors); (d) outcome of the AAC training (i.e., dependent variable); (e) reported effects of the training and effect size, calculated using the percentage of non-overlapping data (PND) for SCEDs or Cohen's  $d$  for group designs; and (f) quality appraisal.

All data were extracted by the first author and all data extraction (100%) was checked by a research assistant (PhD candidate) and the second author. Inter-rater agreement was calculated by dividing the total number of agreements by the number of agreements plus disagreements and then multiplied by 100. This resulted in 100% agreement.

Although scoping reviews typically do not assess the methodological quality of included studies, the quality of included studies was assessed to ensure better interpretation of results and the uptake of findings in policy and practice (Daudt et al., 2013; Levac et al., 2010). Each included study was appraised using a certainty framework developed by Simeonsson and Bailey (1991) to determine the risk of bias. This framework has since also been implemented by others (e.g., Chavers et al., 2022; Dada et al., 2020; Schlosser & Koul, 2015). The certainty framework applies to intervention research in general and can therefore be used for both SCEDs and group design studies (Chavers et al., 2022). The methodological quality of each study was coded according to the quality of the design of the study, interobserver agreement (IOA) and reported treatment integrity (TI). For SCEDs, design quality was based on quality indicators specified by Horner et al. (2005). The ratings were then combined to determine the quality of the study as either conclusive, preponderant, suggestive or inconclusive (Chavers et al., 2022; Dada et al., 2020). Conclusive evidence indicates that the outcomes of the study were the result of the intervention, based on a design that implemented experimental control, reliable IOA and solid TI (i.e., IOA and TI data collected for 25%–30% of all sessions, with a score greater than 80%). Preponderant evidence implies that the reported outcomes were most likely a result of the intervention, based on a design with minor flaws, as well as adequate IOA and TI. Suggestive evidence shows that it is plausible, but not certain, that the outcomes were a result of the intervention, based on a strong design but inadequate IOA and/or TI. Inconclusive evidence suggests that it is impossible to determine whether there is a correlation between the intervention and outcomes because of the presence of significant design flaws, irrespective of the IOA and TI (Chavers et al., 2022; Schlosser & Koul, 2015; Schlosser & Wendt, 2008). The researcher assessed the quality of each included study. A research assistant (PhD candidate) and the second author checked the quality appraisal of 100% of the studies and reached 100% agreement.

For SCEDs and studies with suggestive or better evidence, PND was used to analyze the outcomes of each study as an effect size indicator (Schlosser et al., 2008; Scuggs et al., 1986; Scuggs & Mastropieri, 2012). This measure shows the non-overlap of data between baseline and intervention phases (Schlosser et al., 2008). For group designs, effect size was calculated and interpreted using Cohen's  $d$  interpretation of magnitude of effect size using the following: large

( $\geq 0.8$ ); medium (0.4–0.7); small (0.2–0.3) (Durlak, 2009). The effect size of all studies was checked by a second reviewer, the second author or a statistician. IOA for effect size – for both SCEDs and groups studies – was 97% due to disagreement regarding the PND for one study. The latter was resolved through joint discussion and calculation.

### Data analysis

The extracted data was exported to Microsoft Excel using a comma-separated value format for analysis. Data from each study was analyzed using a descriptive analytical method (Colquhoun et al., 2014). Tables and figures were used to determine and graphically present the coded and descriptive data on the study characteristics and participant characteristics. Training characteristics and outcomes were analyzed using a content analysis approach, which allowed themes to be constructed relating to the aims of the study (Colquhoun et al., 2014).

### Results

A total of 34 studies were identified for inclusion in this review. The PRISMA four-phase flow diagram in Figure 1 indicates the study identification process (Page et al., 2021). Table 1 presents a descriptive summary and explanation of the findings of the included studies in terms of (a) participants, (b) outcomes, (c) quality appraisal, and (d) effects. Table S1 (Supplemental material) provides a summary of the

characteristics of the training. Both Table 1 and S1 are ordered according to quality appraisal from conclusive to inconclusive. Results pertaining to the training programs in terms of descriptors, quality and effects are indicated below.

### AAC training program characteristics

#### Participant characteristics

A total of 265 professionals participated in the training sessions, with the majority being paraeducators ( $n = 102$ ), followed by teachers ( $n = 59$ ), special education teachers ( $n = 38$ ), speech-language pathologists ( $n = 37$ , with 21 of these from one study), and other (e.g., behavioral therapists,  $n = 22$ ). Three occupational therapists and two physiotherapists, as well as two therapy assistants, were also included. Of the 34 studies, 16 focused solely on paraprofessionals. Most of the participants were female ( $n = 108$ ) and a significantly smaller number was male ( $n = 9$ ). The gender was not specified for 148 of the participants. The majority of the participants had one to four years' experience ( $n = 48$ ); 18 participants had five to nine years' experience; 31 participants had 10–19 years' experience; and nine had less than a year's experience. Years of experience was not specified for 159 participants.

#### Study characteristics

Of the 34 studies, 26 utilized a SCED. Of these, 11 were multiple baseline designs and nine studies utilized a multiple probe design. Eight studies utilized a group design, while

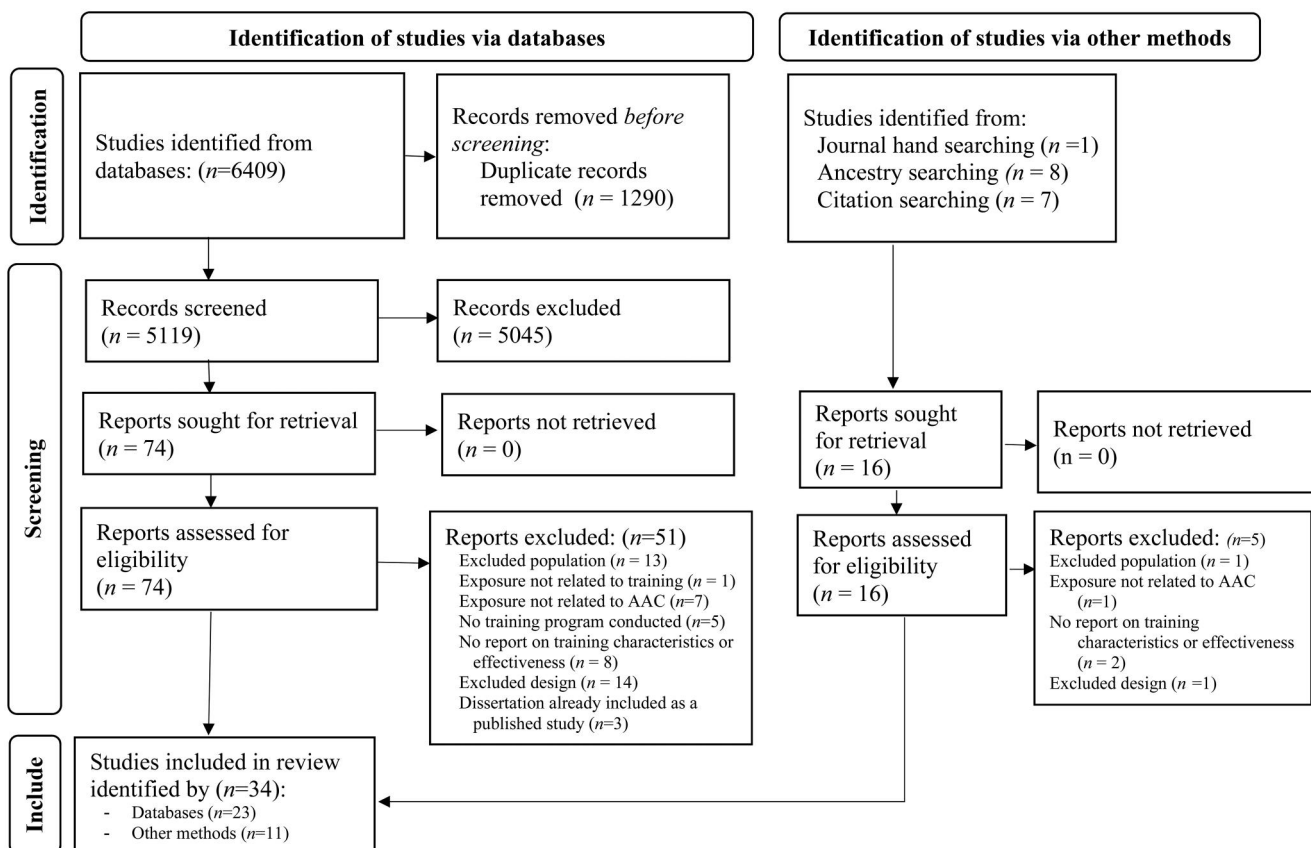


Figure 1. PRISMA 2020 flow diagram (Page et al., 2021)



Table 1. Summary of included studies

Study	Participants trained (no. of participants)	Outcomes measured	Certainty of evidence				SCED: PND per participant. Group: Cohen's d	Effect (no. of participants)
			Design	IOA	TI	Quality appraisal		
1. Ampuero and Robertson (2022)	Para (4)	Percentage of correct mand training steps and sequences	Strong	Adequate or better	Adequate or better	Conclusive	100%; 100%; 100%; 100%	Highly effective (4)
2. Andzik et al. (2021)	Para (3)	Frequency of communication supports (OTI and LTM)	Strong	Adequate or better	Adequate or better	Conclusive	100%; 100%; 100%	Highly effective (3)
3. Binger et al. (2010)	Para (3)	Percentage of correctly implemented strategy steps	Strong	Adequate or better	Adequate or better	Conclusive	100%; 100%; 100%	Highly effective (3)
4. Bingham et al. (2007)	Para (3)	Prompting student use of AAC; response to student requests.	Strong	Adequate or better	Adequate or better	Conclusive	Prompts: 100%; 100%; 100%; 100%; Responses: 100%; 100%; 100%; 100%	Prompts: Highly effective (3) Responses: Highly effective (3)
5. Carnett et al. (2021)	Teacher (4)	Independent use of the teaching procedures	Strong	Adequate or better	Adequate or better	Conclusive	100%; 100%; 100%	Highly effective (4)
6. Chazin et al. (2018)	Para (2) Teacher (1)	Frequency of AAC modeling	Strong	Adequate or better	Adequate or better	Conclusive	100%; 100%; 100%	Highly effective (3)
7. Douglas et al. (2013)	Para (3)	Number of communication opportunities	Strong	Adequate or better	Adequate or better	Conclusive	100%; 100%; 100%	Highly effective (3)
8. Douglas et al. (2013)	Para (3)	Frequency of communication opportunities.	Strong	Adequate or better	Adequate or better	Conclusive	100%; 100%; 100%	Highly effective (3)
9. Ganz et al. (2013)	BT (3)	Frequency of PECS opportunities	Strong	Adequate or better	Adequate or better	Conclusive	100%; 100%; 100%	Highly effective (3)
10. Kashinath et al. (2022)	Para (4)	The number of instances of aided language modeling	Strong	Adequate or better	Adequate or better	Conclusive	100%; 86%; 80%; 88%	Highly effective (1); Fairly effective (3)
11. Parnell (2018)	Teacher (3)	Percentage of accurate mand training components. Performance of mand training procedures using an iPad (SGD)	Strong	Adequate or better	Adequate or better	Conclusive	100%; 100%; 100%	Highly effective (3)
12. Sloman (2010)	Para (5)	Percentage of correct PECS steps completed per trial	Strong	Adequate or better	Adequate or better	Conclusive	Phase 1: 100%;100%; 100%; 0%; 0%; Phase 2: 100%; 100%; 100%;0%	Phase 1: Highly effective (3); Unreliable (2), Phase 2: Highly effective (3); Unreliable (1), Withdraw (1)
13. Tapp (2022)	SET (3)	Rate of teacher-delivered OTR	Strong	Adequate or better	Adequate or better	Conclusive	100%; 100%; 100%	Highly effective (3)
14. Walker et al. (2021)	Para (3)	Implementation fidelity of FCT	Strong	Adequate or better	Adequate or better	Conclusive	100%; 100%; 100%	Highly effective (3)
15. Walker et al. (2021)	Para (3)	Implementation of FCT	Strong	Adequate or better	Adequate or better	Conclusive	100%; 100%; 88%	Highly effective (2); Fairly effective (1)
16. Wermer et al. (2018)	Para (1)	Implementation fidelity of OTR, OTI and LTM.	Strong	Adequate or better	Adequate or better	Conclusive	100%; 100%; 83%	Highly effective (2); Fairly effective (1)
17. Homlitas et al. (2014)	Teacher (3)	Percentage of correct PECS responses	Minor design flaws.	Adequate or better	Adequate or better	Preponderant	100%; 100%; 100%	Highly effective (3)
18. Rosales et al. (2009)	Rehab (1)	Percentage of correctly performed responses	Minor design flaws	Adequate or better	Adequate or better	Preponderant	100%	Highly effective
19. Muttiah et al. (2018)	SET (9)	Number of evocative communication opportunities	Minor design flaws	Inadequate: (20% of the data)	Adequate or better	Preponderant	Pre-post comparison dz= -3.78	Large effect
20. Canosa (1994)	SET (4)	Rate of use of milieu strategies (mand-modeling, time delay and incidental teaching).	Minor design flaws	Adequate or better	Not reported	Suggestive	97%; 52%; 0.05%; 0%	Highly effective (1); Questionable effects (1); Unreliable (2)

(continued)

Table 1. Continued.

Study	Participants trained (no. of participants)	Outcomes measured	Certainty of evidence					SCED: PND per participant; Group: Cohen's d	Effect (no. of participants)
			Design	IOA	TI	Quality appraisal	eta squared = 0.14		
21. Gormley et al. (2023)	SLP (3); OT (3); PT (2); OTA (1); PTA (1)	Percentage of providers who offered a child a choice; accuracy of procedure implementation	Strong	Adequate or better	Inadequate (viewed 21%)	Suggestive	0.14	Large effect	
22. Grygas Google et al. (2018)	SET (4)	Use of communication strategies	Strong	Inadequate (20% of sessions)	Inadequate (20% of sessions)	Suggestive	100%; 100%; 100%; 100%	Highly effective (4)	
23. Kent-Walsh (2003)	SET (5)	Use of the interaction strategy	Strong	Inadequate (20% of data)	Inadequate (20% of data)	Suggestive	100%; 100%; 100%; 100%	Highly effective (5)	
24. McMillan (2005)	Teacher (4)	Frequency of communication instruction and created communication instruction opportunities (device operation; environmental arrangement; time delay)	Strong	Inadequate (20% of data)	Not reported	Suggestive	Device operation: 0%; 37.5%; 0%; 0%; Environment: 90%; 100%; 83%; 55.5%; Time delay: 100%; 100%; 33%; 50%	Device operation: Unreliable (4); Environment: Highly effective (2); Fairly effective (1); Questionable effects (1); Time delay: Highly effective (2); Unreliable (2)	
25. Pennington and McConachie (1996)	24 teachers and para (12 per group)	Quality of facilitation of children's communication; change in knowledge.	Strong	Inadequate (agreement: 76%)	Not reported	Suggestive	Cannot calculate Cohen's d from data in the study.	Highly effective (3)	
26. Ogden et al. (2022)	Para (3)	Extent to which procedural elements of FCT were implemented	Strong	Adequate or better	Not reported	Suggestive	100%; 100%; 100%	Highly effective (3)	
27. McConachie and Pennington (1997)	Exp.: Teacher (9); Para (10); Cont.: Teacher (8); Para (6)	Facilitation of target child's communication	Minor design flaws	Inadequate (agreement: 76%)	Not reported	Suggestive	Cannot calculate Cohen's d from data in the study.		
28. McCulloch and Noonan (2013)	Para (3)	Percentage of intervals with correct implementation of mand training	Minor design flaws	Adequate or better	Not reported	Suggestive	100%; 100%; 62.5%	Highly effective (2); Questionable effects (1)	
29. McMorran-Maus (2022)	SET (5); SLP (3)	Number of manual signs accurately produced; number of manual signs accurately identified.	Strong	Adequate or better	Not reported	Suggestive	Receptive sign: d = 2.26, Expressive sign: d = 1.29	Receptive sign: Large effect, Expressive sign: Large effect	
30. Smidt et al. (2007)	18 Staff from residential home.	Use of AAC; frequency of praise; use of inappropriate staff behavior	Minor design flaws	Adequate or better	Not reported	Suggestive	Use of AAC: 0%; 33%; 0%; Rate of praise: 66%; 0%; 0%; Inappropriate behavior: 0%; 0%; n/a	Use of AAC: Unreliable (3 org); Rate of praise: Questionable effects (1 org); Unreliable (2 org); Inappropriate behavior Unreliable (3)	
31. Wolf (2014)	SLP (21); SET (12)	Knowledge of AAC content; self-efficacy	Strong	Not reported	Adequate or better	Suggestive	Knowledge: d = 1.75, Self-efficacy: d = 1.08	Knowledge: Large effect, Self-efficacy: Large effect	
32. Esteviz (1996)	Each group: 5 SET dyads.	Use of communication acts	Strong	Not reported	Not reported	Inconclusive	Not calculated (see appraisal)		
33. Tsai et al. (2011)	Para (4)	Number of communication opportunities	Minor design flaws	Not reported	Not reported	Inconclusive	Not calculated (see appraisal)		

(continued)

Table 1. Continued.

Study	Participants trained (no. of participants)	Outcomes measured	Certainty of evidence					SCED: PND per participant: Group: Cohen's d	Effect (no. of participants)
			Design	IOA	TI	Quality appraisal			
34. Hayes and Traugher (2021)	Exp.: Para (8); SLP (3); teacher (5) Cont: para (13); SLP (7); teacher (7)	Percentages of utterances modeled	Minor design flaws	Not reported	Not reported	Inconclusive	Not calculated (see appraisal)		

BT: Behavior therapist; Cont.: control or comparison group; Exp.: experimental group; FCT: functional communication training; IOA: inter-observer agreement; KWS: key word signing; LTM: least to most prompts; OT: occupational therapist; OTA: occupational therapy assistant; OTI: opportunities to initiate; no.: number org.: organization; OTR: opportunities to respond; para: paraeducator; PECS: picture exchange communication system; PND: percentage of non-overlapping data; PT: physiotherapist; PTA: physiotherapy assistant; Rehab: rehabilitation graduate; SCED: single case experimental design; SGD: speech generating device; SET: special education teacher; SLP: speech language pathologist; TI: treatment integrity.

nine of the included studies were dissertations. The publication dates of the studies ranged from 1994 to 2023. The majority of the studies took place between 2010 and 2020 ( $n = 12$ ). However, since 2020, 11 studies have been conducted, indicating a rapid increase in the number of studies recently conducted on the training of professionals in AAC.

### Training method

The majority ( $n = 28$ ) of the studies utilized an in-person training method. Four studies utilized online training methods; three of these allowed participants to access the training in their own time; and one used both self-paced and live online sessions. Two studies used a mobile training method. The studies were also analyzed based on the method of training – provided in a one-on-one context or in a group. The majority of the studies provided training in a one-on-one manner between the participant and instructor ( $n = 21$ ). Ten programs at first conducted training in a group, but three of these went on to provide one-on-one training after the group training.

### Content of the training

Training content was extracted in three broad categories: (a) AAC in general; (b) AAC assessment; (c) AAC intervention, method or strategy. The majority of the studies addressed an AAC intervention or AAC strategy (79%,  $n = 27$ ), three studies provided training on AAC in general, and three studies were classified as other (all of which addressed functional communication training (FCT)). One study provided training on an assessment and intervention package, but details on assessment practices were not provided in the paper.

### Instructional strategies

Various instructional strategies were used in the different studies, with each study using a combination of strategies. The most frequently used strategies were supportive, corrective and/or constructive feedback ( $n = 20$ ); modeling and demonstration of a strategy by the instructor ( $n = 17$ ); direct instruction with the use of descriptions, summaries and explanations ( $n = 15$ ); and role-play ( $n = 15$ ). Other strategies included allowing participants to ask questions ( $n = 11$ ); discussions ( $n = 8$ ); rehearsal of strategies ( $n = 7$ ); development of plans for own target children ( $n = 7$ ); brainstorming ( $n = 4$ ); use of mnemonics ( $n = 4$ ); and use of actual AAC systems ( $n = 3$ ). Use of videos featured in 20 studies – for various reasons, such as showing how to apply the strategy being trained ( $n = 13$ ); to facilitate self-evaluation ( $n = 3$ ); to highlight the correct and incorrect implementation of a strategy ( $n = 3$ ); and to practice completion of forms used in the strategy being trained ( $n = 1$ ).

### Instructional material

Various instructional materials (such as videos; handouts; training protocols and manuals; checklists, data sheets, planning sheets and forms; intervention material; visual aids; and

PowerPoint presentations) were used during the training programs to support instruction.

### **Duration of training**

The duration of training varied greatly across the studies. For most of the in-person studies, training continued until a criterion was reached. This required several sessions which varied in length from 10 to 90 min per session. Four studies indicated that training sessions continued over several weeks, ranging between two and 12 weeks. Five studies comprised a once-off training session ranging from a one-hour to a one-day workshop. Four studies were self-paced and allowed up to five days for completion. Nine studies began with an initial training session that ranged from 32 minutes to 7.5 hours, and continued with individual coaching sessions ranging from 5 minutes to 45 minutes.

### **Instructors**

All but five of the training programs were instructed by the researchers conducting the study. Three studies trained the teacher or special education teacher of a class to train the paraeducators to implement a strategy, and one study used a speech-language pathologist to instruct. One study conducted seven workshops of which four were run by the developers of the training package and three were run by therapists and teachers in participating schools. Two studies did not specify the instructor.

### **Outcomes of training**

The majority of the studies ( $n=31$ ) investigated the effects of the training on the professionals' skills, including the use of a particular strategy or intervention; the frequency of use of a particular strategy or intervention; or the percentage of correct steps of a particular strategy or intervention. Two studies investigated the effect of the training on skills and on knowledge regarding the training topic. One study investigated the effect on knowledge in AAC as well as self-efficacy. Data related to change in the individuals using AAC, as a result of the training, was not extracted. It was however noted whether such change was measured in the study. The majority of the studies ( $n=24$ ) included data related to the individuals using AAC. Four of these studies did not use these results to inform design-dependent decisions but used the data for descriptive reasons.

### **Quality of studies**

Sixteen studies were appraised as reporting conclusive effects of the training program. All of these studies employed an experimental design with adequate or better IOA and TI. Three studies provided preponderant evidence. All three of these studies had minor design flaws such as missing quality markers. The certainty of evidence was rated as suggestive for 12 studies due to minor design flaws, or inadequate or missing IOA and TI. Three were appraised as inconclusive due to a lack of reported IOA and TI.

### **Effects of the AAC training programs**

The PND of studies that utilized a SCED, with suggestive or better evidence ( $n=25$ ), was calculated using interpretation guidelines by Scruggs et al. (1986). In 17 studies, the training program implemented was interpreted as highly effective for all participants. All of these studies looked at the effects on professionals' skills in the implementation of an AAC strategy, method or intervention. Three of the studies demonstrated highly effective results for some of the participants and fairly effective results for others. Four studies also demonstrated mixed effects, with highly effective results for some participants and questionable effects and/or unreliable treatment for others. These studies all addressed the effects on professionals' skills in the implementation or use of an AAC strategy, method or intervention. One study demonstrated unreliable treatment for all participants.

Cohen's  $d$  was calculated in studies that utilized a group design and provided suggestive or better evidence ( $n=6$ ). Three studies did not report standard deviation or mean, therefore Cohen's  $d$  could not be calculated; however, significant changes in the intervention group, post training, were reported for two of these studies. One study reported on eta squared (0.14), indicating a large effect of training, and another study reported Cohen's  $d$ , showing a large effect, but data was not provided to check the calculation. Cohen's  $d$  was calculated for two studies. Interpretation of the magnitude of effect size indicated a large effect size for both studies.

Maintenance of training effects was measured in all but five studies with follow up ranging from one week to four months following the training. Maintenance of the aspect being trained was achieved in 21 studies. Five studies showed maintenance, but with variability and a slightly decreasing trend, after booster sessions. Changes were not observed at follow-up sessions in three of the studies.

### **Discussion**

The current review reveals a lack of research focussing on the training of professionals such as speech-language pathologists and occupational therapists. These professionals have direct contact with individuals with CCN through their therapeutic roles and play an essential role in the implementation of AAC (Costigan & Light, 2010; Dada et al., 2017). More research into their professional development as AAC team members is therefore essential, specifically as their undergraduate training in AAC is limited (Dada et al., 2017; Douglas et al., 2020).

The majority of the training programs were conducted in person. While the in-person training programs were found to be effective, considering the professional development of a working professional with multiple demands, it is important to take into account the mode of training delivery (Costigan & Light, 2010). The use of online learning has become a powerful tool for continuous professional development and has gained extra significance since the COVID-19 pandemic (Feldacker et al., 2017; Dhawan, 2020). Seeing that AAC



professionals indicated frequent use of online resources, the latter should be considered when developing and providing AAC training (Douglas et al., 2020). Online instruction has been suggested to ensure adequate in-service professional preparation in the area of AAC (Kent-Walsh et al., 2015). Surprisingly, despite the escalation of online learning since the pandemic and the fact that a third of the studies included in the review were conducted since 2020, none of these studies utilized online learning. Only two of the studies conducted since the pandemic considered the use of technology by suggesting a mobile option for training (Carnett et al., 2021; Gormley et al., 2023). Based on the results of this scoping review as well as the significance of online instruction, it became clear that there is a need for further research into online training for professional development.

Training content identified in the scoping review focussed predominantly on AAC intervention by describing intervention practices in general or training on a specific strategy (e.g., PECS). None of the studies focused solely on AAC assessment. The one study that addressed an intervention and assessment package (Smidt et al., 2007) did not provide details on the aspects of AAC assessment addressed. It is generally recognized that to guide the appropriate recommendation of an AAC system and to ensure that the full benefit of AAC is achieved, a comprehensive assessment is critical. This process is extensive and dynamic, it covers several components (Beukelman & Mirenda, 2013; Theodorou & Pampoulou, 2022) and it has been identified as a topic of high priority for professional development (Douglas et al., 2020). Professionals in AAC have identified a variety of topics in which they would like to receive continuous professional development. These topics all relate to a comprehensive AAC assessment and include language-based AAC assessments, access methods, positioning, feature matching, AAC system options, AAC system selection, and funding (Douglas et al., 2020; Marvin et al., 2003). In view of the importance of a comprehensive AAC assessment, as well as a lack of, and perceived need for, such training, there is a serious demand for professional development training programs addressing a comprehensive AAC assessment.

Individuals who use AAC are typically seen by a collaborative team of professionals from a range of disciplines (Beukelman & Light, 2020). Learning how to work within a team has been noted by AAC professionals as a topic for continuous professional development to ensure that professionals have the knowledge and skills required to work as part of a team (Douglas et al., 2020). However, based on the results of this scoping review, research does not facilitate this multiple professional perspective as only six of the 34 studies included professionals from more than one discipline. A need for training that focuses on, and includes, multiple professionals in AAC is therefore noted.

Successful AAC service delivery is partly dependent on the professionals' competence, knowledge and confidence in AAC (Dada et al., 2017; Murray et al., 2020). Training that focuses on the development of the professionals' skills, knowledge and self-efficacy in AAC is therefore important to facilitate successful and effective AAC service delivery.

This scoping review considered the effects of the continuous professional development training programs on professionals' AAC skills, knowledge and self-efficacy. A definite trend was observed in the implementation of training to improve professional skills in AAC, with only two studies considering the effects of training on professional knowledge in AAC and one study looking at its effects on professional self-efficacy in AAC. While being able to implement skills related to AAC, such as an AAC intervention strategy like PECS, is essential, due to the complex nature of AAC, professionals in AAC need to be familiar with a wide range of information and knowledge (Sanders et al., 2021). It may be that improved knowledge is assumed, and therefore not reported, when training addresses a specific skill, as a skill requires putting acquired knowledge into practice (Beukelman & Mirenda, 2013). More explicit reporting of changes in knowledge would be valuable in future research. Furthermore, research to determine how improved clinical AAC knowledge and skills relates to improved self-efficacy in AAC service delivery has been highlighted as important to improve clinical practice in AAC (Sanders et al., 2021; Wolf, 2014). A need for research that examines the effect of continuous professional development training programs on knowledge of, and self-efficacy in, AAC is thus identified by this scoping review.

The research identified in this review also reflected trends relating to the characteristics of professional development training programs. Several different instructional strategies were identified, such as direct instruction, role-play, rehearsal, feedback, allowing for questions, discussions, modeling, videos, development of intervention plans, and brainstorming. Instructors always used a combination of two or more strategies. Kent-Walsh et al. (2015) made similar findings and identified the following instructional methods: descriptive overview; modeling; verbal rehearsal; role-play; and guided practice. Brock et al. (2017) reported the use of at least two strategies in training programs. Feedback and modeling were the strategies implemented most frequently in the current review, which is also in agreement with the results reported by Brock et al. (2017).

Several types of instructional materials were used. The duration of the training programs varied greatly, which is consistent with the reviews conducted by Douglas (2012) and Brock et al. (2017). Generally, the training programs were presented by the researchers conducting the study. If the researcher was not the instructor, they had trained the instructor in the topic being covered. In addition, the majority of the professionals received training in a one-on-one context. As indicated by Brock et al. (2017), this raises a question about the feasibility of the studies' training processes because continuous professional development is not typically presented in a one-on-one format by researchers. The use of implementation science design and methods could facilitate the adoption of these training programs into clinical and educational settings to allow instructors, other than researchers, to conduct the training. By considering the factors that will allow for effective implementation of the training in practice using clinician-researcher partnerships,

such training programs will more likely be implemented in real-life settings (Douglas et al., 2022).

Finally, the majority of the studies provided suggestive or better evidence. One can therefore assume that the outcomes of the study are as a result of the training provided. This guides the uptake of these findings in practice when developing AAC training programs.

### **Clinical implications**

The results of this scoping review indicate that continuous professional development training programs for professionals in AAC are effective in developing professional skills in AAC. This is important for the field of AAC as such continuous professional development programs are critical for the refinement of specialized skills needed to implement AAC (Sanders et al., 2021). This is particularly important in a field which has been shown to have minimal pre-service AAC training (Costigan & Light, 2010). If professionals feel more competent and knowledgeable in AAC, they will be able to provide more effective and successful AAC service delivery (Dada et al., 2017; Murray et al., 2020). This development of more competent and knowledgeable AAC professionals will, in turn, have clinical implications for individuals who use AAC. These individuals will receive more quality AAC services from AAC professionals and will receive the expertise required to meet their unique needs (Beukelman & Mirenda, 2013). Lastly, the results of this scoping review have implications for the development of effective continuous professional development training programs. The characteristics and effects of current AAC training programs can guide developers of future AAC training programs in terms of content, instructional strategies, instructional materials, instructors and duration of training.

### **Limitations and future directions**

This review adhered to general guidelines for conducting scoping reviews and exceeded expectations in at least two ways – by calculating effect size and conducting quality appraisals (Chavers et al., 2022). Specific limitations should however be considered. Since the search strategy was restricted to studies published in English, language bias cannot be ruled out. Additionally, grey literature was excluded and could lead to bias toward studies that yielded positive findings. An attempt was however made to locate unpublished dissertations and resulted in the inclusion of nine dissertations.

Although change in communication partner instruction research should consider a two-pronged process (partner-focused dependent variable and dependent variable related to change in the individuals using AAC (Kent-Walsh et al., 2015)), this review only considered changes shown by the professionals as a result of the training. It was however noted in Table S1 whether the study considered changes shown by the individuals using AAC. Such a single-pronged approach was considered acceptable, seeing that partner-focused dependent variables were the driving force of the

training and the main aim of the review was to determine the characteristics and effects of training programs for professionals in AAC.

Furthermore, this scoping review showed AAC training for professionals can be effective in controlled contexts, implemented by the researcher in, typically, one-on-one settings. Future research should consider whether such training programs can be adopted in real-world contexts (Douglas et al., 2022). The use of implementation science design and methods in future AAC training research would be valuable.

This scoping review did not consider pre-service AAC training but was guided by the review by Costigan and Light (2010), which considered pre-service training in AAC. As it has been a number of years since this review was conducted, an updated review on pre-service training in AAC would be valuable. Additionally, this scoping review did not consider literature related to the training of families and significant others, who are important AAC team members. Future scoping reviews could consider the effects of AAC training for family and peers.

The scoping review revealed that further research is needed to address the training of professionals in therapeutic roles. Training in AAC assessment is also needed. Moreover, further research is needed that addresses the development of online training programs and training that focuses on the development of professionals' knowledge of, and self-efficacy in, AAC.

### **Conclusion**

The results of this review showed the potential of continued professional development AAC training programs to increase professionals' skills in respect of AAC intervention. We also identified a range of training characteristics such as instructional strategies and materials that could guide the development of future AAC training programs. Our synthesis of the availability, characteristics and effectiveness of professional development in AAC has the potential to steer the development and implementation of continuous professional development training programs in AAC to ensure appropriate AAC service delivery to people with CCN and bridge the gap between research and practice in the training of AAC professionals.

### **Acknowledgements**

We would like to acknowledge the PhD candidates, Pauline Prinsloo and Zakiyya Laher, for their role as inter-raters in this study.

### **Disclosure statement**

No potential conflict of interest was reported by the author(s).

### **ORCID**

Cathy Flores  <http://orcid.org/0000-0003-1072-235X>  
Shakila Dada  <http://orcid.org/0000-0001-6170-4763>

## Data availability statement

The scoping review protocol was registered with PROSPERO, an international database of prospectively registered reviews (see <https://www.crd.york.ac.uk/prospéro/>), with registration identity CRD42022377333. Data can be requested from the first author.

## References

The references with indicator (\*) indicate the studies that were reviewed as part of the scoping review.

- \*Ampuero, M. E., & Robertson, R. E. (2022). Improving paraeducator mand training for students with autism spectrum disorder through a brief performance feedback intervention. *Education and Treatment of Children, 45*(2), 157–172. <https://doi.org/10.1007/s43494-021-00068-w>
- \*Andzik, N. R., Schaefer, J. M., & Christensen, V. L. (2021). The effects of teacher-delivered behavior skills training on paraeducators' use of a communication intervention for a student with autism who uses AAC. *Augmentative and Alternative Communication, 37*(1), 1–13. <https://doi.org/10.1080/07434618.2021.1881823>
- Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology, 8*(1), 19–32. <https://doi.org/10.1080/1364557032000119616>
- Barman, B. E., Dubasik, V. L., Brackenbury, T., & Colcord, D. J. (2023). Graduate students' perceived preparedness and confidence to work with individuals who use augmentative and alternative communication. *American Journal of Speech-Language Pathology, 32*(3), 1165–1181. [https://doi.org/10.1044/2023\\_AJSLP-22-00282](https://doi.org/10.1044/2023_AJSLP-22-00282)
- Beukelman, D. R., & Light, J. C. (2020). *Augmentative and alternative communication: Supporting children and adults with complex communication needs* (5th ed.). Paul H. Brookes.
- Beukelman, D. R., & Mirenda, P. (2013). *Augmentative and alternative communication: Management of severe communication disorders in children and adults* (4th ed.). Paul H. Brookes.
- \*Binger, C., Kent-Walsh, J., Ewing, C., & Taylor, S. (2010). Teaching educational assistants to facilitate the multisymbol message productions of young students who require augmentative and alternative communication. *American Journal of Speech-Language Pathology, 19*(2), 108–120. [https://doi.org/10.1044/1058-0360\(2009/09-0015\)](https://doi.org/10.1044/1058-0360(2009/09-0015))
- \*Bingham, M. A., Spooner, F., & Browder, D. M. (2007). Training paraeducators to promote the use of augmentative and alternative communication with students with significant disabilities. *Education and Training in Developmental Disabilities, 42*(3), 339–352.
- Brock, M. E., Cannella-Malone, H. I., Seaman, R. L., Andzik, N. R., Schaefer, J. M., Page, E. J., Barczak, M. A., & Dueker, S. A. (2017). Findings across practitioner training studies in special education: A comprehensive review and meta-analysis. *Exceptional Children, 84*(1), 7–26. <https://doi.org/10.1177/0014402917698008>
- \*Canosa, R. (1994). *Training teachers to use milieu strategies to teach language to students who use an augmentative communication system* [Doctoral dissertation, Johns Hopkins University]. ProQuest Dissertations & Theses Global.
- \*Carnett, A., Hansen, S., Tullis, C., & Machalicek, W. (2021). Using behavioural skills training via telehealth to increase teachers' use of communication interventions and increase student use of speech-generating devices in a high school functional skills classroom. *Journal of Intellectual Disability Research, 65*(2), 133–148. <https://doi.org/10.1111/jir.12794>
- Chavers, T. N., Schlosser, R. W., Cheng, C., & Koul, R. (2022). Effects of interventions involving speech output technologies on communication outcomes for individuals with developmental disabilities: A scoping review. *American Journal of Speech-Language Pathology, 31*(5), 2248–2267. [https://doi.org/10.1044/2022\\_ajslp-22-00039](https://doi.org/10.1044/2022_ajslp-22-00039)
- \*Chazin, K. T., Barton, E. E., Ledford, J. R., & Pokorski, E. A. (2018). Implementation and intervention practices to facilitate communication skills for a child with complex communication needs. *Journal of Early Intervention, 40*(2), 138–157. <https://doi.org/10.1177/1053815118771397>
- Colquhoun, H. L., Levac, D., O'Brien, K. K., Straus, S., Tricco, A. C., Perrier, L., Kastner, M., & Moher, D. (2014). Scoping reviews: Time for clarity in definition, methods, and reporting. *Journal of Clinical Epidemiology, 67*(12), 1291–1294. <https://doi.org/10.1016/j.jclinepi.2014.03.013>
- Costigan, F. A., & Light, J. (2010). A review of preservice training in augmentative and alternative communication for speech-language pathologists, special education teachers, and occupational therapists. *Assistive Technology, 22*(4), 200–212. <https://doi.org/10.1080/10400435.2010.492774>
- Dada, S., Flores, C., Bastable, K., & Schlosser, R. W. (2020). The effects of augmentative and alternative communication interventions on the receptive language skills of children with developmental disabilities: A scoping review. *International Journal of Speech-Language Pathology, 23*(3), 247–257. <https://doi.org/10.1080/17549507.2020.1797165>
- Dada, S., Flores, C., Bastable, K., Tönsing, K., Samuels, A., Mukhopadhyay, S., Isanda, B., Bampoe, J. O., Stemela-Zali, U., Karim, S. B., Moodley, L., May, A., Morwane, R., Smith, K., Mothapo, R., Mohuba, M., Casey, M., Laher, Z., Mtungwa, N., & Moore, R. (2024). Use of an intelligent tutoring system for a curriculum on augmentative and alternative communication: Feasibility for implementation. *International Journal of Language & Communication Disorders, 1*–15. <https://doi.org/10.1111/1460-6984.13084>
- Dada, S., Murphy, Y., & Tönsing, K. (2017). Augmentative and alternative communication practices: A descriptive study of the perceptions of South African speech-language therapists. *Augmentative and Alternative Communication, 33*(4), 189–200. <https://doi.org/10.1080/07434618.2017.1375979>
- Da Fonte, M., Boesch, M. C., DeLuca, E. R., Papp, S. K., Mohler, A. E., Holmes, E. E., Clouse, K. A., Young, R. D., & Urbano, R. (2022). Current preparation status in AAC: Perspectives of special education teachers in the United States. *Augmentative and Alternative Communication, 38*(1), 29–40. <https://doi.org/10.1080/07434618.2022.2046851>
- Daudt, H. M. L., van Mossel, C., & Scott, S. J. (2013). Enhancing the scoping study methodology: A large, inter-professional team's experience with Arksey and O'Malley's framework. *BMC Medical Research Methodology, 13*(1), 48. <https://doi.org/10.1186/1471-2288-13-48>
- Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems, 49*(1), 5–22. <https://doi.org/10.1177/0047239520934018>
- Douglas, N. F., Feuerstein, J. L., Oshita, J. Y., Schliep, M. E., & Danowski, M. L. (2022). Implementation science research in communication sciences and disorders: A scoping review. *American Journal of Speech-Language Pathology, 31*(3), 1054–1083. [https://doi.org/10.1044/2021\\_AJSLP-21-00126](https://doi.org/10.1044/2021_AJSLP-21-00126)
- Douglas, S. N. (2012). Teaching paraeducators to support the communication of individuals who use augmentative and alternative communication: A literature review. *Current Issues in Education, 15*(1), 1–14.
- \*Douglas, S. N., Light, J. C., & McNaughton, D. B. (2013). Teaching paraeducators to support the communication of young children with complex communication needs. *Topics in Early Childhood Special Education, 33*(2), 91–101. <https://doi.org/10.1177/0271121412467074>
- \*Douglas, S. N., McNaughton, D., & Light, J. (2013). Online training for paraeducators to support the communication of young children. *Journal of Early Intervention, 35*(3), 223–242. <https://doi.org/10.1177/1053815114526782>
- Douglas, S. N., West, P., & Kammes, R. (2020). The training experiences of augmentative and alternative communication practitioners in one midwestern state. *Perspectives of the ASHA Special Interest Groups, 5*(1), 219–230. [https://doi.org/10.1044/2019\\_PERS-19-00053](https://doi.org/10.1044/2019_PERS-19-00053)
- Durlak, J. A. (2009). How to select, calculate, and interpret effect sizes. *Journal of Pediatric Psychology, 34*(9), 917–928. <https://doi.org/10.1093/jpepsy/jsp004>
- Egan, A., Maguire, R., Christophers, L., & Rooney, B. (2017). Developing creativity in higher education for 21st century learners: A protocol for a scoping review. *International Journal of Educational Research, 82*, 21–27. <https://doi.org/10.1016/j.ijer.2016.12.004>
- \*Estevis, M. A. (1996). *The effect of teacher inservice training on the frequency of communication acts accomplished by learners who are deaf-blind* [Doctoral dissertation]. Texas Tech University, ProQuest Dissertations & Theses Global.
- Feldacker, C., Jacob, S., Chung, M. H., Nartker, A., & Kim, H. N. (2017). Experiences and perceptions of online continuing professional



- development among clinicians in sub-Saharan Africa. *Human Resources for Health*, 15(1), 89. <https://doi.org/10.1186/s12960-017-0266>
- \*Ganz, J. B., Goodwyn, F. D., Boles, M. M., Hong, E. R., Rispoli, M. J., Lund, E. M., & Kite, E. (2013). Impacts of a PECS instructional coaching intervention on practitioners and children with autism. *Augmentative and Alternative Communication*, 29(3), 210–221. <https://doi.org/10.3109/07434618.2013.818058>
- \*Gormley, J., McNaughton, D., & Light, J. (2023). Supporting children's communication of choices during inpatient rehabilitation: Effects of a mobile training for health care providers. *American Journal of Speech-Language Pathology*, 32(2), 545–564. [https://doi.org/10.1044/2022\\_AJSLP-22-00200](https://doi.org/10.1044/2022_AJSLP-22-00200)
- \*Grygas Coogle, C., Ottley, J., Rahn, N., & Storie, S. (2018). Bug-in-ear eCoaching: Impacts on novice early childhood special education teachers. *Journal of Early Intervention*, 40(1), 87–103. <https://doi.org/10.1177/1053815117748692>
- \*Hayes, L. E., & Traughber, M. C. (2021). Improving facilitation of student communication through observational feedback within a partner instruction model. *Language, Speech, and Hearing Services in Schools*, 52(2), 542–553. [https://doi.org/10.1044/2020\\_LSHSS-20-00049](https://doi.org/10.1044/2020_LSHSS-20-00049)
- \*Homlitas, C., Rosales, R., & Candel, L. (2014). A further evaluation of behavioral skills training for implementation of the picture exchange communication system. *Journal of Applied Behavior Analysis*, 47(1), 198–203. <https://doi.org/10.1002/jaba.99>
- Horner, R. H., Carr, E. C., Halle, J., McGee, G., Odom, S., & Wolery, M. (2005). The use of single-subject research to identify evidence-based practice in special education. *Exceptional Children*, 71(2), 165–179. <https://doi.org/10.1177/001440290507100203>
- \*Kashinath, S., Dukhovny, E., & Polit, P. (2022). Effects of a coaching intervention on paraeducator use of aided language modeling in classroom settings: A pilot investigation. *Communication Disorders Quarterly*, 44(1), 33–44. <https://doi.org/10.1177/15257401211046871>
- \*Kent-Walsh, J. (2003). *The effects of an educational assistant instructional program on the communicative turns of students who use augmentative and alternative communication during book reading activities* [Doctoral dissertation]. The Pennsylvania State University, ProQuest Dissertations & Theses Global.
- Kent-Walsh, J., Murza, K. A., Malani, M. D., & Binger, C. (2015). Effects of communication partner instruction on the communication of individuals using AAC: A meta-analysis. *Augmentative and Alternative Communication*, 31(4), 271–284. <https://doi.org/10.3109/07434618.2015.1052153>
- Khoza-Shangase, K., Moroe, N., & Neille, J. (2021). Speech-language pathology and audiology in South Africa: Clinical training and service in the era of COVID-19. *International Journal of Telerehabilitation*, 13(1), e6376. <https://doi.org/10.5195/ijt.2021.6376>
- Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping studies: Advancing the methodology. *Implementation Science*, 5(1), 69–77. <https://doi.org/10.1186/1748-5908-5-69>
- Marvin, L. A., Montano, J. J., Fusco, L. M., & Gould, E. P. (2003). Speech-language pathologists' perceptions of their training and experience in using alternative and augmentative communication. *Contemporary Issues in Communication Science and Disorders*, 30, 76–83. [https://doi.org/10.1044/cicsd\\_30\\_S\\_76](https://doi.org/10.1044/cicsd_30_S_76)
- \*McConachie, H., & Pennington, L. (1997). In-service training for schools on augmentative and alternative communication. *European Journal of Disorders of Communication*, 32(3), 277–288. <https://doi.org/10.3109/13682829709177101>
- \*McCulloch, E. B., & Noonan, M. (2013). Impact of online training videos on the implementation of mand training by three elementary school para-professionals. *Education and Training in Autism and Developmental Disabilities*, 48(1), 132–141.
- McHugh, M. L. (2012). Lessons in biostatistics interrater reliability: The kappa statistic. *Biochemia Medica*, 22(3), 276–282. <https://doi.org/10.11613/BM.2012.031>
- \*McMillan, J. M. (2005). *Teacher professional development to increase speech-output communication device use: Providing supports for operation, integration and instruction* [Doctoral dissertation]. University of Illinois, ProQuest Dissertations & Theses Global.
- \*McMorran-Maus, K. (2022). *The efficacy of a key word signing workshop* [Doctoral dissertation]. Chapman University, ProQuest Dissertations & Theses Global.
- Moola, S., Munn, Z., Sears, K., Sfetcu, R., Currie, M., Lisy, K., Tufanaru, C., Qureshi, R., Mattis, P., & Mu, P. (2015). Conducting systematic reviews of association (etiology): The Joanna Briggs Institute's approach. *International Journal of Evidence-Based Healthcare*, 13(3), 163–169. <https://doi.org/10.1097/XEB.0000000000000064>
- Murray, J., Lynch, Y., Goldbart, J., Moulam, L., Judge, S., Webb, E., Jayes, M., Meredith, S., Whittle, H., Randall, N., Meads, D., & Hess, S. (2020). The decision-making process in recommending electronic communication aids for children and young people who are non-speaking: The I-ASC mixed-methods study. *Health Services and Delivery Research*, 8(45), 1–158. <https://doi.org/10.3310/hsdr08450>
- \*Muttiah, N., Drager, K. D. R., McNaughton, D., & Perera, N. (2018). Evaluating an AAC training for special education teachers in Sri Lanka, a low- and middle-income country. *Augmentative and Alternative Communication*, 34(4), 276–287. <https://doi.org/10.1080/07434618.2018.1512651>
- Noe, R. A. (2017). *Employee training and development* (7th ed.). McGraw-Hill Education.
- \*Ogden, N., Walker, V. L., Tapp, M. C., & Carpenter, M. E. (2022). Efficacy of teachers supporting paraeducators to implement functional communication training. *Focus on Autism and Other Developmental Disabilities*, 38(4), 211–222. <https://doi.org/10.1177/10883576221130715>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372(71), n71. <https://doi.org/10.1136/bmj.n71>
- \*Parnell, A. M. (2018). *Effects of task clarification and an adaptive computer software on implementation of mand training using an iPadRTM as a speech-generated device* [Doctoral dissertation]. University of Arkansas, ProQuest Dissertations & Theses Global.
- \*Pennington, L., & McConachie, H. (1996). Evaluating My Turn to Speak, an in-service training programme for schools. *European Journal of Special Needs Education*, 11(2), 167–180. <https://doi.org/10.1080/0885625960110202>
- Peters, M. D. J., Godfrey, C., Mclnerney, P., Khalil, H., Larsen, P., Marnie, C., Pollock, D., Tricco, A. C., & Munn, Z. (2022). Best practice guidance and reporting items for the development of scoping review protocols. *JBI Evidence Synthesis*, 20(4), 953–968. <https://doi.org/10.11124/JBIES-21-00242>
- Pitt, K. M., Brennan, S., Sauerwein, A. M., & Weissling, K. (2023). Preservice training in augmentative and alternative communication for speech-language pathologists and special education teachers: Prevalence and preferences. *Perspectives of the ASHA Special Interest Groups*, 8(6), 1456–1468. [https://doi.org/10.1044/2023\\_PERSP-23-00023](https://doi.org/10.1044/2023_PERSP-23-00023)
- \*Rosales, R., Stone, K., & Rehfeldt, R. A. (2009). The effects of behavioral skills training on implementation of the picture exchange communication system. *Journal of Applied Behavior Analysis*, 42(3), 541–549. <https://doi.org/10.1901/jaba.2009.42-541>
- Sanders, E. J., Page, T. A., & Leshner, D. (2021). School-based speech-language pathologists: Confidence in augmentative and alternative communication assessment. *Language, Speech, and Hearing Services in Schools*, 52(2), 512–528. [https://doi.org/10.1044/2020\\_LSHSS-20-00067](https://doi.org/10.1044/2020_LSHSS-20-00067)
- Schlosser, R. W., & Koul, R. K. (2015). Speech output technologies in interventions for individuals with autism spectrum disorders: A scoping review. *Augmentative and Alternative Communication*, 31(4), 285–309. <https://doi.org/10.3109/07434618.2015.1063689>
- Schlosser, R. W., Lee, D. L., & Wendt, O. (2008). Application of the percentage of non-overlapping data (PND) in systematic reviews and meta-analyses: A systematic review of reporting characteristics. *Evidence-Based Communication Assessment and Intervention*, 2(3), 163–187. <https://doi.org/10.1080/17489530802505412>
- Schlosser, R. W., & Wendt, O. (2008). Effects of augmentative and alternative communication intervention on speech production in children with autism: A systematic review. *American Journal of Speech-Language Pathology*, 17(3), 212–230. [https://doi.org/10.1044/1058-0360\(2008\)021](https://doi.org/10.1044/1058-0360(2008)021)

- Scruggs, T. E., & Mastropieri, M. A. (2012). PND at 25: Past, present, and future trends in summarizing single-subject research. *Remedial and Special Education, 34*(1), 9–19. <https://doi.org/10.1177/0741932512440730>
- Scruggs, T., Mastropieri, M. A., Cook, S. B., Scruggs, T. E., Mastropieri, M. A., Cook, S. B., & Escobar, C. (1986). Early intervention for children with conduct disorders: A quantitative synthesis of single-subject research. *Behavioral Disorders, 11*(4), 260–271. <https://doi.org/10.1177/019874298601100408>
- Simeonsson, R. J., & Bailey, R. L. (1991). Evaluating programme input: Levels of certainty. In D. R. Mitchell & R. I. Brown (Eds.), *Early intervention studies for young children with special needs*. (pp. 280–296). Chapman & Hall.
- \*Sloman, G. M. (2010). *Training paraprofessionals to implement the picture exchange communication system (PECS)* [Doctoral dissertation]. University of Florida, ProQuest Dissertations & Theses Global.
- \*Smidt, A., Balandin, S., Reed, V., & Sigafoos, J. (2007). A communication training programme for residential staff working with adults with challenging behaviour: Pilot data on intervention effects. *Journal of Applied Research in Intellectual Disabilities, 20*(1), 16–29. <https://doi.org/10.1111/j.1468-3148.2006.00336.x>
- \*Tapp, M. C. (2022). *Effects of a coaching package on teacher delivery of supported opportunities to respond* [Doctoral dissertation]. University of North Carolina. ]
- Theodorou, E., & Pampoulou, E. (2022). Investigating the assessment procedures for children with complex communication needs. *Communication Disorders Quarterly, 43*(2), 105–118. <https://doi.org/10.1177/1525740120960643>
- Tönsing, K. M., & Dada, S. (2016). Teachers' perceptions of implementation of aided AAC to support expressive communication in South African special schools: A pilot investigation. *Augmentative and Alternative Communication, 32*(4), 282–304. <https://doi.org/10.1080/07434618.2016.1246609>
- Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., Moher, D., Peters, M. D. J., Horsley, T., Weeks, L., Hempel, S., Akl, E. A., Chang, C., McGowan, J., Stewart, L., Hartling, L., Aldcroft, A., Wilson, M. G., Garritty, C., ... Straus, S. E. (2018). PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Annals of Internal Medicine, 169*(7), 467–473. <https://doi.org/10.7326/M18-0850>
- \*Tsai, M.-J., Lee, H.-C., & Tseng, S.-F. (2011). The effect of communication partners' training on the functional use of augmented devices in a residential home. *Asia Pacific Journal of Speech, Language and Hearing, 14*(4), 205–210. <https://doi.org/10.1179/jslh.2011.14.4.205>
- \*Walker, V. L., Carpenter, M. E., Clausen, A., Ealer, K., & Lyon, K. J. (2021). Special educators as coaches to support paraprofessional implementation of functional communication training. *Journal of Positive Behavior Interventions, 23*(3), 174–184. <https://doi.org/10.1177/1098300720957995>
- \*Walker, V. L., Carpenter, M. E., Lyon, K. J., Garcia, M., & Johnson, H. (2021). Coaching paraeducators to implement functional communication training involving augmentative and alternative communication for students with autism spectrum disorder. *Augmentative and Alternative Communication, 37*(2), 129–140. <https://doi.org/10.1080/07434618.2021.1909650>
- Wallis, S., Bloch, S., & Clarke, M. (2017). Augmentative and alternative communication training provision for professionals in England. *Journal of Enabling Technologies, 11*(3), 101–112. <https://doi.org/10.1108/JET-10-2016-0023>
- \*Wermer, L., Brock, M. E., & Seaman, R. L. (2018). Efficacy of a teacher training a paraprofessional to promote communication for a student with autism and complex communication needs. *Focus on Autism and Other Developmental Disabilities, 33*(4), 217–226. <https://doi.org/10.1177/1088357617736052>
- \*Wolf, J. (2014). *Effects of online professional development in augmentative and alternative communication for special education teachers and speech language pathologists* [Doctoral dissertation]. University of Kansas, ProQuest Dissertations & Theses Global.