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The availability and effectiveness of AAC training programmes for educators and paraeducators: A scoping review

by

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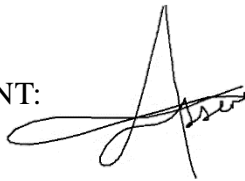**UNIVERSITY OF PRETORIA**

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ACKNOWLEDGEMENTS

ABSTRACT

Background: A trans-disciplinary approach is required to implement Alternative and Augmentative Communication (AAC) for children with complex communication needs (CCN). Educators and paraeducators play an essential role in AAC implementation in the classroom context. Children who use AAC often spend most of their day with educators and paraeducators. Educators and paraeducators facilitate AAC use in the school setting and provide vital feedback regarding practical adjustments that need to be made to AAC devices, the child's daily routine, and their needs and preferences related to AAC (Johnson et al., 2015). The study aims to i) identify and describe the currently available training programmes or studies that train educators and paraeducators in implementing AAC; ii) describe the training objectives and instructions of these programmes; iii) report the research design and outcomes of these programmes; iv) make a quality appraisal of the studies that were included in the review, and lastly, v) describe the effectiveness of the training programmes on AAC for educators and paraeducators.

Methods: The scoping review framework by Arksey and O'Malley (2005), as refined by Levac et al. (2010), as well as the PRISMA checklist (Tricco et al., 2018) was used as the methodology in this study. This methodology was chosen since educator and paraeducator training on AAC is an emerging topic within the field of AAC. A scoping review allowed reporting on currently available studies (Munn, 2019).

Results: A total of 15 (*N*=15) studies met the inclusion criteria between 2001 and 2022. Only one study defined or described what was meant by educators and paraeducators. Most of the training sessions were conducted face to face (*n*=12), while some authors used online platforms (*n* = 1) and others used a combination of both (*n* = 2) to conduct training. Few studies made use of an existing training programme. The quality appraisals of seven (*n*=7) studies were conclusive, three (*n*=3) were preponderant, and four (*n*=4) inconclusive. Thirteen (*n*=13) studies were rated highly effective and two (*n*=2) were rated fairly effective.

Conclusion: Information gathered from these studies showed that face-to-face and online training can be effective when training educators and paraeducators on AAC implementation. Also, definitions of the terms used to refer to educators and paraeducators are needed to understand exactly who is being trained in these studies. Furthermore, while good quality research and effective training are reported in this review, only limited number of studies (*N*=15) complied with the required inclusion criteria. Hence, there is a need for more research on the effectiveness of AAC training for educators and paraeducators in AAC implementation.

Keywords: AAC, Alternative and Augmentative Communication, Educator, Teacher Paraeducator, Training

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1. PROBLEM STATEMENT AND LITERATURE REVIEW

1.1 *Problem statement*

Communication is a human right crucial for daily activities such as learning, socialising and development (Beukelman & Light, 2020; Dietz et al., 2022; International Society for AAC, 2016). Communication refers to the complex, systematic process of sending and receiving information (American Speech-Language-Hearing Association, n.d; Owens, 2014). Successful communication requires both communication partners to be able to interpret the information communicated by each other (Stadskleiv et al., 2022). Communication mainly occurs verbally by means of speaking or non-verbally through gestures, eye contact or facial expressions. Other modes of communication include written communication or digital media (Beukelman et al., 2020, Light et al., 2019b).

It is important to distinguish speech from language skills when considering communication. The term "speech" refers to the physical act of communicating verbally. This includes

i)   using the muscles of the mouth and tongue to articulate sounds and form words;

ii)   the manipulation of the vocal folds and use of breath to create voice, and lastly

iii)   the fluency with which we speak.

"Language" refers to the meaning of words, and how it is used to convey a concept or a message to the listener. The use of language is referred to as expressive language, whereas the understanding of language is referred to as receptive language (American Speech-Language-Hearing Association, n.d.).

Some children may have difficulty with communication through verbal speech and or language, in which case they are referred to as having "Complex Communication Needs" (CCN). CCN is defined as having impaired language or speech, and sometimes, impaired written communication skills (American Speech-Language-Hearing Association, n.d.). Generally, CCN is a severe and pervasive impairment that hinders a person's ability to communicate functionally in their day-to-day life (Sigafoos & Gevarter, 2019). Children with developmental disabilities such as Autism Spectrum Disorder, Cerebral Palsy, or Down Syndrome often present with CCN. Augmentative and Alternative Communication (AAC) is

then recommended to assist persons with CCN to communicate (Beukelman & Light, 2020; Sigafoos & Gevarter, 2019).

AAC has been proven to assist in communication and language development (Light et al., 2019a). To ensure successful use of AAC, a range of intrinsic and extrinsic factors need to be taken into account. Intrinsic factors include consideration of the child's age, diagnosis, and motivation. Extrinsic factors involve components such as the child's environment and the availability of resources (Leonet et al., 2022). A further important extrinsic factor is the communication partners' competence in AAC modeling (Leonet et al., 2022). Not only do children who use AAC depend on their communication partners to provide language stimulation (Stadskleiv et al., 2022), but communication partners also facilitate language development by modelling and scaffolding appropriate AAC use (Leonet et al., 2022; Tegler et al., 2019). However, despite research suggesting that communication partners can assist with the implementation of AAC (Leonet et al., 2022; Tegler et al., 2019), children with CCN often do not receive enough input from their communication partners (Tegler et al., 2019).

This lack of input may be attributed to various reasons such as that professionals, family members and team members are unskilled or inexperienced in AAC implementation, there may be too few professionals to serve the large number of children requiring AAC intervention, and the number of AAC experts may be limited (Light et al., 2019a; Light et al., 2019b). This situation applies especially in lower income countries such as South Africa where there is a disparity between the number of speech therapists and the number of individuals requiring speech therapy services (Abrahams, 2019, Light et al., 2019b). Furthermore, communication partners and AAC practitioners may find it challenging to remain abreast of the latest evidence on AAC best practice. Another barrier to implementing AAC is children's ever-changing and developing language abilities, resulting in the need for their AAC devices to be regularly updated (Tegler et al., 2019). Therefore, team members involved in AAC implementation must receive regular research-based training to disseminate appropriate AAC implementation strategies (Light et al., 2019b; Tegler et al., 2019; Smith, 2019).

Communication partners, including speech therapists, reported limited and inadequate training in AAC implementation (Tegler et al., 2019). Greater emphasis should be placed on training educators and paraeducators who spend most of their days with children with CCN

(Da Fonte et al., 2022), as they reportedly lack the knowledge or skills to implement AAC (Da Fonte et al., 2022).

Pre-service training on AAC is not always a prerequisite for teaching in special-education settings (Vogt, 2021). Therefore, educators often feel comfortable or confident in AAC implementation only after years of experience (Butt, 2016). Paraeducators have also expressed their desire and need for training (Butt, 2018). This is supported by Da Fonte et al. (2022), who argue that preparation through experience is insufficient and that it is crucial for educators who work with children with CCN and who use AAC to receive professional training in this field.

Although some studies have measured the effectiveness of educator and paraeducator training in implementing AAC (Andzik & Canella-Malone, 2019; Douglas et al., 2012), no review has been conducted on the scope of such educator training. The current scoping review therefore aims to explore the availability and effectiveness of AAC training for educators and paraeducators in educational settings. A scoping review was chosen as the preferred methodology, as it can motivate the need for a more extensive study (e.g., a systematic review) to highlight the need for training of educators and paraeducators on AAC implementation and inform the development of policies (Munn, 2018).

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1.2   Literature review

1.2.1   AAC for children with CCN

AAC is an area of clinical practice and education that addresses both permanent or temporary receptive, expressive and written communication impairments through aided or unaided communication methods (Beukelman & Light, 2020). Aided AAC refers to external physical devices such as communication boards or computers with symbols or graphics to aid communication. Unaided AAC refers to non-spoken communication methods such as sign language or facial expressions (Beukelman & Light, 2020; Moorcraft et al., 2019; Sowers & Wilkinson, 2023). AAC has been proven to be beneficial for both adults and children with developmental disabilities such as Cerebral Palsy (CP) or Down Syndrome, and acquired disabilities such as Traumatic Brain Injury (TBI), Cerebrovascular Accident (CVA) or Motor Neuron Disease (MND) (Beukelman & Light, 2020; Sowers & Wilkonson, 2023). Children with CCN can benefit significantly from AAC (Leonet et al., 2022; Teachman & Gibson, 2014) as it can improve their ability to communicate with others, socialise and interact with peers, as well as improve literacy skills, language learning and development of communicative competence (Beukelman & Light, 2020; Light et al., 2021; Leonet et al., 2022).

It is vital for a child with CCN to be generously exposed to opportunities to practise AAC use. For this reason, using two or more modes of communication (also referred to as multimodal communication) is recommended (Light et al., 2019b). A multimodal approach to communication can increase a child's ability to perceive the message, strengthen retention of information and enhance their expression ability (Light et al., 2019b). Having a variety of AAC devices to choose from also assists individuals with CCN to find an AAC device that suits their individual and contextual communication needs (Light et al., 2021; Smith, 2019). The increased availability of AAC systems owing to technological advances and social movements over the past two decades is therefore welcomed (Smith, 2019).

Unfortunately, the increase in AAC options could also act as an implementation barrier. It may be challenging for professionals with limited pre-professional training to assist in decision making related to AAC (McNaughton et al., 2018). Professionals often report that they do not have enough time to upskill themselves and remain abreast of the latest trends in AAC research (Smith, 2019; Light et al., 2019b). Other reported barriers to implementation include policies and legislation, as well as communication partners' general lack of

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awareness, knowledge, and skills on promoting communicative competence through AAC use (McNaughton et al., 2019).

1.2.2 *Communicative competence through AAC and the role of communication partners*

A dynamic team approach is recommended to ensure that a child with CCN develops communicative competence (Biggs, 2023; Light et al., 2019; Klein, 2017). Communication competence can be defined as the ability to fulfil daily communication needs with various modes of communication (Alant, 2017; Beukelman & Light, 2020). Communicative competence requires operational, linguistic, social and strategic competence (Beukelman & Light, 2020; Alant, 2017). Operational competence refers to a child's technical and motor skills to operate an AAC device (Tsai, 2022), while linguistic competence refers to the child's ability to understand and use language (Tsai, 2022). When a child uses AAC, development of linguistic competence can be hampered as a disproportion exists between the child's linguistic input and output. Often, most of the linguistic input is in the form of spoken language, whereas the output required of the child is that of the AAC device (e.g., symbolic or written) (Light et al., 2019b). Social competence refers to the pragmatic ability of the child (Kiessling & Fabry, 2021), whereas strategic competence refers to the child's ability to adapt to communicative environments and contexts. Strategic skills are skills required to make accommodation for communicative restrictions and communication breakdown (Alant, 2017).

The development of communicative competence is seen as an interpersonal dyad of skills developed through interaction with communication partners (Alant, 2017). This is especially true for the beginning stages of learning to communicate through AAC. During the development of communicative competence, the child relies on the communication partner to facilitate the different skills required to gain competence (Alant, 2017; Light et al., 2019b).

To maximise a child's exposure to language skills and the use of different modes of communication, a collaborative team approach to AAC implementation is required (McNaughton et al., 2019; Ianoco et al., 2022). Team members typically involved in implementation include the person who requires AAC, their parents/caregivers, a speech-language therapist, an occupational therapist, a physiotherapist, educators, paraeducators, and peers (Beukelman & Light, 2020; Biggs, 2023).

The gold standard of approaches to collaborative teamwork is the transdisciplinary approach. In a transdisciplinary team, professionals work together to assess the child's cognitive, emotional, motor, and language skills as well as their needs in various contexts to decide how best to assist with AAC (Sowers & Wilkonson, 2023; Weiss et al., 2020). Key elements of this approach include the communication partners' commitment to continuous learning, role releasing, as well as the exchanging and expansion of skills (Weiss et al., 2020).

This can be a complex yet beneficial process, as each professional has unique skills and approaches towards intervention, which assist in creative problem solving during implementation (Robillard et al., 2013). Shared goals among team members can contribute to a carry-over of skills (Chung & Stoner, 2016) and enhance the child's communication, participation, access to the school curriculum, educational performance, and independence (McNaughton et al., 2019; Ianoco et al., 2022). Furthermore, the use of a transdisciplinary approach can reduce the costs and time constraints related to in-service training (Weiss et al., 2020).

1.2.3 *Training of educators and paraeducators and their role in AAC implementation*

Educators and paraeducators are vital members of the transdisciplinary team as they are primary service providers and regular communication partners to children who use AAC in school settings (Da Fonte et al., 2022).

Blackstone (1999) proposes a circle of communication partners (CCP) to outline the influence of different communication partners on the child's language development. The CCP is a dynamic and interchangeable paradigm categorising communication partners, based on their relationship with the child. The child's family is at the model's core (Level 1), which represents the most frequent communication partners. Thereafter it expands to friends (Level 2), acquaintances (Level 3), paid workers (Level 4) and lastly, the most uncommon / unfamiliar communication partners (Level 5).

Even though Blackstone et al. (2007) categorised educators under Level 4 of the CCP, various authors consider educators and paraeducators as important stakeholders and communication partners in the lives of children who use AAC. This is because they often spend the biggest amount of one-on-one time with the child in an educational context (Douglas et al., 2012; Da Fonte et al., 2022).

It is the role of the educator to assist speech therapists in developing AAC devices and to ensure that the curriculum is taught in a way that would allow children to use their AAC devices during lessons (Ianoco et al., 2022; Walker & Chung, 2022). They also assist in classroom inclusion and provide valuable input regarding the child's daily routine, communication needs, and preferences (Johnson et al., 2015). Their feedback on practical adjustments related to AAC is considered critical (Da Fonte et al., 2022). Educators also need to ensure that they model and scaffold appropriate use of AAC devices and encourage children who use AAC to interact with other communication partners, such as their peers (Walker & Chung, 2022). Furthermore, it is the task of the educator to guide paraeducators on AAC facilitation and classroom management (Cassim & Moen, 2020).

Both the terms "educator" and "paraeducator" are not understood in exactly the same way in the literature, and their meaning also differs across geographic area. "Educator" is sometimes used interchangeably with the term "teacher". Some articles suggest that a "teacher" is someone who teaches a class, and an "educator" is someone who can further a child's knowledge and skills. This skill often comes with experience (Korth et al., 2009). The term "paraeducator" is an umbrella term that refers to any adult who assists learners with disabilities in an educational setting (Zhoa et al., 2021). However, poor standardisation of the term has given rise to criticism (Webster & de Boer, 2021). In Swiss schools, paraeducators are referred to as "teacher assistants" (TA) and a distinction is made between a TA for the whole class and a TA for one learner in the class (Vogt, 2021). In Australia, paraeducators or TAs are referred to as Learning Support Assistants (LSA) (Butt, 2016; Butt, 2018). In Ireland, the term "paraprofessional" is accepted as an umbrella term under which TAs, LSAs, and Special Needs Assistants (SNA) are grouped (Zhao et al., 2021).

Poorly defined roles are often accompanied by lack of guidance on the training necessary to become a paraeducator (Butt, 2016; Webster & de Boer, 2021). In some countries, training in Special Education is not a prerequisite to working as a paraeducator (Cassim & Moen, 2020; Butt, 2016). In Australia, for instance, the only prerequisite is that the paraeducator must pass a basic literacy and numeracy test (Butt, 2018). Furthermore, educators and paraeducators are often expected to do training related to special needs services at their own expense and during their own time (Butt, 2016) (These were important considerations when search terms for the methods section of this dissertation were selected.).

Although the role of paraeducators is not always well defined, there is general consensus that paraeducators are required to assist educators with classroom organisation and administration (Butt, 2016; Cassim & Moen, 2020; Vogt, 2021). They are also expected to maintain classroom discipline and children's personal support care, and to assist learners with instructional activities such as AAC facilitation (Biggs et al., 2019; Butt, 2018; Cassim & Moen, 2020; Vogt, 2021; Zhao et al., 2021).

However, due to a lack of educator and paraeducator training on AAC implementation, many children who require AAC services in school settings are not adequately supported in this regard (Da Fonte et al., 2022; Hanline et al., 2018; Ianoco et al., 2022). This can be attributed to inconsistent in-service training on AAC (Andzik et al., 2019), which leaves educators and paraeducators feeling ill-equipped for AAC implementation (Da Fonte et al., 2022).

Although training is also essential for high- and middle-income countries, the lack of educator and paraeducator training poses particular challenges in low-income countries where resources are minimal (Alant, 1999; Ianoco et al., 2022; Tönsing & Dada, 2016). A study by Alant (1999) revealed that AAC was not prioritised in South Africa, as less than 1% of the 1344 learners with CCN in local special schools used AAC at the time – due to poor access to AAC. South Africa's Department of Basic Education has since made deliberate attempts to increase the provision of AAC in special schools (DoE, 2007, 2010; Tönsing & Dada, 2016). Although the situation has improved in the last 15 to 20 years (Dada et al., 2023; McDowell & Bornman, 2022; Tönsing & Dada, 2016), the supply and implementation of AAC devices are still problematic (Tönsing & Dada, 2016).

Tönsing and Dada researched South African teachers' perception of AAC implementation in special school settings and noted five themes: i) teacher-related factors; ii) the classroom context; iii) aided AAC factors; iv) other team members; and v) student factors. These factors were related to poor AAC provision, limited human and financial resources to support implementation, and limited training of team members. Furthermore, educators did not feel confident about AAC implementation – partially due to their having to master new technological devices when implementing AAC, but also due to having received poor training on AAC implementation (Dada, 2019).

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When educators and paraeducators are untrained in this field, fewer opportunities are generated to expand on the utterances of children with CCN or to provide access to vocabulary (Douglas et al., 2013). This can result in poor socialisation (Moorcroft et al., 2020), frustration, and feelings of incompetence (Andzik et al., 2019). Reduced communication development affects language and literacy development and the ability to communicate and participate in school activities. Furthermore, poor communication abilities in children have been linked to behavioural challenges that can hinder scholastic performance and social participation (Hanline et al., 2018).

The critical role of educators was mentioned at a recent Assistive Technology Industry Association (ATIA) round-table discussion, which highlighted the need for continuous educator training on the implementation of AAC to increase the scholastic performance and participation of affected learners (Goldman et al., 2021). Educators, paraeducators and parents of children using AAC identified a clear need for pre-service training on AAC as they felt that many educators and paraeducators were not familiar with the implementation process (Da Fonte et al., 2022; McNaughton et al., 2008).

Furthermore, the need for training as highlighted by various stakeholders concurs with McNaughton's (2018) suggestion that pre-service and in-service training on AAC constitute one of the three pillars of AAC implementation. Educator and paraeducator training would also assist in understanding the use of AAC and its benefits (Andzik et al., 2019), which can increase confidence in AAC implementation (Smith, 2019).

1.2.4 *Currently available training for educators and paraeducators*
Hanline et al. (2018) suggest that professional development often lacks cohesion, focus and collaboration across team members and is further impacted by financial and time constraints. Due to the heterogeneity of the populations requiring AAC, educators feel that training would be best if conducted in the classroom during teaching time. Furthermore, it is important that training be linked to the specific needs of the educators (Tonsing & Dada, 2016). During the COVID-19 pandemic, resource allocation for travel and in-service training costs was re-prioritised (Khoza-Shangase et al., 2022) and the move from physical to online education proved to be an efficient (Kanga, 2020) and cost-effective (Walker et al., 2021) training option.

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Both online education and in-classroom training of educators during teaching times align with two newly researched adult learning principles, namely agile learning and microlearning (Rothwell, 2020). Agile learning, defined as rapid learning, is usually experience based, it draws on interdisciplinary thinking, consists of interactive lessons and encourages adults to think beyond their scope of practice (Aziyonya & Oksiutycz, 2019). This method is based on a trial-and-error process and is said to increase creativity during problem solving. Examples of how agile learning can be used in education are case discussions that involve the whole team. Workshops with other professionals and on-site learning also draw from agile learning principles. There is, however, little literature available on how this can be used in the field of education and fields other than management education (Aziyonya & Oksiutycz, 2019).

Microlearning refers to "bite-sized" learning that could take the form of video learning or infographics (So et al., 2018). These fragments of information can usually be read or understood in under 10 minutes. They are said to be effective as they complement the fast-paced and rapidly changing state of knowledge that adults must acquire, and the need for more stringent guidelines is noted (So et al., 2018). Microlearning can be adopted during educator training to ensure that educators are given fragments of information on new concepts over time. This process can help to counter time constraints that have been noted as a barrier to educator training (Hanline et al., 2018).

Another adult learning style is problem-based learning (Aziyonya & Oksiutycz, 2019). In this method of learning, students co-create environments with real-life complexities. Training educators in their classrooms using real-life examples is a good illustration of problem-based learning. These have been criticised as using theoretical examples that are not based on real-life cases, that do not foster a high level of creativity and motivation in students and that can stunt a learner's critical thinking (Aziyonya & Oksiutycz, 2019).

A study by Kent-Walsh et al. (2010) that aimed to determine the effects of communication partner instruction, can be used to illustrate the successful use of adult learning styles. Parents of children with severe motor speech disorders who presented with a receptive language age equivalent of 3,4 to 6,0 years were trained using the Improving Partner Applications of Augmentative Communication Techniques (ImPAACT) programme. The latter programme consists of steps that align with agile learning because it is experience-based. Parents were asked to practise partner-interaction strategies during a book-reading

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activity with their children. They were also encouraged to be interactive and ask questions during the sessions. The ImPAACT model has been shown to effectively increase communication partner skills and the children's communication outcomes (Kent-Walsh et al., 2010). The limitation of the Kent-Walsh et al. (2010) study is that it was conducted without a control group. The validity of their results could not be attributed directly to the ImPAACT programme, as the children all received general language stimulation during the study. A suggestion was made to adapt the training and expand it to different audiences. Furthermore, Kent-Walsh et al.'s (2010) study focused on parents as communication partners and did not include educator training. The researchers suggested that the ImPAACT model be modified to be used with different communication partners (teachers, caregivers and parents) and to incorporate other professionals.

A review by Romski et al. (2015) that focused on early intervention and AAC highlighted that educators reported minimal training and support on AAC use in classrooms. It was, however, a mere "glimpse" of the need for research into educator training on AAC use. More research is required on training paraprofessionals who work with AAC (Romski et a., 2015). Some studies have been conducted on the perceptions and experiences of educators and paraeducators on this topic (Da Fonte et al., 2022; Patel & Khamis-Dakwar, 2005). This, along with the need for a scoping review to remain comprehensive (Levac et al., 2010) has led the researcher to decide to not include experience and perceptions of educators and educators within the scope of this study.

The study in hand aims to review the currently available training programmes for educators and paraeducators on the implementation of AAC in educational contexts and to describe their effectiveness.

2. METHODOLOGY

2.1 Main aim

The main aim of this review was to explore the availability and effectiveness of current research into training programmes for educators and paraeducators, aimed at implementing AAC in educational settings.

2.2 Sub-aims

The sub-aims of the review were to:
i. identify and describe the currently available training programmes or studies that train educators and paraeducators in implementing AAC;
ii. describe the training objectives and instructions of these programmes;
iii. report on the research design and outcomes of these programmes;
iv. do a quality appraisal of the studies that were included in the review; and
v. describe the effectiveness of the training programmes on AAC for educators and paraeducators.

2.3 Research design

A scoping review was selected as the design to be used for this review (Arksey & O'Malley, 2005). A scoping review is a relatively new method of collecting and reporting on data, and during this process, a broad concept or ideology is summarised in terms of its characteristics and the available research in the particular field. With this type of review, concepts are clarified and research gaps are identified (Munn, 2018).

A scoping review was chosen, as it lends itself to being more flexible when the research question does not meet the criteria for a more structured study such as a systematic review (Munn et al., 2018).

Traditionally, scoping reviews do not include a quality appraisal of the included studies. However, since this study intended to describe the effectiveness of training programmes, a quality appraisal was included to report on the certainty of evidence of included studies. Quality appraisals were also included in previous scoping reviews related to the field of AAC such as in the studies conducted by Schlosser and Koul (2015); Dada et al. (2021), Peters et al., (2022) and Pollock et al. (2023).

After Arksey and O'Malley (2005) first outlined the steps of this methodology, a methodological working group of the Joanna Briggs Institute (JBI) released more formal guidelines for this approach (Munn et al., 2015; Munn et al., 2022). The latest guidelines promote the use of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews (PRISMA-ScR) because it follows the more comprehensive PRISMA checklist and process (Munn et al., 2022; Peters et al., 2021). It also allows for the scoping review process to remain consistent, while guiding decisions throughout the search, coding, and reporting process (Tricco et al., 2018).

Scoping reviews do have limitations – one of which involves the difficulty of balancing the breadth and comprehensiveness of a research question, while ensuring that the study is feasible (Daudt et al., 2013; Levac et al., 2010). Scoping reviews have also been criticised for not focusing enough on detail, resulting in the possibility of their results being misleading (Levac et al., 2010). Even though a well-framed scoping review is seen as of higher quality than a typical literature review, scoping reviews do not typically monitor the quality of the papers that are included and only provide a broad overview of topics. Specific research conclusions can therefore not be made (Peterson et al., 2017).

Scoping reviews are, however, beneficial in determining the value of undertaking a systematic review (Peterson et al., 2017). Furthermore, due to the breadth of literature being reviewed, results can account for diversity and relevant literature (Munn et al., 2022; Sucharew & Macaluso, 2019).

The scoping review in hand aimed to explore the availability and effectiveness of current training programmes for educators and paraeducators on the implementation of AAC in educational settings. The research phases that were adopted are summarised in Table 1.

Table 1

Overview of the methodological framework of a scoping review (Peters et al., 2022)

Framework stage	Description
1. Identifying the research question	The aims and sub-aims of the research question were used to inform the breadth of the study. This included the selection of the target population, context, construct and outcomes of the study.
2. Identifying relevant studies	The inclusion and exclusion criteria were refined using an

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Framework stage	Description
	iterative process. Experts in the field of AAC and Information Specialists were consulted to refine search terms and select appropriate databases.
3. Study selection	Two reviewers independently reviewed studies according to the set inclusion and exclusion criteria. This was done at title, abstract and full-text level, using the Rayyan™ platform to increase efficiency and accuracy.
4. Charting the data	The researcher developed a data extraction form to identify key aspects of each article. This was an iterative process.
5. Collating, summarising, and reporting results	This stage was divided into three steps: analysis, reporting of the results and considering the meaning of the results. Implications for further research were also discussed.
6. Consultation	This process was not involved in this Scoping Review but could be conducted in later studies.

The Population Concept Context (PCC) pneumonic was used to develop the research question (Peters et al., 2017). The target populations of this review, which were educators and paraeducators, were not confined to a specific group of educators (e.g., special educators or high school educators). Yet, they limited the type of communication partners, seeing that studies with varying communication partners already existed (Constransitch, 2021; Kent-Walsh et al., 2015). The construct was research on the effectiveness of AAC training programmes and intervention studies for educators and paraeducators within an educational setting. This was a broad construct as it could apply to any training programme available if administered to educators or paraeducators. The context was training conducted in and for an educational setting.

2.4 Protocol

A search protocol was constructed to ensure that rigorous and accurate steps of a scoping review were followed. The protocol assumed the form of a research proposal and reported the research objectives, inclusion and exclusion criteria, as well as the research method and data extraction steps (Peters, 2020).

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2.5   *Pilot search*

A pilot study was conducted to refine the study's search terms and the inclusion and exclusion criteria. The researcher conducted the pilot study using search terms in the ERIC database. The search string used at the beginning of the pilot search was as follows:

"(augmentative and alternative communication) OR AAC AND educator training NOT experience NOT perception".

An iterative process was followed during the pilot search to gain a more accurate reflection of available articles. The search string used to achieve the final yield for the pilot search was as follows:

TX ("augmentative and alternative communication") OR TX AAC AND TX (educator* OR teacher* OR "special teacher" OR "teacher assistant" OR paraeducator) AND TX ("teacher education" OR "teacher training" OR "teacher assistant training") AND TX "special education"

This search string yielded 555 articles with no duplicates. The first 299 articles were used for the pilot study. After the researcher and interrater screened the titles, abstracts and full articles, six articles met the inclusion criteria for the scoping review. The aims, procedures, results and recommendations for the main study are outlined in Table 2.

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Table 2

Pilot Searches: Aims, procedures, results and recommendations

Aim	Procedure	Results	Recommendations
To determine the appropriateness of search terms.	The researcher used search terms identified according to the PCC acronym to search the ERIC database. An Information Specialist was consulted during this process to ensure the retrieval of relevant and appropriate articles.	Yield ranged between 15 and 200 000, depending on the combination of search terms used. The small yield indicated that search terms were too restricted, and the larger yield would not have been feasible for a scoping review. Many articles dealing with unrelated topics on teacher education were identified.	Remove: "NOT perception" / "NOT experience" school setting, school district, school* "teach* assistant*" "training programme", "train", "training", "treatment*", "exercise in relation to training", "therapy" Add: "special teacher" "teacher assistant training" "teacher training"
To determine the appropriateness and feasibility of the "Title and Abstract Screening Tool" (Appendix A) and the "Full Article Review Tool" (Appendix B).	During the pilot search, the researcher and an interrater independently used the "Title and Abstract Screening Tool" to screen the first 299 articles yielded through ERIC at title, abstract and full-article level.	Inconsistent terms are used to refer to educators and paraeducators. Experimental designs can be further elaborated on regarding the methodology, e.g. "Multiple baselines across participants." Inclusion date not correct on form.	Add paraprofessionals as an inclusion population. Expand the list of included and excluded designs to be more specific, e.g. inclusion of single-subject experimental designs and exclusion of systematic reviews. Amend the inclusion date from 1970-2021 to 2001-2020.

Aim	Procedure	Results	Recommendations
To determine whether inclusion and exclusion criteria were appropriate and applicable.	An iterative process was used to update inclusion and exclusion criteria as the researcher and interrater came across articles with terms that were not considered.	Inclusion and exclusion criteria needed to be clarified.	Clarify population criteria by adding paraeducators, special teachers, and teacher assistants at care facilities. Include "paraprofessionals" within a school or educational setting where the article specified that they play an assisting role within a classroom setting (the term is often used interchangeably with paraeducators). Clarify context criteria to include "Special School" and "Care facility" and to exclude "Home setting". Clarify source type criteria to exclude books, theses and dissertations. Clarify time criteria to exclude articles published before 2001 and to include articles published between 2001 and 2020.
To test the useability of Rayyan™ for screening at the title, abstract, and full-text level.	The researcher and an interrater independently used Rayyan™ to screen articles for relevance (Khalil et al., 2022).	Rayyan™ was effective for screening at title, abstract and full-text level. The method of indicating reasons for inclusion or exclusion needed to be refined.	Refine the description of reasons for including and excluding articles by using the "label" and "reason" functions within Rayyan™.

Aim	Procedure	Results	Recommendations
To determine the clarity of procedures for inter-rater reliability for screening at title, abstract and full-text level.	The researcher and an interrater independently used Rayyan™ to screen articles for relevance and they used the data extraction form to extract data from the articles in the pilot study.	Discrepancies between the researcher and interrater showed how to use Rayyan™ to categorise included and excluded articles during different screening phases. The interrater required an explanation of some of the extraction form category titles. The data extraction form was deemed appropriate for this study.	Use "Maybe" and "Exclude" labels during title and abstract screening. Only use "Include" label at full-text level to ensure consistency. Insert a pop-up comment within each column to provide the interrater with a description of the required data. Train the interrater before commencing with the final data extraction by using 2-3 articles as an example.
To determine the appropriateness of the data extraction form.	The researcher and interrater each used the data extraction form to extract data from the articles in the pilot study.	The included articles did not use the same methods to report on the effectiveness of training studies. It was therefore necessary to state the method used within each article.	Add a column that states the desired outcome of training. Add a column that states the method used in the article to determine data effectiveness.
To determine the reliability of data extraction procedures.	The researcher and interrater each made use of the data extraction form to extract data from the articles in the pilot study.	The data extraction form proved to be a reliable tool for data extraction procedures.	None.

2.6 Ethical considerations

Ethical clearance for conducting this review was applied for and obtained from the Ethics Committee of the Faculty of Humanities at the University of Pretoria (Appendix A). The literature included is expected to have required and upheld privacy and anonymity.

The researcher pursued accuracy by ensuring that the scoping review methods are explained and used in a manner that allows other researchers to replicate the review and verify the findings (McMillan & Schumacher, 2014). Plagiarism was avoided by clearly crediting the original authors and providing references (McMillan & Schumacher, 2014).

2.7 Materials and equipment

A web-based tool, Rayyan™, was used during the study selection process. The tool assists with knowledge and evidence-synthesising projects such as systematic or scoping reviews (Khalil et al., 2022). Although it has been criticised for not handling duplicate articles and automatic data extraction (Ouzzani, 2016; Khalil et al., 2022), the tool is freely available and offered a simple and efficient user experience (Harrison et al., 2020; Khalil et al., 2022).

2.8 Search strategy

The research strategy was developed iteratively, considering the data sources, search terms, and inclusion and exclusion criteria (Levac et al., 2010). An information specialist at the University of Pretoria was consulted to assist with the identification of relevant databases, journals, and search strings (Egan et al., 2017).

A multifaceted approach towards the search was adopted to ensure that source selection bias would not occur (Schlosser et al., 2007). This included the searching of electronic databases, hand-searching of relevant journals, forward citation (Arksey & O'Malley, 2005) and conducting ancestry searches on platforms such as Google Scholar and unpublished research papers via PROQUEST (Schlosser et al., 2007).

To avoid database bias, multiple and appropriate databases were carefully selected (Schlosser et al., 2007). The following databases that are accessible through the University of Pretoria's library were selected: PubMed; Africa-Wide Information; Scopus; and EBSCOhost (which includes PsychINFO, Education Resources Information Centre (ERIC), Health Source and MEDLINE).

Table 3 summarises the search strings used within each database, the number of articles yielded by each search and the number of yields after removing duplicates.

Table 3

Search terms per database

Database	Search Terms	Yield	Yield after removal of duplicates
PsychINFO (EBSCOhost)	TX ("augmentative and alternative communication") OR TX AAC AND TX (educator* OR teacher* OR "special teacher" OR "teacher assistant" OR paraeducator) AND TX ("teacher education" OR "teacher training" OR "teacher assistant training") AND TX "special education"	1,214	1,209
ERIC (EBSCOhost)	TX ("augmentative and alternative communication") OR TX AAC AND TX (educator* OR teacher* OR "special teacher" OR "teacher assistant" OR paraeducator) AND TX ("teacher education" OR "teacher training" OR "teacher assistant training") AND TX "special education"	555	553
Health Source (EBSCOhost)	TX ("augmentative and alternative communication") OR TX AAC AND TX (educator* OR teacher* OR "special teacher" OR "teacher assistant" OR paraeducator) AND TX ("teacher education" OR "teacher training" OR "teacher assistant training") AND TX "special education"	704	628
MEDLINE (EBSCOhost)	TX ("augmentative and alternative communication") OR TX AAC AND TX (educator* OR teacher* OR "special teacher" OR "teacher assistant" OR paraeducator) AND TX ("teacher education" OR "teacher training" OR "teacher assistant training") AND TX "special education"	1,020	1015
PubMed	(((("augmentative and alternative communication") OR (AAC)) AND (educator*	12	12

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Database	Search Terms	Yield	Yield after removal of duplicates
	OR teacher* OR "special teacher" OR "teacher assistant" OR paraeducator)) AND ("teacher education" OR "teacher training" OR "teacher assistant training")) AND ("special education")		
Scopus	(ALL ("augmentative and alternative communication") OR ALL (aac) AND ALL (educator* OR teacher* OR "special teacher" OR "teacher assistant" OR paraeducator) AND ALL ("teacher education" OR "teacher training" OR "teacher assistant training") AND ALL ("special education")) AND PUBYEAR > 2000 AND PUBYEAR < 2021 AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English"))	269	267
Africa-Wide Information	"augmentative and alternative communication" in All Text OR AAC in All Text AND educator* OR teacher* OR "special teacher" OR "teacher assistant" OR paraeducator in All Text AND "teacher education" OR "teacher training" OR "teacher assistant training" in All Text AND "special education" in All Text - with Cochrane Library publication date Between Jan 2001 and Dec 2020	34	34
		2408	2344

2.9 Eligibility criteria

Table 4 illustrates the inclusion and exclusion criteria used in this study in terms of populations, types of AAC intervention, types of sources, research designs, dates and languages.

Table 4

Inclusion and exclusion criteria

Aspect considered	Inclusion criterion	Exclusion criterion	Justification
Population	Educators Paraeducators Special teachers Teachers Teacher Assistants	Other communication partners such as carers, peers and parents.	Educators and paraeducators are important in AAC implementation (Beukelman & Light, 2020).
Construct	Teacher training programmes on AAC	Non AAC-related training programmes such as training on Speech Therapy techniques such as phonological awareness, oral motor exercises, turn-taking, topic initiation and maintenance during verbal conversations.	Educators reported that they are ill-equipped in terms of AAC implementation and require training (Andzik et al., 2019).
Context	School setting Special school setting Care facility with educational classes	Settings that are not school settings, special school settings or care facilities with educational classes such as home settings, care facilities without educational classes, clinics, rehabilitation centres and stimulation centres.	To focus the review on the training of educators and paraeducators for the implementation of AAC (Douglas, 2012).

Aspect considered	Inclusion criterion	Exclusion criterion	Justification
Outcome	Results pertaining to the effectiveness of the training programme for the implementation of AAC.	Results pertaining to the perceptions or experiences of the educators and paraeducators on the use of AAC.	To focus the review on the training of educators and paraeducators for the implementation of AAC (Douglas, 2012).
Design	Experimental designs (single subject or group designs), non-experimental designs, qualitative studies, mixed methods.	Systematic reviews, scoping reviews, literature reviews, meta-analyses, simple A-B designs, case studies.	To adopt a wide approach to generate broad coverage (Arksey & O'Malley, 2005).
Source type	Peer-reviewed journal articles.	Expert opinions, conference presentations Books Theses Dissertations Systematic reviews Literature reviews	To construct an objective and comprehensive scope of primary studies (Egan et al., 2017).
Time and language	Publications in English dated from 2001-2020	Publications not available in English or published prior to 2001.	To ensure feasibility of the study due to time and resource constraints (Levac et al., 2010).

2.10   Reliability of screening

To increase the efficiency and transparency of the search, the results were imported into Rayyan™, an online-based tool that is designed to assist in expediting the screening and selection of studies (Khalil et al., 2022).

The researcher and the supervisors independently reviewed the selected studies at title, abstract level and full-text level to ensure that the inclusion and exclusion criteria were applied consistently (Egan et al., 2017). Inter-rater reliability of 80% was achieved at title, abstract and full-text screening. The reviewers discussed any discrepancies until full consensus was reached (Levac et al., 2010).

2.11   Data extraction and analysis

A data extraction form (Appendix B) was developed based on previous studies by Schlosser et al. (2009), Schlosser and Koul (2015), and guidance from Peters et al. (2022). Data from each of the included studies was extracted as outlined in Table 5.

Table 5

Data extraction and analysis

Criteria	Justification
Authors and date of publication	To determine the frequency of publications annually (Pollock et al., 2023).
Aim/purpose of the study	To report on the research aims and help link the main aims to the outcomes of the studies (Schlosser & Koul, 2015).
Participants (name/number, age, gender, diagnosis)	To determine the frequencies of age, gender, and diagnosis of participants in the included studies (Aromataris & Munn, 2020).
Research design	To determine the types of research design in the included studies (Pollock et al., 2023).
Type of AAC training programme	To determine the type of AAC training programmes used (Pollock et al., 2023).

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Criteria	Justification
Outcome	To determine the outcome of each study (Aromataris & Munn, 2020).
Quality appraisal	To determine the certainty of evidence that authors provided in the included studies (Simeonsson & Bailey, 1991).
Effect	To determine the effect of AAC training programmes on educators and paraeducators implementation of AAC (Peters et al., 2020). (See Section 2.14 for explanation on how effectiveness was determined.)

Data from each included article was extracted in terms of (a) title; (b) authors; (c) year of publication; (d) aims; (e) participants (name; number of participants); (f) research design; (g) types of AAC training programmes; (h) outcomes; (i) quality appraisal; and (j) effectiveness of training programme.

The data was extracted by the researcher and 100% of the data extraction was checked by the supervisors. 80% agreement was found and discrepancies were discussed until 100% agreement was reached.

2.12 Selection of records

The PRISMA diagram in Figure 1 demonstrates how the researcher selected studies to be included for data charting.

Figure 1

PRISMA Flow Diagram of Selection Process (Page et al., 2021)
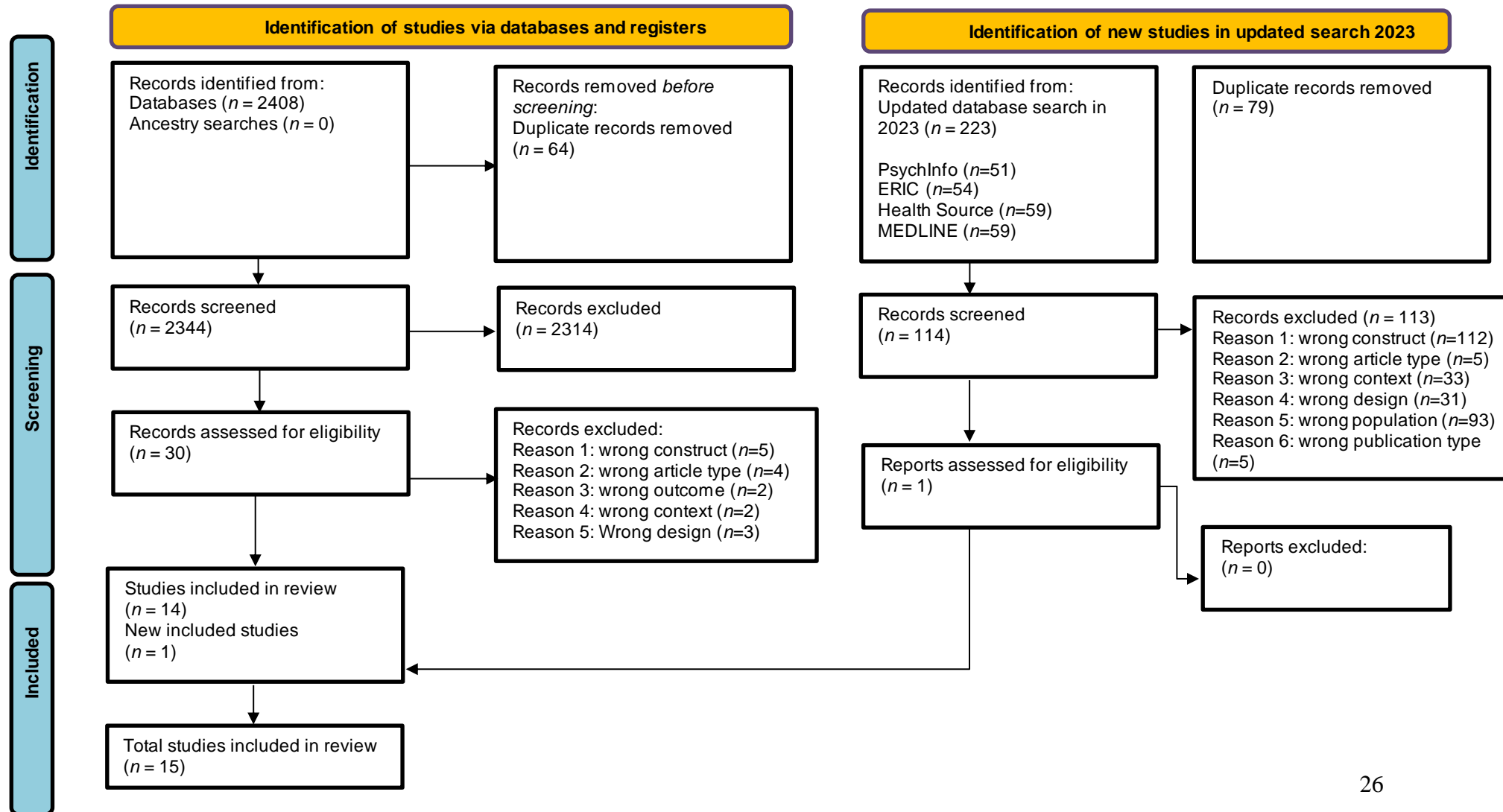
The PRISMA diagram in Figure 1 indicates that 2408 articles were identified through database searches. When the researcher removed duplicates, 2344 articles were screened by title and abstract, and the researcher excluded 2314 articles through this screening process. Altogether 30 (n=30) full-text articles were reviewed for eligibility. A total of 16 (n=16) of the 30 (n=30) articles were excluded after full-text review. The reasons for such exclusion comprised wrong constructs (n=5), wrong article types (n=4), wrong outcomes (n=2), wrong context (n=2) and wrong study design (n=3).

The researcher needed to take a six-month leave of absence from the University of Pretoria from May 2022 to January 2023. To ensure that no articles were missed during this period, she replicated the search strategy in January 2023. The researcher subsequently included studies from 2021 to 2022 and completed the inclusion and exclusion criteria with the supervisor.

The updated database search conducted from January 2021 to December 2022 yielded 223 articles (n=223). The yields per database were as follows: PsychInfo (n=51); ERIC (n=54); Health Source (n=59); and MEDLINE (n=59).

Once a total of 79 (n=79) duplicates had been removed, 144 (n=114) articles remained to be screened at title and abstract level. Only one (n=1) article met the inclusion criteria to be assessed for eligibility at full-text level. This article was added to the 14 (n=14) articles previously identified to be included in the review, resulting in a total of 15 (N=15) articles that met the inclusion criteria for this study.

2.13   Quality appraisal

Each included study was appraised based on a certainty framework (Horner et al., 2005; 2012) developed by Simeonsson and Bailey (1991). Other authors also applied this framework (Dada et al., 2020; Chavers et al., 2022), in which the certainty of evidence was classified into one of four categories: 1) conclusive; 2) preponderant; 3) suggestive; 4) inconclusive. These four groupings are determined by descriptively examining three dimensions, namely research design quality, Interobserver Agreement of the dependent variable, and treatment integrity. Since the three dimensions apply to general intervention research, the framework is used for single-case experimental designs and group design studies.

The study design was rated to be of good quality, provided that it had increased data points at baseline (3-5 data points), the design protocol was accurately followed, and the explanation was provided when a researcher deviated from the planned methodology (Krasny-Pacini, 2017).

Treatment integrity (TI) refers to the degree to which an intervention is implemented as intended (Rowland, 2018) and is used to test causal relations (Goense et al., 2014). A high intervention TI is usually linked to a high change in behaviours (Xu, 2016). Since the intervention is multidimensionally influenced by factors such as the environment, the level of complexity and motivation of the person implementing the intervention, the intervention is error prone. Therefore, it must be implemented as accurately and consistently as possible to ensure a good TI (Rowland, 2018).

Treatment Integrity must be equal to or above 80% for at least 20% of sessions in order for the study to be classified as having adequate or better TI. If TI is under 80%, the session is said to be inadequate (Rowland, 2018).

Interobserver Agreement (IOA) is an aspect of internal validity that refers to the level of similarity between data recorded by multiple observers on the activities pertaining to one subject (Walter, 2019). If there was a high level of agreement between observers, the study was reported to have a good IOA (Walter, 2019). The quality of the study design was considered, next, and a study had adequate or better IOA when IOA was 80% or higher (Walter, 2019).

The quality of the study was determined by aggregating the ratings of these categories. Conclusive evidence demonstrates that the outcomes resulted from the intervention based on a design that demonstrates at least three replications of experimental control and adequate or better IOA and TI. Preponderant evidence features minor design flaws, reports adequate or better IOA, and TI leads to the conclusion that the outcomes are associated with the intervention provided. Evidence suggests a robust design or one with minor flaws; however, the IOA and TI are inadequate. Finally, evidence is inconclusive when it is impossible to determine if the outcomes are associated with intervention owing to fatal design flaws, regardless of adequate IOA and TI. Evidence is also considered inconclusive when TI or IOA is not provided, regardless of the design (Schlosser & Koul, 2015; Schlosser & Wendt, 2008).

2.14   *Effect of training*

For single-case experimental designs, the outcomes of each study were analysed using the percentage of non-overlapping data (PND) to indicate an effect size (Parker & Vannest, 2009). PND was selected as a suitable metric to determine effect size as it has strengths related to accuracy and external validation relative to R^2 and visual analysis judgements (Parker & Vannest, 2009). PND measures the non-overlap of data between baseline and intervention phases (Parker & Vannest, 2009).

In the current review, PND was determined manually by calculating the non-overlap baseline and successive intervention phases. This was done by selecting the highest datapoint in the baseline phase and determining the percentage of datapoints in intervention or maintenance phases that was higher than that of the highest baseline datapoint (Schlosser & Koul, 2015). A PND was considered highly effective if greater than 90%, fairly effective if between 70% and 90%, questionable if between 50% and 70%, and if below 50%, ineffective (Schlosser & Koul, 2015).

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3. RESULTS

A total of 15 (*N*=15) studies met the inclusion criteria for this scoping review. Table 6 provides an overview of the studies in terms of the i) author of the study; ii) title of the article; iii) aim of the study; iv) study design; v) participant sampling method; vi) participants; vii) training programme used; viii) training approach; ix) training objectives; and x) results of the study as reported by the authors.

Table 6

Included studies (N=15)

No	Author (date)	Title	Study Aim	Design	Sampling	Participants	Training programmes (Independent Variable)	Training approach	Training Objectives	Results as reported by the author
1	Andzik & Cannella-Malone (2019)	Practitioner implementation of communication intervention with students with Complex Communication Needs	"The aim of this study was to evaluate pyramidal training with BST as an efficient way of training four special education paraeducators." (Andzik & Canella-Malone, 2019, p. 407).	Single-subject experimental design; Multiple probe across subject	Non-probability sampling	Educators	Communication partner strategies	Behavioural Skills Training programme	Fidelity and rate of paraeducator-implemented opportunities to initiate (OTI)	"This brief training was effective at preparing staff to (a) train others and (b) implement with fidelity over time and across settings." (Andzik & Cannella-Malone, 2019, p. 407)
						Paraeducators			Fidelity and rate of paraeducator-implemented Least to Most Prompting (LTM)	
						Students			Increased prompted initiations made by students	
2	Binger et al. (2010)	Teaching educational assistants to facilitate the multisymbol message productions of young students who require Augmentative and	"This study investigates the impact of using a communication partner instructional program to teach Educational Assistants (EAs) how to teach their students to produce symbol combinations on their speech-generating devices." (Binger et al.,	Single-subject experimental design; Multiple probe across subject	Non-probability sampling	Educational Assistants (EAs)	RAAP RAAP RAAP! pneumonic	ImPAACT programme	EAs' increased use of the RAAP RAAP RAAP! pneumonic which include the following steps: i) **R**eading the story; ii) **A**sking WH questions; iii) **A**nswering WH questions; and using verbal iv)	"The results, then, provide further evidence that using the ImPAACT Program is an effective and efficient method for teaching communication partners how to support the communication and language skills of children who use

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No	Author (date)	Title	Study Aim	Design	Sampling	Participants	Training programmes (Independent Variable)	Training approach	Training Objectives	Results as reported by the author
		Alternative Communication	2010, p. 108).						Prompting while using AAC.	AAC." (Binger et al., 2010, p. 117)
						Students			Children's increased use of multisymbol messages.	
3	Bingham et al. (2007)	Training paraeducators to promote the use of Augmentative and Alternative Communication by students with significant disabilities	"To determine the impact of training paraeducators on (a) paraeducator prompting use of augmentative communication (AAC) systems, (b) paraeducator responding to student requests, (c) student use of AAC, and (d) student problem behavior via a series of multiple probe designs." (Bingham et al., 2007, p. 339).	Group experimental design; Multiple probe across paraeducator design	Non-probability sampling	Paraeducators	Communication partner strategies	No specific programme used.	Increased use of prompts from professional	"The primary finding was that the training of paraeducators using a treatment package including self-evaluation increased the number of times they prompted students to use AAC and the number of times they responded to student requests." (Bingham et al., 2007, p. 348)
						Students			Increased responses from professional to child	
									Students' increased use of AAC	
									Students' reduced problem behaviour	
4	Chazin et al. (2018)	Implementation and intervention practices to	"To (a) examine the effects of a behavior skills training (BST) approach to professional	Single-subject experimental design;	Non-probability	Teacher	No specific programme used	Behaviour Skills training	Increased spontaneous use of modelling	"Despite initial differences in demographic and behavioural

No	Author (date)	Title	Study Aim	Design	Sampling	Participants	Training programmes (Independent Variable)	Training approach	Training Objectives	Results as reported by the author
		facilitate communication skills for a child with Complex Communication Needs	development (PD) in supporting a classroom teaching team in the implementation of a behavior support plan for a child with CCN and (b) evaluate the effects of a single component of the plan (adult modeling) on child use of AAC." (Chazin et al., 2018, p. 140).	Multiple probe across subject	sampling	Student				characteristics, the intervention was effective for all teachers." (Chazin et al., 2018, p. 149)
5	Douglas et al. (2012)	Teaching paraeducators to support the communication of young children with Complex Communication Needs	"This study examined the impact of instruction to paraeducators in two communication interaction strategies (IPLAN [Identify activities for communication, Provide means for communication, Locate and provide vocabulary, Arrange environment, use iNteraction strategies] and MORE [Model AAC, Offer opportunities for communication, Respond to communication, Extend communication]) on the number of communication	Single-subject experimental design; Multiple probes across subject	Non-probability sampling	Paraeducators	Communication partner strategy (IPLAN and MORE)	Strategy instruction framework (Ellis et al., 1991; Kent-Walsh & McNaughton, 2005).	Increased communication opportunities	"This study provides initial evidence that a 2-hr, one-on-one paraeducator training targeting best practices to support communication of young children (Light, 1997a), and taught through a strategy instruction model (Ellis et al., 1991; Kent-Walsh & McNaughton, 2005), had a positive impact on the communicative interaction between paraeducators and children with CCN during play activities. Following training,
						Students			Increased use of spontaneous communication attempts from child	

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No	Author (date)	Title	Study Aim	Design	Sampling	Participants	Training programmes (Independent Variable)	Training approach	Training Objectives	Results as reported by the author
			opportunities provided by paraeducators during play activities with young children with CCN." (Douglas et al., 2012, p. 91).							paraeducators increased the number of communication opportunities, and children took a greater number of turns." (Douglas et al., 2012, p. 98)
6	Douglas et al. (2013)	Online training for paraeducators to support the communication of young children	"To identify effective and efficient strategies for teaching paraeducators to support the communication development of children with CCN. Specifically, to better understand how we can teach paraeducators to support the development of communication skills during play activities, which provide naturally occurring and motivating learning opportunities for young children" (Douglas et al., 2013, p. 226)	Single-subject experimental design, Multiple probe across subject	Non-probability sampling	Paraeducators Students	PoWR strategy	Communication partner instruction model	Increased communication opportunities Increased responses from professional to child Increased amount of communication act by child with CCN	"Results of this study show that the combination of interactive online training and a live practice play session was effective at increasing the number of communication opportunities provided by the paraeducators. In addition" (Douglas et al., 2013, p. 234)

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No	Author (date)	Title	Study Aim	Design	Sampling	Participants	Training programmes (Independent Variable)	Training approach	Training Objectives	Results as reported by the author
7	Hetzroni (2003)	A positive behaviour support: A preliminary evaluation of a school-wide plan for implementing AAC in a school for students with intellectual disabilities	"To investigate if the use of AAC strategies could be applied as part of a systematic positive support plan that could provide a whole school with appropriate methods that would enhance communication and reduce behaviour problems in a school for students with intellectual disabilities." (Hetzroni, 2013, p. 285)	Single-subject experimental design, Multiple probe across subject	Non-probability sampling	All school staff	A systematic positive support plan	No specific approach used	Reduced problem behaviour Increased use of AAC by children	The results indicated that based on the inventory report, the communication abilities of the students increased during the school year after introducing the year-long AAC plan. Of particular importance was the finding that while communication abilities increased, behaviour problems decreased." (Hetzroni, 2003, p. 290).
8	Homlitas et al. (2014)	A further evaluation of behavioral skills training for implementation of the Picture Exchange Communicatio	"The purpose of the present study was to replicate the procedure outlined by Rosales et al. (2009) with teachers as participants and to evaluate the results of training when children with autism with no formal experience with PECS served as the	Single-subject experimental design, Multiple probe across subject	Non-probability sampling	Teachers Students	Training package for Phases 1 to 3A of PECS	Behaviour skills training programme	Increased percentage of correct responses	The results of the present study provide additional support for the use of BST to teach professionals to implement the first three phases of PECS (Barnes et al., 2011; Rosales et al., 2009). All three teachers performed at or above

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No	Author (date)	Title	Study Aim	Design	Sampling	Participants	Training programmes (Independent Variable)	Training approach	Training Objectives	Results as reported by the author
		n System	learners in their typical classroom environment." (Homlitas et al., 2014, p. 199)							criterion levels during natural environment and follow-up probes when multiple children from their own classrooms served as learners, and no remedial training was required." (Homlitas et al., 2014, p. 201)
9	Kashinath et al. (2022)	Effects of a coaching intervention on paraeducator use of Aided Language Modeling in classroom settings: A pilot investigation	"The purpose of this pilot study was to extend existing research on paraeducator training by embedding a paraeducator-focused coaching intervention within regular classroom activities and adding in the evidence-based practices of situated coaching, reflection, and problem-solving as established professional development strategies that address the needs of the adult learner (the paraeducator)." (Kashinath et al., 2022, p. 34)	Single-subject, multiple probe design	Non-probability sampling	Paraeducators	Aided language modelling	No specific approach used		"the clear intervention effects replicated across participants support the overall effectiveness of the intervention." (Kashinath et al., 2022, p. 41)
10	McMillan	Teachers make it	"To investigate the effects of a multiphase	Single-subject	Non-probabili	Teachers	Communication partner	No specific approach	Device initiation	"This investigation found no effect on

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No	Author (date)	Title	Study Aim	Design	Sampling	Participants	Training programmes (Independent Variable)	Training approach	Training Objectives	Results as reported by the author
	(2008)	happen: From professional development to integration of Augmentative and Alternative Communication technologies in the classroom	teacher professional development package on student use of speech-generating augmentative and alternative communication devices (SGDs)." (McMillan, 2008, p. 202)	experimental designs, Multiple baseline probe design	ty sampling	Students	instruction strategy; Training on time-delay milieu teaching technique	used	Device response	student communication during phase 1, device operation and programming for teachers. There were no increases in SGD initiations or responses during this phase. This study indicates that on-site instructional support is necessary for students with severe disabilities using SGDs by demonstrating that an increase in device initiations occurred only after teachers had received training on creating opportunities for instruction and initiation using the environmental arrangement strategies and embedding in phase 2 (Kaiser et al., 1993; Sigafoos, Roberts, Kerr, Couzens, & Baglioni, 1994)." (McMillan, 2008, p. 209)

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No	Author (date)	Title	Study Aim	Design	Sampling	Participants	Training programmes (Independent Variable)	Training approach	Training Objectives	Results as reported by the author
11	Muttiah et al. (2018)	Evaluating an AAC training for special education teachers in Sri Lanka, a low- and middle-income country	"To investigate the effectiveness of an AAC training model for special education teachers living in Sri Lanka." (Muttiah et al., 2018, p. 277)	Quasi-experimental design, interrupted time-series	Non-probability sampling	Teachers Students	Evocative communication opportunity strategy	No specific training approach used	Increased communication opportunities Increased communication turns by child	"These findings are promising, given that the intervention did not directly target the students with complex communication needs." (Muttiah et al., 2018, p. 285)
12	Senner & Baud (2017)	The use of an eight-step instructional model to train school staff in partner-augmented input	To determine whether school staff training in PAI using the Kent-Walsh and McNaughton (2005) instructional model increases staff use of modeling on students' SGDs in regularly occurring classroom activities.	Single-subject experimental designs, Multiple baseline probe design	Non-probability sampling	Teacher Teacher assistant Speech therapist Students	Partner Assisted Input (PAI)	Kent-Walsh and McNaughton's (2005) eight-step instructional model	Increased spontaneous use of modelling	"Overall, Kent-Walsh and McNaughton's (2005) eight-step instruction model appeared to be effective in teaching self-contained classroom staff to provide PAI for students using core vocabularies on their personal SGDs." (Senner & Baud, 2017, p. 93)
13	Snodgrass & Meadan (2018)	A boy and his AAC team: Building instructional competence across team	"To evaluate if training and coaching improved instructional competence across team members." (Snodgrass & Meadan, 2018, p. 695).	Single-subject experimental designs, Multiple baseline	Non-probability sampling	Paraeducator Teacher	Communication partner instruction strategies	No specific approach used	Using least-to-most prompting hierarchy (LTM) Increased amount of communication acts by child with	"We experimentally demonstrated that training followed by coaching improved high-fidelity use of most-to-least systematic prompting

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No	Author (date)	Title	Study Aim	Design	Sampling	Participants	Training programmes (Independent Variable)	Training approach	Training Objectives	Results as reported by the author
		members.		probe design					CCN	(see Figure 1) for four members of a family-school team." (Snodgrass & Meadan, 2018, p. 175).
14	Walker et al. (2019)	Supporting Educators to Implement Mand Training for a Student with Multiple Disabilities	"To assess the effects of an online learning module on the implementation of mand training by a classroom team and determine whether training improved manding for a student with multiple disabilities." (Walker et al., 2019, p. 262)	Single-subject experimental designs, Multiple baseline probe design	Non-probability sampling	Teacher Paraeducator Students	Mand training strategies	No specific approach	Child's use of manding	"The results of this study suggest that online learning modules may be a viable option for professional development in the area of mand training." (Walker et al., 2019, p. 272)
15	Wermer et al. (2018)	Efficacy of a teacher training a paraprofessional to promote communication for a student with Autism and Complex Communication Needs	To determine the efficacy of a training package (featuring modelling, role-play, and performance feedback) on the degree to which a paraprofessional implements OTR, OTI, and LTM prompting to promote communication for an elementary student with ASD. (Wermer et al., 2018)	Single-subject experimental designs, Multiple baseline probe design	Non-probability sampling	Teacher Paraeducator Students	LTM Prompting OTR training and OTI training	No specific approach used	Using least-to-most prompting hierarchy (LTM) Opportunities for student to initiate (OTI) Increased use of spontaneous communication attempts from child	"The paraprofessional implemented all three practices accurately, and the rate of student communication improved substantially." (Wermer et al., 2018, p. 223)

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No	Author (date)	Title	Study Aim	Design	Sampling	Participants	Training programmes (Independent Variable)	Training approach	Training Objectives	Results as reported by the author
									Opportunities for students to respond (OTR)	

3.1   General characteristics of the studies

3.1.1   The number of publications per year

Figure 2 illustrates the number of publications per year (ranging from the beginning of 2003 to December 2022).

Figure 2

Number of publications
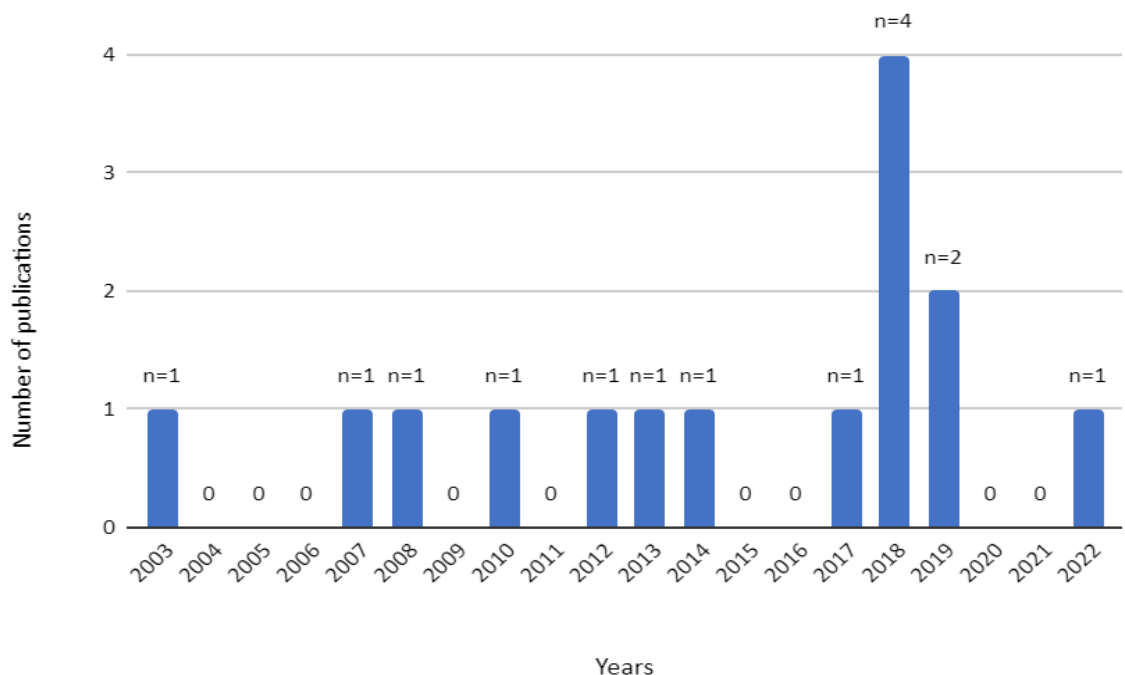
Figure 2 illustrates that few papers were published between 2003 and 2017. No articles ($n=0$) were published between 2004 - 2006, 2009, 2011, 2015 – 2016 and 2020-2021. Only one ($n=1$) paper per year was published in 2003 (Hetzroni, 2003), 2007 (Bingham et al., 2007), 2008 (McMillan, 2008), 2010 (Binger et al., 2010), 2012 (Douglas et al., 2012), 2013 (Douglas et al., 2013), 2014 (Homlitas et al., 2014), 2017 (Senner & Baud, 2017) and 2022 (Kashinath et al., 2022). It is evident that the regularity and the frequency of publications increased after 2018, with the largest number of publications ($n=4$) in 2018 (Chazin et al., 2018; Wermer et al., 2018; Muttiah et al., 2018; Snodgrass & Meadan, 2018;) and 2019 (Andzik & Cannella-Malone, 2019; Walker et al., 2019).

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3.1.2 *The study designs*

The study designs used in the included articles (*N*=15) are shown in Figure 3.

Figure 3

Study designs
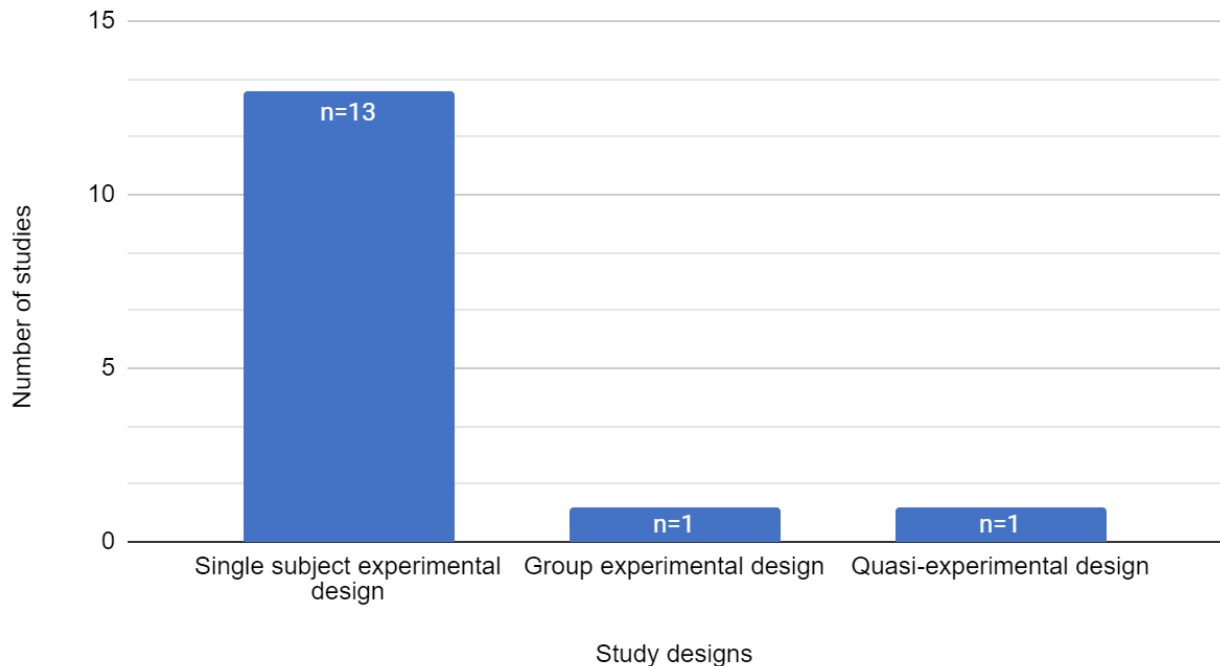
As illustrated in Figure 3, the majority of the studies included in this review were single-subject experimental designs – specifically multiple probe designs across subjects (*n* = 13) (Andzik & Cannella-Malone, 2019; Binger et al., 2010; Chazin et al., 2018; Douglas et al., 2012; Douglas et al., 2013; Hetzroni, 2003; Homlitas et al., 2014; Kashinath et al., 2022; McMillan, 2008; Senner & Baud, 2017; Snodgrass & Meadan, 2018; Walker et al., 2019; and Wermer et al., 2018). Only one group experimental design (*n*=1) (Bingham et al., 2007) and one quasi-experimental design (interrupted time series) (*n*=1) (Muttiah et al., 2018) were found.

3.1.3 Description of participants

The participants across the different studies (*N*=15) are described in Table 7.

Table 7

Participants across included studies

Author (year)	Participant	Number of participants	Author's definition of participants
Andzik & Cannella-Malone (2019)	Teacher	3	No definition included
	Paraeducator	4	No definition included
	Student	3	No definition included
Binger et al. (2010)	Educational Assistants	3	No definition included
	Student	3	No definition included
Bingham et al. (2007)	Paraeducator	3	No definition included
	Student	3	No definition included
Chazin et al. (2018)	Teacher	1	No definition included
	Intern	1	
	Teacher-Assistant	2	
	Student	1	
Douglas et al. (2012)	Paraeducator	3	No definition included
	Student	3	
Douglas et al. (2013)	Paraeducator	3	Supports children with special needs in early childhood educational settings.
	Student	3	
			Supervised by teachers and other educational professionals.
Hetzroni (2003)	Teacher	9	No definition included
	Teacher-aide	9	
	Students	67	
	Other	Unspecified	
Homlitas et al. (2014)	Teacher	3	No definition included
	Student	9	
Kashinath et al. (2022)	Paraeducators	6	No definition included
	Students	6	
McMillan (2008)	Teacher	4	No definition included
	Student	4	
Muttiah et al. (2018)	Teacher	9	No definition included
	Student	9	
Senner & Baud (2017)	Teacher	1	No definition included
	Teacher Assistant	2	
	Speech Therapist	1	
	Student	6	
Snodgrass & Meadan	Paraeducator	2	No definition included

Author (year)	Participant	Number of participants	Author's definition of participants
(2018)	Teacher	1	
Walker et al. (2019)	Teacher	1	No definition included
	Paraeducator	2	
	Student	5	
Wermer et al. (2018)	Paraeducator	1	No definition included
	Teacher	1	
	Student	1	

Most studies included students (*n*=13) (Andzik & Cannella-Malone, 2019; Binger et al., 2010; Bingham et al., 2007; Chazin et al., 2018; Douglas et al., 2012; Douglas et al., 2013; Hetzroni, 2003; Homlitas et al., 2014; McMillan, 2008; Muttiah et al., 2018; Senner & Baud, 2017; Snodgrass & Meadan, 2018; Walker et al., 2019; Wermer et al., 2018).

The study conducted by Hetzroni (2003) included the greatest number of students (*n*=67). Homlitas et al. (2014) and Muttiah et al. (2018) both involved nine (*n*=9) students in their studies. Senner and Baud (2017) included six students (*n*=6), Walker et al. (2019) five (*n*=5) students and McMillan et al. (2008) included four students (*n*=4). Furthermore, the majority of studies included three students each (*n*=3) (Andzik & Cannella-Malone, 2019; Binger et al., 2010; Bingham et al., 2007; Douglas et al., 2012; Douglas et al., 2013) and the rest focused on a single student per study (*n*=1) (Chazin et al., 2018; Snodgrass & Meadan, 2018; Wermer et al., 2018).

Ten of the studies specified the inclusion of teachers (*n*=10) (Andzik & Cannella-Malone, 2019; Chazin et al., 2018; Hetzroni, 2003; Homlitas et al., 2014; McMillan, 2008; Muttiah et al., 2018; Senner & Baud, 2017; Snodgrass & Meadan, 2018; Walker et al., 2019; Wermer et al., 2018). Of these, Muttiah et al. (2018) and Hetzroni (2003) each involved nine (*n*=9) teachers, making these two the studies with the most teachers each. McMillan (2008) included four (*n*=4) teachers and Homlitas et al. (2014) included three (*n*=3). The other studies that involved teachers only focused on one per study (*n*=1) (Chazin et al., 2019; Senner & Baud, 2017; Snodgrass & Meadan, 2018; Walker et al., 2019; Wermer et al., 2018).

Eight (*n*=8) studies included paraeducators (Andzik & Cannella-Malone, 2019; Bingham et al., 2007; Douglas et al., 2012; Douglas et al., 2013; Kashinath et al., 2022; Snodgrass & Meadan, 2018; Walker et al., 2019; Wermer et al., 2018). Of these, Kashinath et al. (2022) included the biggest number of paraeducators (*n*=6), Anzik and Canella-Malone (2019) included four paraeducators (*n*=4) and Bingham et al. (2007), Douglas et al. (2012)

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and Douglas et al. (2013) each included three (*n*=3) paraeducators. Snodgrass and Meadan (2018) and Walker et al. (2019) both included two (*n*=2) paraeducators respectively, and only one (*n*=1) study included one (*n*=1) para-educator only (Wermer et al., 2018). Two (*n*=2) studies included two (*n*=2) teacher assistants each (Chazin et al., 2018; Senner & Baud, 2017), while Binger et al. (2010) included three (*n*=3) educational assistants. All of these professionals can, however, be grouped under the umbrella term "paraeducators" (Zhao et al., 2021), making it the population most often included across the reviewed studies (*n*= 11).

A whole-school approach was followed in the study by Hetzroni (2003). Although the article did not specify exactly how many participants took part in the study, there were 67 (*n*=67) students in the school in nine (*n*=9) classes that participated, and one teacher (*n*=1) and one teacher-aide (*n*=1) per class formed part of the study group. The researcher consequently calculated that nine (*n*=9) teachers and nine (*n*=9) teacher-aides formed part of the study. Hetzroni also mentioned that the students continued to receive speech therapy, occupational therapy, physiotherapy, music and art therapy, as well as psychological and social services. The article did not specify whether these services and the professionals that offered them actually formed part of the school-wide training programme.

Only one (*n*=1) study included a definition of paraeducators and defined them as professionals supervised by teachers and other educational professionals, who support children with special needs in educational settings (Douglas et al., 2013). None of the other studies clarified their definition of the included participants.

One (*n*=1) study included a speech therapist (Senner & Baud, 2017) and another one (*n*=1) study included an intern (Chazin et al., 2018)
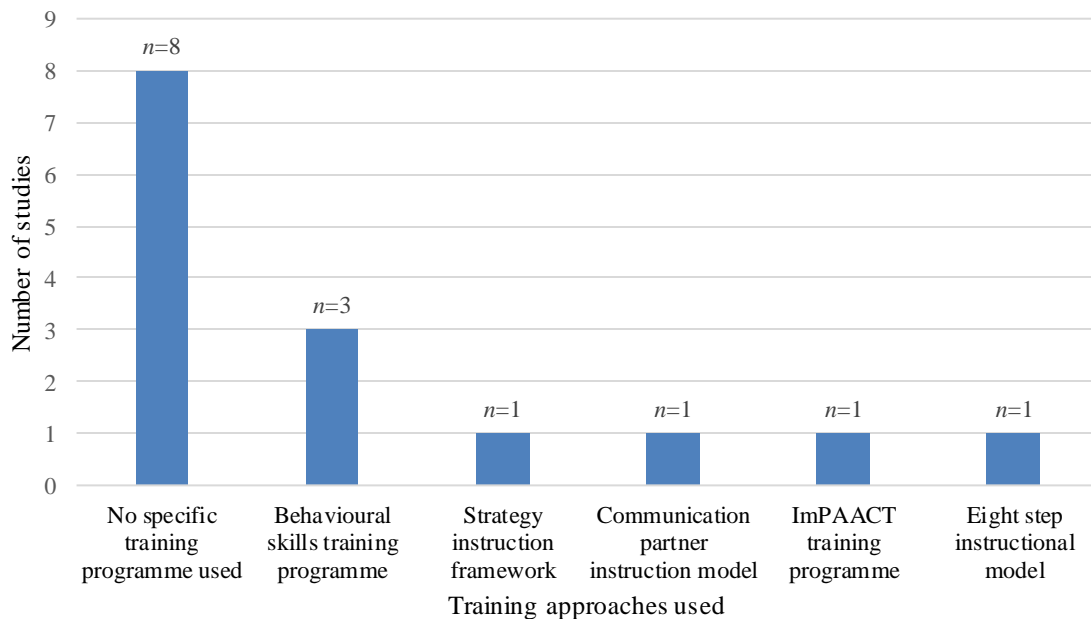
3.1.4 AAC training approaches and their components

Figure 4 highlights the types of AAC training approaches that were included in the reviewed papers.

Figure 4

Training approaches

Most of the included studies did not make use of a specific training approaches (*n*= 8) (Bingham et al., 2007; Hetzroni, 2003; Kashinath et al., 2022; McMillan, 2008; Muttiah et al., 2018; Snoddgrass & Meadan, 2018; Walker et al., 2019; Wermer et al., 2018). However, three of them used the components of behaviour skills training (BST) (Andzik & Cannella-Malone, 2019; Chazin et al., 2018 and Homlitas et al., 2014), while one study (*n*=1) used the Improving Partner Applications of Augmentative Communication Techniques (ImPAACT) programme (Binger et al., 2010). Another study used the strategy instruction framework by Ellis et al. (1991) as well as Kent-Walsh and McNaughton (2005) (Douglas et al., 2012). One study (*n*=1) made use of the Communication partner instruction model (Douglas et al., 2013) and another (*n*=1) used the Eight-Step Instructional Model framework (Senner & Baud, 2017) to train educators.

3.1.5 Components of training programmes

Table 8 next provides detail about the components of the training programmes, as well as the length and type of training strategies used in each article. Descriptions for "Type of training strategy" were provided based on the description as indicated in the respective articles. For instance, if an article specified that training was conducted in a one-on-one setting, but not specified where it took place, the description "One-on-one training was provided. If the article, however, described that the training was conducted "one-on-one" and within the "school setting" or "in-service" training setting, the description "one-on-one in-service training" was provided.

Table 8

Components, length, and type of training programmes

Author (date)	Training programme used (IV)	Training approach	Components of training programme	Length and frequency of training strategy	Type of training strategy
Andzik & Cannella-Malone (2019)	Communication partner strategies	Behavioural Skills Training programme	1. Importance of practice explained 2. Steps in practice explained 3. Summary of procedures provided 4. Task analysis 5. Time for questions 6. Modelling of steps by researcher – teacher role-playing as paraeducator – include errors and ask follow-up questions providing teacher with opportunity to practise using BST and answer questions 7. Time for questions	"17 to 26 min (M=22 min)" p401	One-on-one in-service training
Binger et al. (2010)	RAAP RAAP RAAP! pneumonic	ImPAACT programme	1. EAs sign dedication to learning document 2. Strategy described 3. Strategy demonstrated 4. Strategy practised orally 5. Strategy practised in controlled environment. 6. Strategy practised in natural environment. 7. EAs solicited to commit to long-term strategy implementation	More than an hour	One-on-one training
Bingham et al. (2007)	Communication partner strategy	No specific programme used.	1. Concepts explained: • Importance of communication • Relationship between behaviour and communication	"one two-hour session" (Bingham et al., 2007, p. 342)	One-on-one in-service training

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Author (date)	Training programme used (IV)	Training approach	Components of training programme	Length and frequency of training strategy	Type of training strategy
			● AAC use		
			● Prompting students		
			● Responding to communication attempts		
			2. Self-evaluation		
Chazin et al. (2018)	Behaviour Intervention Plan Training	Use of Behavioural Skills Training	1. Concepts explained: ● Predecessors, behaviours and consequences ● Function of behaviours ● Utilisation of reinforcement and elimination as part of Behaviour Intervention Plan (BIP) 2. BIP steps modelled 3. Teachers practise BIP steps 4. Feedback provided	One hour's training followed by three 15-minute sessions	Group training
Douglas et al. (2012)	Communication partner strategy (IPLAN and MORE)	Strategy instruction framework (Ellis et al., 1991; Kent-Walsh & McNaughton, 2005).	Session 1: 1. Sign commitment to participate. 2. Watch video of, and discuss importance of communication. 3. Watch video of, and introduce IPLAN strategy steps. 4. IPLAN step 1 video and in-person demonstration. 5. Time for questions and reflection on implementation with educator's own learners. 6. New scenario provided and case discussion held. 7. IPLAN step 2, 3 and 4 discussed in similar format. 8. iNteraction strategies introduced.	Four sessions, first one an hour long, followed by 20-minute sessions stretched over two weeks	One-on-one in-service training with follow-up sessions

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Author (date)	Training programme used (IV)	Training approach	Components of training programme	Length and frequency of training strategy	Type of training strategy
			9. Paraeducators instructed to memorise iPLAN steps for the next session. Session 2: 1. Brief test on iPLAN strategy. (Provide review of iPLAN strategy until all participants recall with 80% accuracy). 2. MORE strategy is taught using the same instructional format as in session. 3. Construct plan to implement IPLAN and MORE strategies with learners. Educators must: ● select motivating play-based activity; ● describe AAC system with relevant vocabulary; ● arrange environment according to IPLAN strategy; ● discuss plan to model AAC, provide opportunities to communicate, respond and extend communication during the activity, making use of MORE strategy. Session 3: 1. Paraeducators implement plan from Session 2 with learner. 2. Time for questions. 3. Self-evaluation on strategy use, implementation, successes and things to change in future plans.		
Douglas et al. (2013)	Training programme containing PoWR strategy	Communication partner instruction model	1. Communication partner instruction model	Multiple day training	Online, self-paced training
Hetzroni (2003)	A systematic positive support	No specific training approach used	1. Introduce AAC and following topics: ● "AAC models, taxonomy and the importance of communication for students with intellectual disabilities"	Multiple-day training	Workshop

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Author (date)	Training programme used (IV)	Training approach	Components of training programme	Length and frequency of training strategy	Type of training strategy
	plan		● "Assessment and intervention issues in AAC"		
			● AAC and its use in a classroom setting .		
			● "Intentional communication, initiations and the role of communicative behaviours"		
			● "high and low assistive technology and the use of various devices available within the school setting"		
			● AAC classroom implementation		
			● "Concept of positive behavioural support"		
			2. Discuss communication behaviours of child within an environmental context with all school staff.		
			3. Present research findings regarding child behaviours .		
			4. Present an AAC implementation plan to school staff.		
			5. Evaluate plan by staff with focus on a child's needs in the school and community .		
			6. Evaluate "current state of communication in the school, quality of life, ecology, target behaviour, and learning styles".		
			7. Develop and implement AAC support plan in line with curriculum .		
			8. Evaluate and present outcomes of the plan at the end of the school year (Hetzroni, 2013, p. 287).		
Homlitas et al. (2014)	Training package for Phases 1 to 3A of PECS	Behaviour Skills Training Programme	1. Educators read training manual and information on Phases 1 - 3A PECS.	Not specified	In-service training
			2. Verbal instructions and checklist for Phase 1 of PECS.		
			3. Modelling of one five-trial block to educator.		
			4. Educator given opportunity to rehearse one five-trial block and ask questions before and after each trial.		
			5. Researcher provides feedback after each trial block.		

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Author (date)	Training programme used (IV)	Training approach	Components of training programme	Length and frequency of training strategy	Type of training strategy
			6. Educators practise trial blocks until "90% correct independent responses across three consecutive five-trial blocks".		
			7. Phase 2 and 3 training are conducted following the same instructional guidelines as with Phase 1 (Homlitas et al., 2014, p. 201).		
Kashinath et al. (2022)	Aided language modelling	No specific approach used	Interactive modules presented on the following: ● Device management ● Multimodal communication attempts ● Recognising communication opportunities ● ALM ● "Responding to and reinforcing communication" (Beukelman & Light, 2020, p. 128; Kashinath et al., 2022, p. 38)	"Consecutive training sessions of 75 to 90 minutes over the course on 4 to 8 weeks"	Workshop
McMillan (2008)	Communication partner instruction strategy; Training on time-delay milieu teaching technique	No specific approach used	1. Phase 1: Operating SGDs 2. Phase 2: Developing opportunities for instruction and SGD use; Using device in classroom activities 3. Phase 3: Assist teachers in communication instruction; Training on time-delay milieu teaching technique	Consecutive training sessions of 16-30 minutes each	One-on-one in-service training with follow-up sessions
Muttiah et al. (2018)	Evocative communication opportunity strategy	Communication partner strategies	1. Role-playing to demonstrate importance of communication with an introduction to AAC. 2. Describe evocative communication opportunity strategy. 3. Watch video with AAC use demonstration highlighting partner communication strategies. 4. Practise educator and instructor role-play as well as communication partner strategies. 5. Complete worksheet on case study video of child familiar to the educator. 6. Educators practise making their own AAC and role-playing with each other using AAC	Group sessions: 3-4 hours One-on-one follow-up sessions of 16 to 30 minutes only	Group in-service training with follow-up sessions

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Author (date)	Training programme used (IV)	Training approach	Components of training programme	Length and frequency of training strategy	Type of training strategy
			materials and learnt communication strategies		
			7. One-on-one follow-up sessions with each educator and learner over the course of three days. Feedback on implementation provided to educators during these sessions.		
Senner & Baud (2017)	Partner Assisted Input (PAI)	Kent-Walsh and McNaughton's (2005) eight-step instructional model	1. Sign dedication to learning document	Consecutive training sessions of more than one hour each. Sessions spread over five weeks	Group in-service training
			2. Description of strategy		
			3. Demonstration of strategy		
			4. Oral strategy practice using S'MoRRES mnemonic		
			5. Practice in a controlled environment		
			6. Feedback session		
			7. Practice in advanced scenario		
			8. Feedback session		
			9. Commitment to long-term strategy use		
Snodgrass & Meadan (2018)	Communication partner instruction strategies	No specific approach used	1. Training on: ● Aided AAC modelling ● Creating opportunities for communication ● Most-to-least systematic prompting.	"Each coaching session addressed all three strategies and averaged 29 min" (p. 171)	One-on-one training
Walker et al. (2019)	Mand training strategies	No specific training approach used	Modules consisted of: 1. Review of: ● SNAP procedure ● Communication Bill of Rights (NJC1992) ● Manding	40 minutes	Online self-paced training with follow-up in-service training

Author (date)	Training programme used (IV)	Training approach	Components of training programme	Length and frequency of training strategy	Type of training strategy
			• Reinforcers preference and assessments		
			• CTD		
			2. Video case studies of learners familiar to educators		
			3. Quiz on training content		
			Classroom team members are required to reach 100% for a section before they can move to the next.		
Wermer et al. (2018)	Communication partner instruction strategy	No specific approach used	Each training session involved the following steps: 1. Description of rationale for strategy 2. Description of strategy and steps 3. Modelling of strategy followed by role-playing of strategy 4. Discussion and taking note of ways of implementing strategy in classroom 5. Implementation of strategy with learner 6. Time for questions	"Training consisted of an initial 10 to 20 min training for each target (i.e., 10 min for OTR, 10 min for OTI, and 20 min for LTM prompting), and then ongoing performance feedback after each intervention session." (p. 221)	One-on-one in-service training with follow-up sessions

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3.1.5.1. Length of training

Chazin et al. (2018) and Douglas et al. (2012) (*n*=2) both administered an hour-long training programme with short follow-up training sessions that were administered over the course of a few weeks. Chazin et al. (2018)'s training session was an hour long with three 15-minute follow-up training sessions. The training offered by Douglas et al. (2012) consisted of four training sessions. The first session was an hour long, thereafter the sessions were 20 minutes long.

The length of five (*n*=5) training programmes was kept under an hour: Wermer et al. (2018)'s session was between 10 and 20 minutes; the session by Andzik and Cannella-Malone (2019) lasted between 17 and 26 minutes, that of McMillan (2008) between 16 and 30 minutes, Snodgrass and Meadan (2018)'s session was 29 minutes long, and that of Walker et al. (2019) took 40 minutes.

Only two (*n*=2) of the programmes that were under an hour long, also noted follow-up training sessions (McMillan, 2008; Wermer et al., 2018). McMillan (2008)'s training consisted of consecutive 16- to 30-minute sessions and that of Wermer et al. (2018) of an initial 10- to 20-minute training session on each target area of training, followed by brief follow-up and feedback sessions after each intervention session.

Most of the training programmes (*n*=6) were more than an hour long (Binger et al., 2010; Bingham et al., 2007; Kashinath et al., 2022; Muttiah et al., 2018; Senner & Baud, 2017; Sennott & Mason, 2016). Three (*n*=3) of these studies also consisted of follow-up sessions or were spread over the course of a few weeks (Kashinath et al., 2022; Muttiah et al., 2018; Senner & Baud, 2017). For instance, the training sessions by Kashinath et al. (2022) lasted between 75 and 90 minutes each and were conducted over the course of four to eight weeks. Muttiah et al. (2018)'s group sessions lasted between three and four hours each, and additional one-on-one follow-up sessions were between 16-30 minutes each. The consecutive training sessions held by Senner and Baud (2017) were reported to be more than one hour each, and were spread over the course of five weeks.

Douglas et al. (2013) and Hetzroni (2003) (*n*=2) only noted that the training programmes were spread over multiple days but did not specify how long these were. Homlitas et al. (2014) (*n*=1) also did not specify the length of their training programmes.

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3.1.5.2. **Type of training**

Most studies (*n*=3) consisted of one-on-one training that can be grouped under the following four subsections based on the descriptions provided in the studies:

i)   One-on-one in-service training with follow-up sessions (Douglas et al., 2012; McMillan, 2008; Wermer et al., 2018)

ii)   One-on-one in-service training (*n*=2) (Andzik & Cannella-Malone, 2019; Bingham et al., 2007)

iii) One-on-one training (not specified whether in-service or not) (*n*=2) (Binger et al., 2010; Snodgrass & Meadan, 2018)

iv)   One-on-one in-service training with online follow-up sessions (*n*=1) (Senner & Baud, 2017)

Two authors used the term "workshop" to describe their training sessions. The sessions involved paraeducator groups (Kashinath et al., 2022) and school staff groups (Hetzroni, 2003). One (*n*=1) study described their training as a group training (Chazin et al., 2018), another (*n*=1) described it as a group training with additional follow-up sessions (Muttiah et al., 2018), and still another (*n*=1) comprised independent online self-paced training (Douglas et al., 2013). Homlitas et al. (2014) made use of in-service training (*n*=1), while Walker et al. (2019) used online self-paced training with follow-up in-service training.

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3.1.6   Independent variables of studies

The training programmes are referred to as the independent variable in this study. Figure 5 provides an illustration of all the independent variables included in each study.

Figure 5

Independent variables in the included studies

Independent Variable
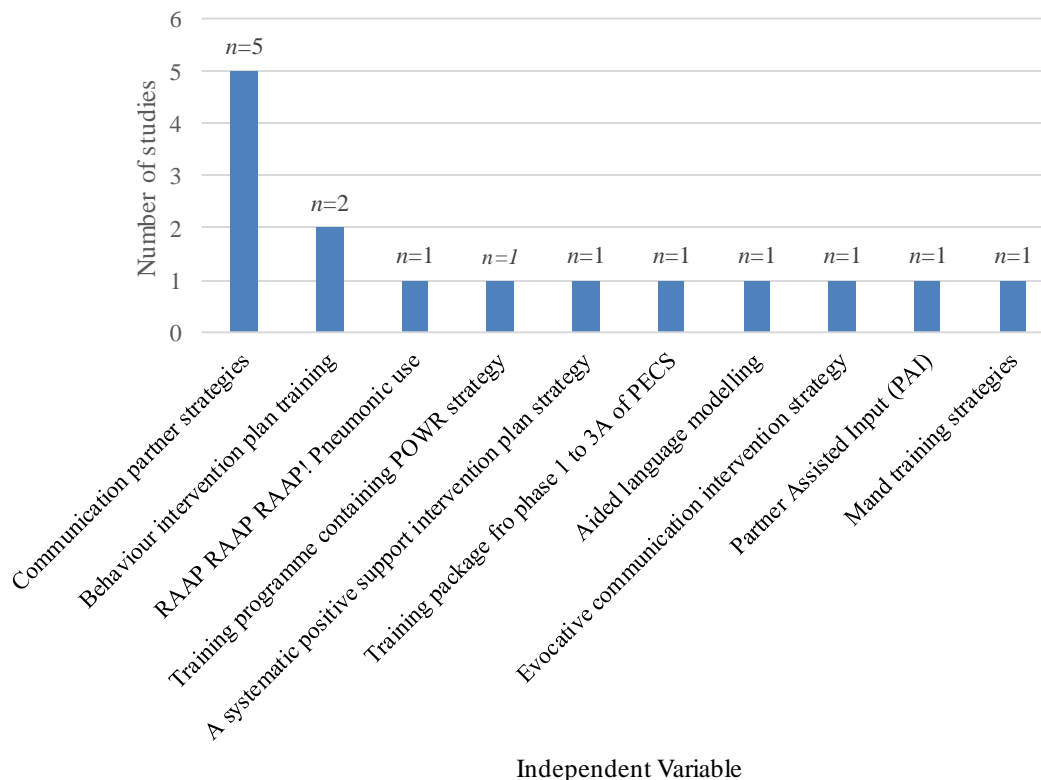
The independent variable descriptions were extracted from the articles. If and article did not provide a specific training programme name, the researcher labelled it as "communication partner strategies".

The independent variable of five (n=5) studies was communication partner strategies (Bingham et al., 2007; Douglas et al., 2012; McMillan, 2008; Snodgrass & Meadan, 2018; Wermer et al., 2018). The IV of two (n=2) studies was to use components of Behavioural Skills Training (Andzik & Cannella-Malone, 2019; Chazin et al., 2018). The independent variables that featured only once (n=1) each within the studies used for the scoping review were as follows: The use of the RAAP RAAP RAAP! pneumonic (n=1); a training programme containing the PoWR strategy (n=1); teaching an AAC positive support plan

($n=1$) (Hetzroni, 2003); the implementation of training package of phase 1 to 3A of PECS ($n=1$) (Homlitas et al., 2014); aided language modelling (Kashinath et al., 2022); an evocative communication intervention strategy (Muttiah et al,. 2018); teaching partner assisted input (Senner & Baud, 2017); and lastly, the training of mand strategy ($n=1$) (Walker et al., 2019).

3.1.7 *Dependent variables of studies*

Figure 6 provides an overview of the dependent variables in each included study.

Figure 6

Dependent variables in studies included in the scoping review
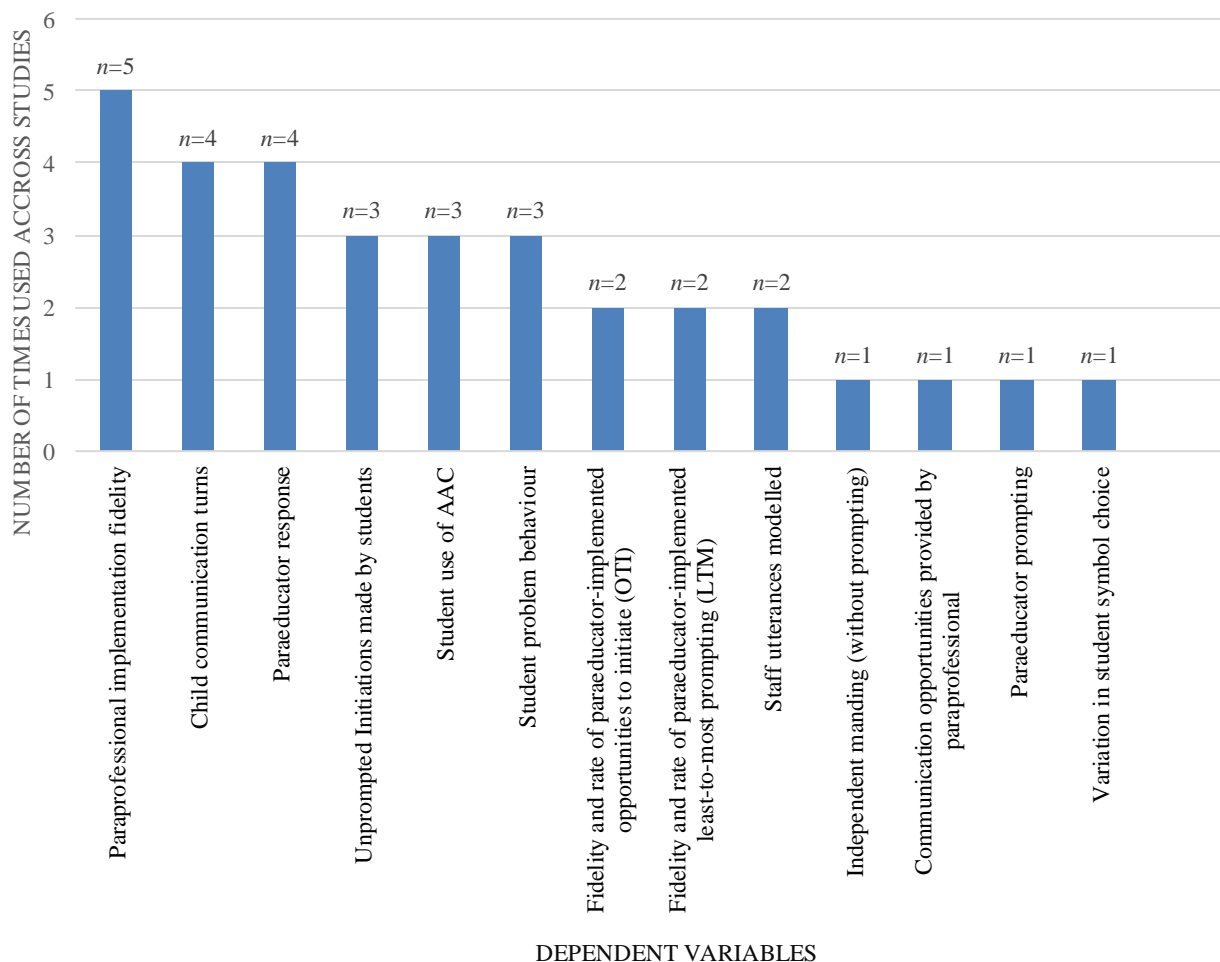
Most of the dependent variables were related to Paraprofessional implementation fidelity. Five studies ($n=5$) considered implementation fidelity as the primary dependent variable (Binger et al., 2010; Chazin et al., 2018; Kashinath et al., 2022; Walker et al., 2019; Wermer et al., 2018). Four ($n=4$) studies considered the child communication turns (Douglas

et al., 2018; Douglas et al., 2012; Muttiah et al., 2018, Wermer et al., 2018) of which all four were the secondary variables of the respective studies. Four (n=4) considered the paraeducator's response as the primary dependent variable (Bingham et al., 2007; Douglas et al., 2012; Homlitas et al., 2014; McMillan, 2008). The primary dependent variable in three (n=3) studies was the unprompted initiation made by students (Binger et al., 2010; Chazin et al., 2018; McMillan, 2008), and three (n=3) studies looked at the students' use of AAC (Binger et al., 2010; Bingham et al., 2007; Hetzroni, 2003). The primary dependent variable for three (n=3) studies was the student problem behaviour (Bingham et al., 2007; Chazin et al., 2018; Hetzroni, 2003).

Two (n=2) articles respectively included the following primary dependent variables: i) the fidelity and rate of paraeducator-implemented Least-to-Most Prompting (Andzik & Canella-Malone, 2019; Snodgrass & Meadan, 2018) and ii) the fidelity and rate of paraeducator-implemented opportunities to initiate communication (Andzik & Canella-Malone, 2019; Muttiah et al., 2018). The primary dependent variable in two (n=2) studies was the staff utterances modelled (Chazin et al., 2018; Senner & Baud, 2017.

Furthermore, some dependent variables appeared only once throughout the included studies. Walker et al. (2019)'s dependent variable was independent manding without prompting (n=1). In the study by Douglas et al., (2013) the communication opportunities provided by paraprofessionals (n=1). "Paraeducator prompting" was mentioned once (n=1) throughout data collection as a primary dependent variable in Bingham et al., (2007)'s study. Lastly, the variability in students' symbol choices was mentioned as a secondary dependent variable in only one study (n=1) (Binger et al., 2010).

3.2 *Quality appraisal and effectiveness of the training programmes*

Table 9 provides a quality appraisal of included studies (N=15) and indicates the effectiveness of the training. This quality appraisal was rated by the researcher and reviewed by a supervisor. Its reliability was 80%.

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Table 9

Quality appraisal of studies and effectiveness of training programmes

Author (date)	Name of AAC training approach	Training Programme used (IV)	Dependent Variable	Quality Appraisal			Classification of Study	Effectiveness of Training
				Design	Interobserver Agreement	Treatment Integrity		
Andzik & Cannella-Malone (2019)	Behavioural Skills Training programme	Communication partner strategies	Fidelity and rate of paraeducator-implemented opportunities to initiate (OTI) Fidelity and rate of paraeducator-implemented Least-to-Most Prompting (LTM) Unprompted initiations made by students	Strong	Adequate or better	Adequate or better	Conclusive Strong design, adequate or better IOA and TI.	Highly effective (100% PND)
Binger et al. (2010)	ImPAACT Programme	RAAP RAAP RAAP! pneumonic	Percentage of strategy steps correctly implemented by the Educational Assistants (EAs) on each page of the storybook. Frequency of multisymbol messages produced by the students, using their SGDs, within a 10-minute story-reading session.	Strong	Adequate or better	Adequate or better	Conclusive Strong design, adequate or better IOA and TI	Highly effective (100% PND)
Bingham et al. (2007)	Communication partner instruction	No specific programme used	Paraeducator prompting Paraeducator responding	Strong	Adequate or better	Adequate or better	Conclusive	Highly effective (100% PND)

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Author (date)	Name of AAC training approach	Training Programme used (IV)	Dependent Variable	Quality Appraisal			Classification of Study	Effectiveness of Training
				Design	Interobserver Agreement	Treatment Integrity		
	training		Student use of AAC Student problem behaviour					
Chazin et al. (2018)	Behaviour Skills Training	Behavioural Intervention Plan training	Fidelity of use of behaviour intervention plan (BIP) across teachers	Strong	Adequate or better	Adequate or better	Conclusive	Fairly effective (87.50% PND)
Douglas et al. (2012)	Communication partner instruction training	Strategy instruction framework (Ellis et al., 1991; Kent-Walsh & McNaughton, 2005).	Number of communication opportunities provided by paraeducators during play activities with young children with CCN. Child communication turns	Strong	Adequate or better	Adequate or better	Conclusive	Fairly effective (90% PND)
Douglas et al. (2013)	Communication partner instruction model	Training programme containing PoWR strategy	The number of communication acts performed by the children The number of paraeducator responses to the children's behaviours	Strong	Adequate or better	Adequate or better	Suggestive	Highly effective (100% PND)
Hetzroni (2003)	Communication partner instruction model	A systematic positive support plan strategy	Child communication method and behaviour	Strong design	Adequate or better	Inadequate	Inconclusive	Highly effective (100% PND)
Homlitas et al. (2014)	Behaviour Skills Training Programme	Training package for phase 1- 3A PECS	Percentage of correct responses	Minor design flaws	Adequate or better	Adequate or better	Preponderant	Highly effective (100% PND)

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Author (date)	Name of AAC training approach	Training Programme used (IV)	Dependent Variable	Quality Appraisal			Classification of Study	Effectiveness of Training
				Design	Interobserver Agreement	Treatment Integrity		
Kashinath et al. (2022)	No specific programme	Aided language modelling	Number of instances of ALM used by paraeducator within an activity.	Minor design flaws (Two of the six para-educator-student dyads did not complete the study)	Adequate or better	Adequate or better	Preponderant	Highly effective (100% PND)
McMillan (2008)	No specific programme	Communication partner instruction strategy	Device initiation Device response	Strong design	Not reported	Not reported	Inconclusive	Highly effective (100% PND)
Muttiah et al. (2018)	Evocative communication opportunity strategy	Communication partner strategies	Number of communication opportunities provided by special education teachers during a naturalistic 10-minute interaction. Number of communication turns taken by the students during a 10-minute interaction.	Strong design	Not reported	Inadequate	Inconclusive	Highly effective (100% PND)
Senner & Baud (2017)	Kent-Walsh and McNaughton's (2005) eight-step instructional model	Partner Assisted Input	Percentage of staff utterances modelled.	Strong design	Not reported	Not reported	Inconclusive	Highly effective (100% PND)
Snodgrass & Meadan	No specific training programme used	Communication partner instruction strategy	High-fidelity prompting across conditions (Nina) High-fidelity prompting across conditions (Elsa)	Strong design	Adequate or better	Adequate or better	Conclusive	Highly effective (100% PND)

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Author (date)	Name of AAC training approach	Training Programme used (IV)	Dependent Variable	Quality Appraisal			Classification of Study	Effectiveness of Training
				Design	Interobserver Agreement	Treatment Integrity		
(2018)			High-fidelity prompting across conditions (Lizzy)					
			Child's (Eli) communication topography across adults and conditions					
Walker et al. (2019)	No specific training programme used	Mand training strategy	To determine whether classroom team members successfully implemented mand training across each targeted activity after participating in the online learning module	Strong design	Adequate or better	Adequate or better	Conclusive	Highly effective (100% PND)
			Independent manding (without prompting)					
Wermer et al. (2018)	No specific programme used	Communication Partner instruction strategy	Paraprofessional implementation fidelity	Minor design flaws	Adequate or better	Adequate or better	Preponderant.	Highly effective (100% PND)
			Student communication					

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The sections below provide further detail regarding results noted in Table 8. In terms of percentage of non-overlapping data (PND), the majority (*n*=13) of the studies had a highly effective effect size with two (*n*=2) studies having a fairly effective effect size (Chazin et al., 2018; Douglas et al., 2012).

3.2.1 *Quality appraisal of studies*

Studies with a strong design and adequate or better Inter Observer Agreement (IOA) and Treatment Integrity (TI) were classified as having conclusive effects in seven studies (Andzik & Canella-Malone, 2019; Binger et al., 2010; Bingham et al., 2007; Chazin et al., 2018; Douglas et al., 2012; Snodgrass & Meadan, 2018; Walker et al., 2019). Three (*n*=3) of the studies had minor design flaws but had adequate or better IOA, and they were therefore classified as having preponderant effects (Homlitas et al., 2014; Kashinath et al., 2022; Wermer et al., 2018). Two studies (*n*=2) had strong designs but did not report on the IOA and TI and were classified as having inconclusive effects (McMillan, 2008; Senner & Baud, 2017). Furthermore, two studies (*n*=2) presented with inadequate TI and omitted IOA results and were classified as inconclusive (Hetzroni, 2003; Muttiah, 2018).

3.2.2 *Effectiveness of training*

From Table 9 it was evident that the majority (*n*=13) of studies were found to have a highly effective effect size with PNDs that were 100% (Andzik & Canella-Malone, 2019; Binger et al., 2010; Bingham et al., 2007; Douglas et al., 2013; Hetzroni, 2003; Homlitas et al., 2014; Kashinath et al., 2022; McMillan, 2008; Muttiah et al., 2018; Senner & Baud, 2017; Snodgrass & Meadan, 2018; Walker et al., 2019; Wermer et al., 2018). A total of two (*n*=2) studies had PNDs ranging from 87.50% to 90% and hence were considered to have a fairly effective effect size (Chazin et al., 2018; Douglas et al., 2012).

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4.   DISCUSSION

The main aim of this scoping review was to explore the current availability and effectiveness of AAC training programmes for educators and paraeducators on the implementation of AAC in educational settings. The serious demand for quality educator and paraeducator training on AAC is highlighted in the literature (Da Fonte et al., 2022; Goldman et al., 2021). This need is supported by the fact that only 15 articles met the inclusion criteria of the current scoping review, with little increase being seen in the number of studies published yearly since 2001. In fact, most of the studies were conducted in 2019. The decrease in publications after 2019 may be attributed to the global COVID-19 pandemic which significantly restricted research that required travelling, social interaction, and funding (Harper et al., 2020). While Khoza-Shangase et al. (2022) suggested that good quality research in the field of speech therapy during the COVID-19 period could still be feasible, Harper et al. (2020) argued that research priorities across the globe changed. The field of education, especially for children with disabilities, took strain in moving from a physical to a virtual setting (Kamga, 2020), which may account for the decrease in studies conducted after 2019.

The limited number of studies that this review retrieved may furthermore be attributed to the recent research focus on training peers (Iocono et al., 2022). It is argued that children who use AAC are often not included in schools, or they spend most of their day in stimulation settings that do not include educators or paraeducators (Wehmeyer et al., 2020).

4.1 Educator and paraeducator roles and training

In most of the included studies, educators and paraeducators within school settings were not defined. This could add to feelings of frustration due to poor role definition related to AAC implementation. It also substantiates current available research that show the roles of educators and paraeducators are not well defined (Butt, 2016; Webster & de Boer, 2021). Future research must therefore aim to define different and specific terms to standardise the roles and responsibilities of these team members.

Although both educators and paraeducators were included in this scoping review, the majority of studies focused on paraeducator training (Andzik & Cannella-Malone, 2019; Binger et al., 2010; Bingham et al., 2007; Chazin et al., 2018; Douglas et al., 2012; Douglas et al., 2013; Kashinath, 2022; Senner & Baud, 2017; Snodgrass & Meadan, 2018; Walker et

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al., 2019; Wermer et al., 2018). This increase in research on paraeducator training can be seen as positive, as paraeducators are often not required to have any prior training in the field to fulfil their role (Vogt, 2021) – a situation that could lead to workplace frustration for educators and paraeducators alike. For instance, Butt (2016) remarked that a lack of proper training for paraeducators could result in their supporting role being ineffective, a waste of monetary and time resources, and ultimately, a disservice to the children whom paraeducators are supposed to support. Besides, it is equally important to train the educator on AAC and on how to guide the paraeducator effectively (Webster & de Boer, 2021). It is important that future research should continue to investigate paraeducator training and that educator training should receive just as much consideration.

Some of the included studies used a training-the-trainer approach, where educators were trained to train paraeducators on AAC. This is seen as positive, as educators generally do not feel equipped to manage paraeducators in their classrooms. They often do not have adequate undergraduate training for taking on this role in addition to their role as a teacher (Butt, 2016).

The reviewed literature has also shown that teamwork across different disciplines is effective in reducing the costs associated with training (Weiss et al., 2020). By following an interdisciplinary team approach, educators will be able to inexpensively further their knowledge and skills with regard to AAC. It is therefore positive to note that in many of the included articles, training was conducted on-site where skills could have been transferred between professionals during speech therapy or in classroom intervention sessions.

4.2 Adult learning principles

Another way to upskill educators and paraeducators on the best practice for implementing AAC is to incorporate the principles of adult learning during training sessions (Rothwell, 2020). Using microlearning and agile learning techniques, teachers and paraeducators can alleviate time-related barriers to learning (Rothwell, 2020). This may assist in eliminating educators' and paraeducators' difficulty to remain up to date with the latest best practice in AAC implementation. Most of the training sessions reported on in the included articles made use of these principles, which could account for their success. All but two studies ($n=2$) (Douglas et al., 2013; Kashinath, 2022) used short training sessions that lasted at most two hours each. Training sessions were generally kept to around one hour and training was stretched over multiple days instead of having one long training session. This

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allowed trainees to learn while continuing with their daily responsibilities, thus making an accommodation for the time constraints that often hinder teachers and paraeducators from attending training sessions (Butt, 2016).

4.2 Training set-up

Most of the studies (*n*=12) were conducted in a face-to-face set-up. In the remaining studies, the training was either conducted online (Douglas et al., 2013) or hosted online as self-paced training with in-person follow-up sessions (Walker et al., 2019). Although technological advancements and the recent shift to online training have helped to make training more cost effective (Walker et al., 2021), teachers and paraeducators from low- or middle-income countries without access to data or online platforms are still at a disadvantage (Khoza-Shangase et al., 2022). It is therefore important to consider their needs and the available resources when setting up a training programme. Further research on the effectiveness of online training of educators and paraeducators is also warranted.

Most of the included studies did not make use of a pre-existing training programme. Instead, they developed training programmes that would suite the contextual and reliability criteria for the respective studies. Although this is could be seen as being in line with the adult learning principle of agile learning, there is a need for clearly outlined training programmes in terms of their components, contents, and methodology. This could help future studies to compare variables and so provide better guidance on effective training programmes.

4.4 Training programmes

The training programmes in the included studies focussed on a variety of outcomes in terms of AAC implementation. Majority of the studies, however, focussed on training educators on improving child communication turn and educator or paraeducator responses. Both of these outcomes provide the educators or paraeducators with the opportunity to cost-effectively target the child's communication needs. Future research can be done on the specific training objectives. Specifically, objectives that ease reported barriers to AAC implementation in a classroom setting such as training educators on creating cost-effective AAC resources.

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4.5 Challenges in study appraisal

It is interesting to note that according to the certainty framework (Simeonsson & Bailey, 1991), not all the studies were regarded as containing conclusive evidence. In most of the studies, the TI and IOA were not reported. The appraisal of studies may have been negatively impacted by factors such as the variability in school days, along with the heterogeneity of the population who was using AAC. This could lead to researchers having to jeopardise external validity and, thereby, the quality of their research (Byiers et al., 2012). This is an important factor to consider in future studies to ensure that they report in respect of both procedural fidelity and reliability of data.

4.6 Effectiveness of AAC training

Furthermore, the current review found that all but two of the training programmes had a highly effective PND. The two (n=2) remaining studies – those by Douglas et al. (2012) and Chazin et al. (2018) – had a fairly effective PND. This finding, along with those of studies not reporting on IOA and TI, highlights the requirement for AAC training to have more rigorous methodologies with more robust designs. Nonetheless, it is important to note that more than half of the studies included in this review were regarded as conclusive and effective, which is promising in terms of AAC training for educators and paraeducators. This suggests that the training of educators and paraeducators on AAC implementation is effective, as it has the potential to enhance educator skills related to AAC implementation.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of main findings

The review in hand confirmed that more research needs to be done on available AAC training programmes for educators and paraeducators. This became evident, since only 15 studies that had been conducted between 2001 and 2022 met the inclusion criteria.

The review demonstrates that an explicit definition of the educator and paraeducator is lacking in the studies. Seeing that one is unclear of the population who actually received training, it is difficult to fully understand the effect of training programmes on educators and paraeducators. In this review, for example, almost no studies provided a definition for these professionals. This can add to uncertainty with regard to the roles and requirements for pre-service or in-service training related to AAC (Butt, 2016; Webster & de Boer, 2021).

Even though few studies made use of an existing training programme on the implementation of AAC, most of them conducted face-to-face training. Some authors also made use of online platforms to conduct training, while still others used a combination of the two modes.

A definite need was noted for future research on educator and paraeducator training to be clearer on quality appraisal. Many of the included studies did not report on the treatment integrity (TI) and interobserver agreement (IoA), resulting in them being appraised as inconclusive. Nonetheless, more than half of the studies were regarded as conclusive and effective, which indicates that effective training of good quality is possible in this field.

Furthermore, all but two training programmes were effective. This is promising, as it suggests that educators and paraeducators would not have to rely on experience to gain confidence and expertise in AAC implementation (Da Fonte et al., 2022).

5.2 Implications for practice

The current review revealed that educator and paraeducator training on AAC can be effective in promoting AAC use for children with CCN in schools. Hence, training can ensure that educators and paraeducators continue to play an important role in AAC facilitation. Agile learning techniques can continue to be used in training programmes, as they address the need for such programmes to be cost efficient and time saving. The review also revealed that the

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use of a train-the-trainer approach is feasible and can assist in saving costs related to training, especially in low-income countries.

5.3   Critical evaluation of the study

5.3.1   Strengths

To ensure that database bias did not occur, a broad range of six databases was used to search for articles that would meet the inclusion criteria for this review (Schlosser et al., 2007).

The use of the PRISMA protocol ensured the robustness and transparency of the steps involved in the scoping review (Munn et al., 2022). Furthermore, through an iterative process and consultation of an information specialist from the University of Pretoria, the researcher was assisted in obtaining all the necessary search terms to ensure that studies related to the aim of the study would be included in the search yield (Egan et al., 2017). By conducting a pilot study and following the PRISMA checklist, the researcher could determine the feasibility and appropriateness of the scoping review (Levac et al., 2010).

Furthermore, the inter-rater reliability for screening articles at title, abstract and full-text levels, as well as the data extraction were all 80%, which indicates a high internal validity of this review (Khalil, 2022).

5.3.2   Limitations

The present study included only articles available in English, hence creating a language bias. Also, although forward citations and ancestry searches were conducted, the researcher neglected to include grey literature, leading to a publication bias (Egan et al., 2017). Furthermore, the results of the quality appraisal tool that appraised studies based on study design, treatment integrity might not be generalisable to other quality appraisal tools (Schlosser & Koul, 2015).

5.3.3   Recommendations for further research

Through completion of this scoping review, a few recommendations became evident. There is an overall need for more research related to AAC training programmes for educators and paraeducators. Furthermore, future research on this topic must aim to be more robust, so that the effectiveness of training can be better determined and compared to the training offered by other available programmes. The success of face-to-face versus online training

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approaches for educators and paraeducators should be studied and compared as this can assist in overcoming potential time and resource barriers to training. Research focused on the standardisation of the terms that are used to refer to educators and paraeducators, as well as on the role that these individuals play in educational settings, could assist them to better understand their roles and responsibilities with regard to AAC implementation.

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6.   CONCLUSION

Educators and paraeducators form a crucial part of the interdisciplinary team responsible for AAC implementation for children with CCN who rely on AAC. Educators and paraeducators spend most of their day with children who use AAC and they can therefore provide valuable information regarding the children's specific AAC needs. Furthermore, they can facilitate AAC use through modelling and scaffolding. However, due to a lack of training, these individuals often feel ill-equipped in their role as AAC facilitators. In many schools, it is the educator or paraeducator's own responsibility to upskill themselves on AAC best practice. The current review indicated that effective educator and paraeducator training is feasible and can be done in various ways, such as by adopting a train-the-trainer approach or through online training. It was also found that the role of educators and paraeducators is often poorly defined. Standardisation of the relevant definitions and terms, as well as the programmes for training on AAC, could allow professionals to feel confident in their role as AAC facilitators. This would in turn allow for children with CCN to have greater exposure to AAC, which can increase their communicative competence, enhance their participation in school activities and improve their scholastic performance.

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Appendix A

Ethical Clearance

Faculty of Humanities
Fakulteit Geesteswetenskappe
Lefapha la Bomotho

![Humanities 100 - Since 1919]

2 December 2021

Dear Miss A Visser

Project Title:	The availability and effectiveness of AAC training programmes for educators and paraeducators: A scoping review
Researcher:	Miss A Visser
Supervisor(s):	Prof S Dada
Department:	Centre for Augmentative and Alternative
Communication Reference number:	21819182 (HUM006/1121)
Degree:	Masters

Thank you for the application that was submitted for ethical consideration.

The Research Ethics Committee notes that this is a literature-based study and no human subjects are involved.

The application has been approved on 25 November 2021 with the assumption that the document(s) are in the public domain. Data collection may therefore commence, along these guidelines.

Please note that this approval is based on the assumption that the research will be carried out along the lines laid out in the proposal. However, should the actual research depart significantly from the proposed research, a new research proposal and application for ethical clearance will have to be submitted for approval.

We wish you success with the

project. Sincerely,

![Signature]

Prof Karen Harris
Chair: Research Ethics
Committee Faculty of
Humanities
UNIVERSITY OF
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Appendix B

Title and Abstract

Relevance Screening Form

Title and Abstract Relevance Screening Tool

Author(s):			
Year:			
Topic:			
Journal:			
Database:			

Criteria:	YES	NO	CAN'T TELL
Does the citation report on training programmes for AAC implementation?	☐	☐	☐
Does the citation report on programmes directed at educators and paraeducators?	☐	☐	☐
Published in English?	☐	☐	☐

Reviewer's decisions:

- If the reviewer answers YES to all of the questions, the article will be included for full-text screening.

- If the reviewer answers NO to any of the questions, the citation will be excluded.

- If the reviewer answers CAN'T TELL to any of the questions, the article will be included for full-text screening.

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Appendix C

Criteria for Inclusion and Exclusion

Criteria for Inclusion and Exclusion

Author(s):	
Year:	
Topic:	
Journal:	
Database:	

Inclusion criteria	Exclusion criteria
POPULATION	POPULATION
□ Educators	□ Other communication partners
□ Paraeducators	
□ Special teachers	
□ Teachers	
□ Teacher assistants at care facility	
CONSTRUCT	CONSTRUCT
□ Training programmes on AAC intervention and implementation	□ Non-AAC-related training programmes
CONTEXT	CONTEXT
□ School setting	□ Home setting
□ Special school setting	□ Hospital setting
□ Care facility with classroom setting	□ Stimulation centre
	□ Care facility without classroom settings
OUTCOME	OUTCOME
□ Results pertaining to the effectiveness of the training programme for educators and paraeducators on the implementation of AAC.	□ Results pertaining to the perceptions of the educators and paraeducators on the use of AAC.
	□ Results pertaining to the experiences of the educators and paraeducators on the use of AAC.
DESIGN	DESIGN
□ Experimental designs (single subject)	□ Systematic reviews
□ Experimental designs (group designs)	□ Scoping reviews
□ Non-experimental designs	□ Literature reviews

□ Case studies	□ Meta-analyses
□ Qualitative studies	
SOURCE TYPE	**SOURCE TYPE**
□ Primary/original research published as peer-reviewed journal articles	□ Expert opinions
	□ Conference presentations
	□ Systematic reviews
	□ Scoping reviews
	□ Books
	□ Dissertations and theses
LANGUAGE	**LANGUAGE**
□ Published in English	□ Publications not available in English
TIME	**TIME**
□ Publication dated 2001 - 2022	□ Published before 2001

Reviewer's decisions:

- If the reviewer indicates all of the inclusion criteria, the article will be included.

- If the reviewer indicates any of the exclusion criteria, the citation will be excluded.

- If the reviewer cannot indicate either inclusion or exclusion at any of the criteria, the article will be excluded.

Appendix D

Data Extraction Form

Data extraction form

	Variable & Key	Category	Reporting Objectives
General Review Information			
1.	Article identification number (ISSN)		None
2.	Date form completed		None
3.	Name of person extracting data		None
4.	Author/s		None
5.	Date of publication		To determine a trend in the year of publication and the number of publications per year
6.	Title		None
7.	Database	☐ PsychINFO (EBSCOhost) ☐ ERIC (EBSCOhost) ☐ Health Source (EBSCOhost) ☐ MEDLINE (EBSCOhost) ☐ Pubmed ☐ Scopus ☐ Africa-Wide Information	None
8.	Journal	☐ Augmentative and Alternative Communication ☐ Communication Disorders Quarterly ☐ Focus on Autism and Other Developmental Disabilities ☐ Journal of Early Intervention ☐ Research and Practice for Persons with Severe Disabilities ☐ Other, please specify:	None
9.	Aim of the research study - Purpose - Dependent variable - Independent variable		To allow qualitative analysis of research aims To facilitate linking research aims to main findings, research limitations

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			and future research recommendations
Method			
8.	Study design	☐ Single-subject experimental designs ☐ Group experimental design ☐ Non-experimental designs ☐ Case studies ☐ Qualitative studies ☐ Other, please specify: _____	To determine the frequency of different types of study designs
9.	Sampling	☐ Probability ☐ Random ☐ Simple random ☐ Systematic ☐ Stratified random ☐ Cluster ☐ Nonprobability ☐ Convenience ☐ Purposeful ☐ Quota ☐ Other, please specify: _____	To determine the frequencies of different sampling methods
10.	Sample size	Number of educators / paraeducators trained on AAC implementation _____ Number of learners with CCN that participated in the study_____	To calculate the overall number of participants involved in the scoping review
11.	Description of participants trained	☐ Educators ☐ Paraeducators ☐ Teachers ☐ Teacher assistants ☐ Learner facilitators ☐ Other, please specify: _____	To determine the distribution of participants trained

12.	Type of AAC training conducted	☐ One-on-one training ☐ Group training ☐ Workshop ☐ In-service training ☐ Pre-service training ☐ Other, please specify: _____	To identify a trend in training methods
13.	Length of training	☐ 0 – 15 minutes ☐ 16 – 30 minutes ☐ 1 hour ☐ More than an hour ☐ 1-day training ☐ Multiple-day training ☐ Other, please specify: _____	To determine a trend in length of training sessions
14.	Training programme used	☐ Impaact programme ☐ I-Plan programme ☐ MORE training ☐ Informal training / no specific programme followed ☐ Other, please specify: _____ _____	To identify a trend in the training programmes used
15.	Training objectives	☐ Increasing communication opportunities ☐ Increasing spontaneous use of modelling ☐ Positioning of AAC system ☐ Repairing a communication breakdown with AAC ☐ Other, please specify: _____	To identify a trend in training objectives
	Results and Discussion		
16.	Factors identified as affecting the training of educators and paraeducators on the implementation of AAC	☐ Duration of training ☐ Training objective ☐ Training method ☐ Other, please specify: _____	To determine a trend in factors that influence training outcomes
	Conclusion		

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17.	Quality Appraisal of design	☐ Strong designs ☐ Minor design flaws ☐ Fatal flaws	To determine the quality of the study design
18.	Treatment Integrity (TI)	☐ Adequate or better ☐ Inadequate ☐ Not reported	To determine treatment integrity
19.	Interobserver Agreement (IOA)	☐ Adequate ☐ Inadequate ☐ Not reported	To determine internal integrity
20.	Classification of Evidence	☐ Conclusive ☐ Inconclusive ☐ Suggestive ☐ Preponderant	To determine the quality of the study
21.	Effect size of results	☐ Small (.20) ☐ Medium (.50) ☐ Large (.80)	To determine the effectiveness of the training programme
	Future Research		
18.	Recommendations for future research identified in the paper	☐ None reported ☐ Specified by researcher	To determine gaps in the research conducted to date

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