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The Predominant Focus Is Still on Teaching Children to Make Requests: A Systematic Review of AAC for Autistic Adults and Children

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ABSTRACT

Background: Autistic people with communication support needs can benefit from the use of augmentative and alternative communication. While research has considered the use of AAC to supplement communication and improve communication effectiveness, less is known about other potential outcomes across the lifespan such as wellbeing and social interaction.

Aims: The aim of this systematic review was to synthesise current research regarding the use of AAC for autistic adults and children; exploring how AAC supports the individual's communication, adaptive functioning and quality of life.

Methods: A systematic search was conducted across six databases; PsychINFO, Medline, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Scopus, Educational Resources Information Centre (ERIC), and Google Scholar. Eligibility criteria included experimental design, peer-reviewed publications and papers published in English after 2013. Relevant papers were exported to Covidence; screening, full text review and data extraction were conducted in duplicate and quality appraisal was completed for all papers using the Scientific Merit Rating Scales (SMRS). Included studies were grouped by age, intervention types, AAC types and reported outcomes, and described qualitatively.

Main Contribution: The 69 included papers focused on a range of AAC types. The majority investigated speech-generating devices and low-tech picture exchange. Most used behavioural intervention techniques. Most papers focused only on children, with only three papers investigating outcomes of AAC use with adults. The results were largely descriptions of proximal outcomes, such as simple requests, with few considering generalisation of skills or distal outcomes such as quality of life. The quality of the papers was generally low, with limitations in study design and diagnostic ascertainment noted.

Conclusions: AAC has the potential to be an important support for autistic people, however, evidence regarding the impact on the broad range of communication functions and quality of life is very limited. A greater focus on the impact of AAC on these areas is needed in both research and practice along with a stronger focus on adults and a greater range of AAC types.

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WHAT THIS PAPER ADDS

What is already known on this subject

- The use of augmentative and alternative communication (AAC) with autistic adults and children is an established practice. Previous research has shown some effectiveness related to the specific goals being studied but it has centred mostly on children, and most research has focused on making requests, rather than broad communication or life outcomes.

What this paper adds to existing knowledge

- This study explores the literature about autism and AAC and seeks to specifically examine the range of outcomes reported. We found that most of the research on this topic continues to focus on children, aided rather than unaided communication, and on outcomes related directly to the intervention, such as making requests. Very few studies included measures of generalisation or considered broader outcomes of AAC supports, such as quality of life, or enhanced social interactions.

What are the potential or actual clinical implications of this work?

- Clinicians and researchers should consider the potential for broader impacts of AAC and ensure that goals focus on skills beyond immediate functions to areas such as quality of life, well-being, learning and employment, and the development of social relationships. Clinicians and researchers should also ensure that AAC interventions are offered to not only children, but also to autistic adults who may benefit from communication supports.

1 | Introduction

Autism, also referred to as Autism Spectrum Disorder (ASD),[1] is a broad term describing individuals with characteristics across two broad criteria: social communication and interaction difference or difficulties across contexts, and repetitive behaviour patterns, and strong interests (American Psychiatric Association 2022). The term 'spectrum' is used to acknowledge the range of presentations of the diagnosis, and that the challenges experienced may vary, influenced by personal characteristics, including strengths, interests, co-occurring intellectual disability or attention difficulties, and environmental factors including the social environment (American Psychiatric Association 2022). Adults and children diagnosed with autism frequently experience delayed or disordered language development (American Psychiatric Association 2022) as part of broader communication difficulties that are core to an autism diagnosis. Whilst speech is used widely by autistic adults and children as the primary form of communication, studies suggest that between 25% and 35% of individuals are classified as 'nonverbal' or 'minimally verbal' following early intervention in childhood (Rose et al. 2016). Some autistic people who are minimally verbal may be described as having 'profound autism' (a term proposed to described autistic people who are minimally verbal, have a severe to profound intellectual disability (<50) and the need for full-time support; Hughes et al. 2023), while others will experience a range of difficulties acquiring or using speech and language skills and may require alternative ways to communicate.

Communication presentations can include those who are non-speaking, those who are sometimes unable to use spoken language, or those who use idiosyncratic language, along with those who present with fluent language but with differences in prosody, phonology and semantics (Mody and Belliveau 2013). While not all autistic people experience reduced quality of life (Oakley et al. 2021), social-communication difficulties have been found to be related to subjective quality of life outcomes, particularly for children (Oakley et al. 2021). Overall, the impact of communication support needs can be profound and affect a range of areas, including social interaction, social relationships, and well-being, learning and employment opportunities.

Autistic individuals with communication support needs can benefit from the use of augmentative and alternative communication (AAC; Morin et al. 2018). AAC is a means of supplementing or replacing speech to help people communicate their interests, wants and needs, to access the environmental access, and, crucially, for social participation (Bekteshi et al. 2023). AAC can be aided, involving the use of external materials or devices, and unaided which utilise forms of communication such as gestures, manual signs and facial expressions (Logan et al. 2017). It can also be categorised into non-technology based AAC known as 'no tech' (specific signals using one's body), 'low-tech AAC' (e.g., picture boards and Picture Exchange Communication System; Ganz 2015; Logan et al. 2017) as well as technology-based devices referred to as 'high-tech AAC' (e.g., Speech Generating Devices; Bekteshi et al. 2023). AAC tools may be used in isolation or in conjunction with one another, where combinations of high-tech aided devices and unaided low-tech tools may be chosen according to setting or context (e.g., classroom, swimming pool), user preference or partner knowledge (e.g., using idiosyncratic sign with a well-known family member but a voice output device with a service provider; Elsahar et al. 2019).

There are a number of systematic reviews that have evaluated the efficacy of AAC devices for autistic children. Logan et al. (2017) examined the effectiveness of aided AAC in supporting autistic children to use a range of communicative functions, such requests, protests. The findings suggested emerging support for the effectiveness of AAC to teach functions beyond simple requests. However, no information about broader outcomes, such as quality of life or improved participation were reported. Logan et al. (2022) explored intervention strategies that were the most effective in teaching autistic children communicative functions beyond object requests. Results indicated that interventions that included time delay, prompting, and teaching skills in routines were the most effective but the researchers continued to focus only on aided AAC systems. White et al. (2021) systematic review

evaluated the effects of AAC on speech development of autistic children. They found that using an AAC device resulted in some improvements in speech production, however the review focused only on children and did not explore other areas of communication, wellbeing or adaptive functioning. A systematic review by Holyfield et al. (2017) shifted focus to AAC use with autistic adolescents and adults, reporting that the literature was limited and the need for more intervention studies with this demographic. Thus whilst AAC has been shown to support some elements of communication development, particularly aided AAC for children less is known about the additional effects these systems may have in areas such as wellbeing and participation (Enderby 2013).

Within the scope of speech pathology, the International Classification of Functioning, Disability and Health (ICF; World Health Organisation 2001) framework is used by clinicians to advocate for a more holistic approach to an individual's care. In this framework, the impact of impairment on activities and participation is a primary focus, with recognition of the role of environment on an individual's functioning. Enderby (2013) identified the relationship between the ICF domains and the core objectives of AAC services. Enderby argued that AAC service outcomes should prioritise improved communication effectiveness across environments (activity) in order to increase an individual's social participation, autonomy and independence (participation) and further the individual's and family's wellbeing (Enderby 2013). Another way to consider outcomes are as global measures impacting individuals across the lifespan as seen in a study by Baker et al. (2022). Baker et al. (2022) argued for using both proximal and distal measures to better understand the efficacy of interventions. In this work, proximal measures were those directly correlated to the intervention targets measured within the intervention context (e.g., discrete communication skills) and distal measures referred to broader changes in skills (e.g., quality of life, participation, independence, and employment). This idea appears largely limited to speech interventions, with no application to date to AAC supports reported in the literature.

Overall, previous reviews of AAC use with autistic people indicated that outcomes have focussed on the discrete skills trained, such as symbol recognition or expressing preferences, with limited attention given to other communication outcomes, quality of life, wellbeing and participation. There is an evident gap in literature synthesising the proximal and distal outcomes of different AAC types for autistic individuals across the lifespan. Therefore, a high-quality comprehensive systematic search and review of the field is critical for synthesising relevant data regarding the impact of AAC across the lifespan. As the gaps in the research outlined indicates, and given the lack of consideration of distal measures in AAC interventions, an updated systematic review may offer updated perspectives and reflect current research trends.

1.1 | Aim

The aim of this systematic review is to identify and synthesise findings about AAC interventions regarding type, teaching method and outcomes for autistic adults and children. The following research questions were addressed: (1) What is the state of the research regarding current AAC interventions for autistic adults and children; and (2) What outcomes, including communication, adaptive functioning, and quality of life are evaluated in research regarding AAC interventions for autistic adults and children?

2 | Method

2.1 | Study Design

The present study is a systematic search and narrative review in accordance with guidelines by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher et al. 2009) and the Synthesis Without Meta-analysis reporting guidelines (SWiM; Campbell et al. 2020). The protocol for this review was registered with the International Prospective Register of Systematic Reviews in November 2023. This study design was adopted to allow for sufficient exploration and understanding of the breadth of the existing literature presenting AAC interventions and to explore the nature of the outcomes being reported for autistic individuals.

2.2 | Eligibility Criteria

Eligibility criteria for inclusion of papers for the review are outlined in Table 1. Papers published in English from 2013 were included, to align with the current understanding of autism per the DSM-5 guidelines that were published that year (American Psychiatric Association 2013). Other inclusion criteria were use of an experimental design of any kind, including pre-post single case designs through to randomised control trials, and publication in peer-reviewed journals. Papers that did not include the specified population of interest (children or adults with an autism diagnosis), used interventions that were not communication-based, reported on teaching outcome measures only (e.g., percentage correct, accuracy), and study designs that were reviews or qualitative research, were excluded. Studies reporting on Facilitated Communication, Rapid Prompting Method or variants (e.g., Supported Typing, Spelling 2 Communicate, Spellers Method) were also excluded due to the inability to accurately attribute the authorship of messages purported to be conveyed by facilitated communicators (e.g., Hemsley et al. 2018).

2.3 | Literature Search

Researchers conducted an initial systematic search in November 2023 of six electronic databases; PsychINFO, Medline, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Scopus, Educational Resources Information Centre (ERIC) and Google Scholar. Databases were searched using key terms describing autism and augmentative and alternative communication. Appendix 1 provides full search terms and syntax of databases searched. Additionally, hand searches of previously published systematic reviews reporting content on autism and augmentative and alternative communication were conducted. Hand searches were also conducted of reference lists of included studies for relevant articles. Additionally, a content expert in this area was

TABLE 1 | Eligibility criteria for included papers.

Framework	Criteria
Type of population (P)	• Participants diagnosed with autism (including the term autism spectrum disorder). • Participants are all autistic people or at least one person with autism with individual data reported.
Type of intervention (I)	• Studies implementing an augmentative and alternative communication (AAC). • Studies implementing an intervention that is high or low tech. • Studies implementing an intervention that is aided or unaided.
Type of comparator (C)	• Not applicable.
Type of outcomes (O)	• Studies that reported on communication, adaptive functioning, behaviour, independence, Quality of Life (QoL), employment, participation, activity, inclusivity and/or emotions.
Research design	• Studies are of experimental design. • Studies are published in English. • Date of publication from 1 January 2013. • Studies published in peer-reviewed journals.

consulted to ensure that no recent or relevant studies had been overlooked.

A search of the same six databases using the same search terms, date limited from 2024—current was re-run in April 2025.

2.4 | Selection Procedures

Papers identified through the database search were extracted and exported into the Covidence systematic review software (Veritas Health Innovation 2022) for the full review process. Titles and abstracts were independently screened by two authors based on the inclusion criteria (Table 1). Where suitability of a given paper was unclear, it was progressed to the next phase for full text consideration. Two authors then reviewed all papers for inclusion. A third author resolved disagreements between authors regarding suitability of the paper for inclusion, while being blinded to the other reviewers' decisions. Eligible papers progressed to data extraction. See Figure 1 for the breakdown of the database search and inclusion/exclusion of studies.

2.5 | Data Extraction

Eligible studies were summarised according to the parameters discussed and agreed upon by all authors. Two authors independently extracted data from the papers regarding year of publication, origin of study, participant characteristics, diagnostic information, study design, the type of AAC and intervention used in conjunction, agent and setting, and reported outcome measures. A third author provided consensus checking and resolved and discrepancies or ambiguities in information until consensus was reached.

2.6 | Synthesis Methods

Following data extraction, a narrative review was developed. The narrative synthesis was structured around the AAC types used, the interventions used to teach or support AAC acquisition, and the outcomes measured. Papers were grouped based on these topics, and qualitative information, and basic quantitative measures (i.e., number of papers, percentages) were calculated. Meta-analysis was not completed due to the heterogeneity of the papers and data; given that the aim of the review was to understand the current state of the literature including descriptions of outcomes, rather than to determine effectiveness, a descriptive approach was appropriate.

Outcome measure categories were defined a priori based on the work of Enderby (2013) and Baker et al. (2022). Proximal outcomes were defined as targets discretely measured within the intervention setting (Baker et al. 2022), medial outcomes included intermediate behaviours such as initiations and interactions that could progress to broader goals, and distal outcomes were those that impacted on participation and/or quality of life, such as social interaction, wellbeing and behaviour changes. Classification of outcome measures was completed via consensus discussions with the team members.

2.7 | Quality Appraisal

Quality appraisal of all included papers was undertaken using the Scientific Merit Rating Scale (SMRS; National Autism Centre 2009). The SMRS is a quality appraisal tool specific to autism research and hence, was the most appropriate for this research project (National Autism Centre 2009). The SMRS tool has previously been used for other published systematic reviews reporting on the types of interventions for echolalia in autistic

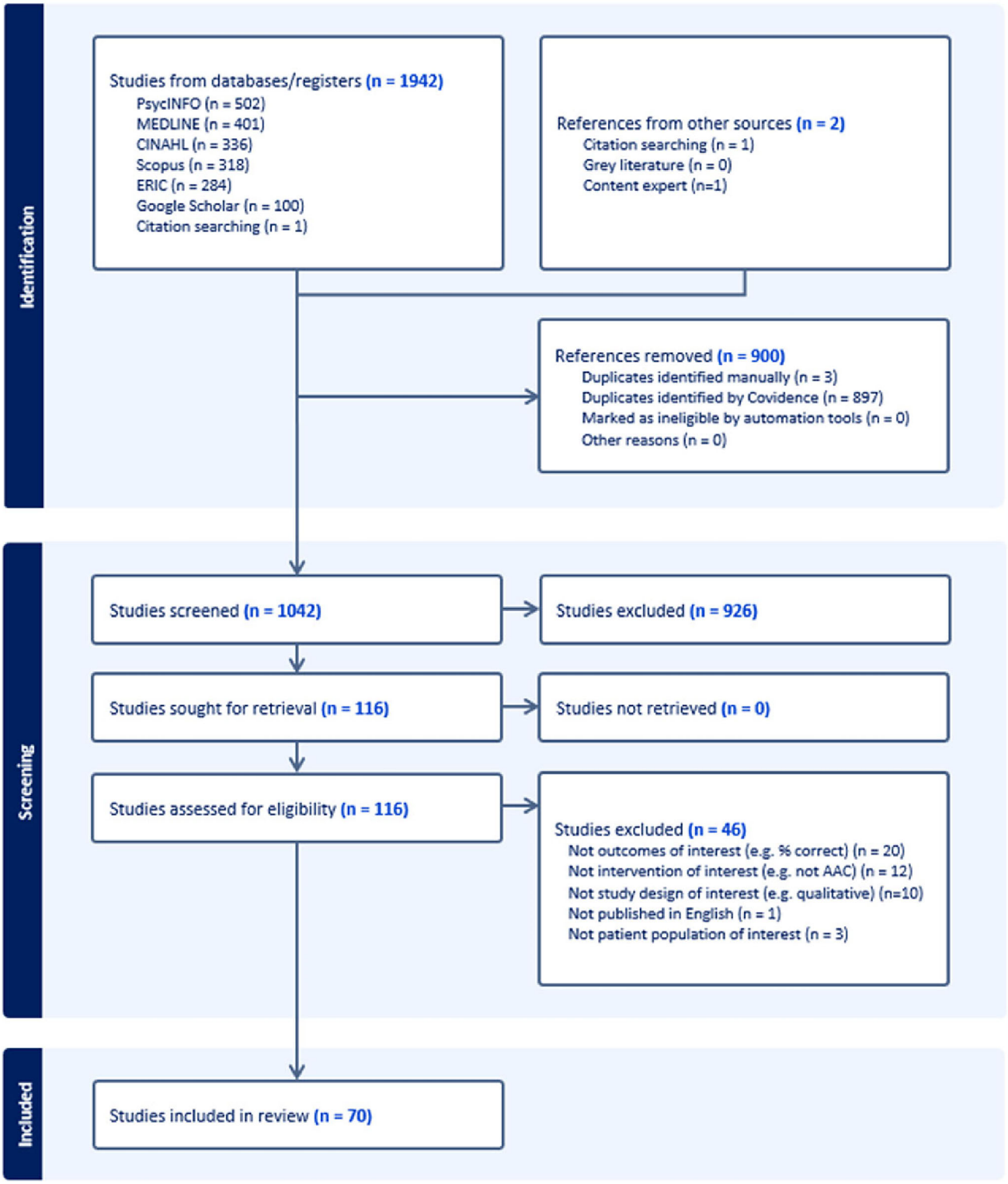

FIGURE 1 | PRISMA flowchart.

children (Blackburn et al. 2023) and the effects of shared reading on the early literacy skills of autistic children (Boyle et al. 2019). The tool produces a composite score out of five for the scientific merit of the paper, where five is indicative of strong scientific rigour and zero indicative of a weak rigour. Composite scores are produced from five individual scores (each with a ranking of 0–5) within the domains of research design, dependent variable, participant ascertainment, procedural fidelity and generalisation of the study, and different weightings are applied to each element. To compute this score, the following formula is used: Composite Score Rating = Research Design (0.30) + Dependent Variable (0.25) + Participant Ascertainment (0.20) + Procedural Integrity (0.15) + Generalisation. Team members completed consensus training using SMRS guidelines with 10% of the studies. Following

this, one author worked independently to assess all included studies for quality, scientific rigour and reliability using the SMRS tool (National Autism Centre 2009). Inter-rater reliability of SRMS ratings was determined by having a second research team member independently score 13 randomly selected papers of the 69 papers (19%). Point by point agreement between the two raters' scores for each SMRS subscale was calculated, with 55 of 65 (85%) having exact agreement.

3 | Results

The initial database search in November 2023 yielded 1817 studies, with 866 duplicates removed. Of the 951 titles and abstracts evaluated, 113 were included for review at the full-text level. Two additional studies were found in the updated search in April 2025, giving a total of 69 studies that met the criteria for inclusion. A complete breakdown of article inclusion and exclusion can be seen in Figure 1. Table 2 summarises relevant information on the included studies.

The 69 included studies consisted of 58 single-case experimental designs, 10 randomised control trials and one longitudinal quasi-experimental design, published between 2013 and 2024. Fifty studies originated from the United States, four studies from Australia, three studies from New Zealand, and two studies each from Ireland, Italy and India and most were published in autism, behaviour or speech language pathology specific journals.

3.1 | Participants

Across the studies, there was a total of 421 participants diagnosed with autism, with non-verbal and minimally-verbal being the most frequently reported communication level. Participant age ranged from 1 year 8 months to 44 years; however, a mean age could not be determined due to lack of specific demographic data reported by some studies. The majority of these participants were children; only five participants (four males and one female) were adults with ages ranging between 23 and 44 years old. No studies included geriatric autistic individuals (i.e., aged 65 or over). The most frequently reported age group was 5–8 years old. Fifty-seven studies recruited a majority male participants, 33 of which were 100% male participants only with females less frequently included across the majority of studies.

3.2 | Setting and Communication Partners

Studies took place across a variety of settings including clinics, school, preschools and participants' homes. The most common intervention setting was school and preschool (45%), although most studies did not occur within the context of the academic school day. Rather, studies frequently used isolated or therapy rooms in school facilities as the intervention setting, with participants engaging in researcher-manufactured situations removed from the participants' school day (e.g., requesting a snack or toy that, while potentially highly relevant to the person, was separate from the regular activities of the setting). Familiar communication partners, such as parents and carers, were included in some studies (8.9%), researchers were the most frequently included communication partner and agent of intervention, appearing in 30 out of 69 studies (45%). Other communication partners studied include clinicians (i.e., speech pathologists) in six studies, educators (i.e., teachers, teaching assistants) in two studies, parents/carers in six studies and peers in nine studies. A further 16 studies used multiple/variable types of communication partners across participants (e.g., clinician and researcher; parent, educator and researcher).

3.3 | Intervention Characteristics

3.3.1 | AAC Types, Strategies, and Tools

Table 3 describes the types of AAC used by the included studies. Forty-six studies explored high-tech AAC only, with 11 studies focused on low-tech AAC only and 12 studies investigating both. Almost all the studies reported on aided AAC whereas one study (Tan et al. 2014) reported on unaided AAC only. Within the reviewed studies, speech generating devices, either dedicated devices (e.g., Dynavox) or tablets with software (e.g., iPad with Proloquo2Go app) were used most frequently (61%) as the AAC modality. The second most common type of AAC was the Picture Exchange Communication System (PECS) which were used in 18% of studies, followed by low-tech communication boards and books (7%) and visual scene displays (6%). The remaining studies explored sign and the use of a BIGmack, a simple, single button device for recording and communicating single messages. Of note, Shillingsburg et al. (2019) did not specify the type of AAC, as they reported that different participants used different AAC devices.

3.3.2 | Intervention and Teaching Methods

As seen below in Table 3, most of the studies included used an intervention or teaching method in combination with the AAC modality. The most frequently reported interventions were behavioural methods (that is those using stimulus-response-reward teaching, often in association with drills or repetition), mentioned in 49 studies (71%). There was a higher number of behavioural interventions in earlier studies, with 30/45 in the first half of the timeframe, and 19/45 in the second half. Naturalistic/developmental instruction, such as modelling and general prompting, or naturalistic developmental behavioural intervention (such as the Joint Attention Symbolic Play Engagement, and Regulation (JASPER) program among others) was used in eight studies (12%), peer-mediated was used in seven studies (10%) and eight studies (11.5%) conducted multiple or comparisons of interventions (i.e., behavioural vs. naturalistic instruction). Two studies (3%) reported on alternative teaching methods including aided language modelling (Douglas et al. 2023) and a technology delivery protocol (Desai et al. 2014).

3.4 | Outcomes

Outcomes were assigned to one of three categories: proximal (e.g., requests, responses that were the immediate outcomes or goals of the intervention), medial (e.g., skills such as initiations,

TABLE 2 | Characteristics of studies on AAC interventions for autistic adults and children.

Study	Study design	No. of autistic participants (age range in years), gender	Country	Quality of evidence (SMRS)
Agius and Vance (2016)	SCED	3 (3;1–4;5), 100% male	Malta	3
Almirall et al. (2016)	Randomised control trial	31 (5–8), 79% male	United States	2
Alzrayer (2020)	SCED	4 (3–5), 75% male	Saudi Arabia	4
Babb et al. (2021)	SCED	4 (16–18), 50% male	United States	4
Barlow et al. (2013)	SCED	3 (2–6), 100% male	United States	2
Bethune and Boyle (2023)	SCED	2 (12–14), 100% male	United States	2
Bishop et al. (2020)	SCED	3 (5–10), 100% male	United States	3
Boesch et al. (2013)	SCED	3 (6–10), 66.7% male	United States	3
Bourque and Goldstein (2020)	SCED	6 (3;7–5;1), 33.3% male	United States	4
Carnett and Ingvarsson (2016)	SCED	1 (11), 100% male	United States	2
Carnett et al. (2019)	SCED	3 (5–13), 66.7% male	New Zealand	3
Caron et al. (2018)	SCED	1 (9), 100% male	United States	3
Chang et al. (2018)	Randomised control trial	29 (5–8), 77% male	United States	3
Chung and Douglas (2015)	SCED	3 (10–12), 100% male	United States	3
Cornelius Habarad (2015)	SCED	1 (12), 100% male	United States	0
Desai et al. (2014)	SCED	1 (13), 100% male	Canada	1
Dimian et al. (2018)	SCED	1 (7), 100% male	United States	2
DiStefano et al. (2016)	Randomised control trial	Not reported (5–8), 79% male	United States	3
Douglas et al. (2023)	SCED	1 (7), 0% male	United States	2
Falcomata et al. (2013)	SCED	2 (3;3–4;4), 100% male	United States	3
Ganz et al. (2013)	SCED	3 (3–4), 100% male	United States	2
Ganz et al. (2015)	SCED	2 (5;4–5;5), 100% male	United States	2
Genc-Tosun et al. (2023)	SCED	2 (2–5), 100% male	Turkey	3

(Continues)

TABLE 2 | (Continued)

Study	Study design	No. of autistic participants (age range in years), gender	Country	Quality of evidence (SMRS)
Gevarter et al. (2016)	SCED	4 (4;0–7;9), 100% male	United States	3
Gevarter and Horan (2019)	SCED	6 (3;6–5;3), 83.3% male	United States	4
Gevarter et al. (2020)	SCED	5 (3;6–5;3), 80% male	United States	4
Gilroy et al. (2018)	Randomised control trial	35 (5–13), Not reported	Ireland	3
Gilroy et al. (2023)	Randomised control trial	29 (7–14), Not reported	Ireland	3
Griffen et al., (2024)	SCED	3 (3;0–4;3) 66.7% male	United States	3
Greenberg et al. (2014)	SCED	4 (4;2–8;4), 100% male	United States	2
Hampton et al. (2020)	Randomised control trial	34 (3;0–4;9), 76% male	United States	3
Hill and Flores (2014)	SCED	3 (3–9), 66.7% male	United States	2
Holyfield et al. (2019)	SCED	1 (9;8), 100% male	United States	3
Holyfield (2021)	SCED	4 (9;2–11;3), 100% male	United States	3
Hong et al. (2014)	SCED	1 (32), 100% male	United States	3
Hu and Lee (2019)	SCED	1 (4), 100% male	China	2
Kasari et al. (2014)	Randomised control trial	31 (5–8), 79% male	United States	3
King et al. (2014)	SCED	3 (3–5), 33.3% male	United States	3
Laubscher et al. (2022)	SCED	6 (6;0–9;2), 50% male	United States	3
Lerna et al. (2014)	Randomised control trial	7 (2–5), Not reported	Italy	2
Lesser and Ebert (2020)	SCED	1 (3;4), 100% male	United States	2
Logan et al. (2023)	SCED	3 (2–7), 100% male	Australia	3
Lorah and Parnell (2017)	SCED	3 (3;6–4;2), 33.3% male	United States	2
Lorah (2018)	SCED	3 (3;2–4;0), 33.3% male	United States	3
Lorah et al. (2019)	SCED	3 (3;6–4;2), 33.3% male	United States	2
Lorah and Griffen (2023)	SCED	3 (2;6–5;1), 33.3% male	United States	3

(Continues)

TABLE 2 | (Continued)

Study	Study design	No. of autistic participants (age range in years), gender	Country	Quality of evidence (SMRS)
Meeks (2017)	SCED	2 (3–5), 100% male	United States	2
Naguib Bedwani et al. (2015)	SCED	8 (4–12), 87.5% male	Australia	1
Neeley et al. (2015)	SCED	1 (4), 100% male	United States	0
Nepo et al. (2017)	SCED	3 (31–44), 66.7% male	United States	4
Orozco et al. (2023)	SCED	4 (2–8), 75% male	United States	3
Roche et al. (2014)	SCED	1 (9), 100% male	Not reported	2
Schreibman and Stahmer (2014)	Randomised control trial	19 (1;8–3;9), 84.2% male	United States	3
Simeoli et al. (2024)	SCED	3 (3 – 10), 67% male	Italy	2
Shillingsburg et al. (2019)	SCED	3 (3–7), 66.7% male	United States	2
Sonawane and Varshneya (2020)	SCED	8 (11–14), 100% male	India	0
Srinivasan et al. (2022)	Quasi-experimental, longitudinal study	17 (3;6–12;0), 82.3% male	India	0
Stephenson (2016)	SCED	1 (7), 100% male	Australia	2
Strasberger and Ferreri (2014)	SCED	4 (5;8–12;11), 100% male	United States	3
Suberman and Cividini-Motta (2020)	SCED	3 (9–12), 66.7% male	United States	3
Tan et al. (2014)	SCED	3 (3–4), 100% male	Australia	2
Tan and Alant (2018)	SCED	1 (7), 100% male	United States	2
Thiemann-Bourque et al. (2016)	SCED	4 (3;0–5;1), 75% male	United States	3
Thiemann-Bourque et al. (2017)	SCED	3 (4;5–4;7), 66.7% male	United States	3
Thiemann-Bourque et al. (2018)	Randomised control trial	23 (3;1–5;0), 80% male	United States	4
van der Meer et al. (2014)	SCED	1 (10), 100% male	New Zealand	2
Waddington et al. (2017)	SCED	1 (8), 100% male	New Zealand	2
Wendt et al. (2019)	SCED	3 (14–23), 100% male	United States	3
Xin and Leonard (2015)	SCED	3 (10), 66.7% male	United States	0

Abbreviations: SCED, single case experimental design; SMRS, Scientific Merit Rating Scale (National Autism Centre 2009).

TABLE 3 | AAC technologies used in intervention research and outcomes for autistic adults and children.

Study	Type of AAC (device/s and system/s)	Technology type	Aided/Unaided	Teaching method/Intervention	Setting	Outcome type	Proximal/Medial/Distal
Agius and Vance (2016)	PECS (iPad + SoundingBoard)	Low-tech and high-tech	Aided	Behavioural, standard PECS protocol	Clinic	Requests, AAC preference	Proximal
Almirall et al. (2016)	SGD (iPad or DynaVox V or Dynavox Maestro)	High-tech	Aided	Naturalistic/Developmental	Clinic and home	Requests, initiations, behaviour changes, joint attention, play	Proximal and medial
Alzrayer (2020)	PECS and SGD (iPad PECS IV)	Low-tech and high-tech	Aided	Behavioural	Clinic	Request, AAC preference	Proximal
Babb et al. (2021)	VSD (tablet + EasyVSD)	High-tech	Aided	Peer-mediated	High school	Turn-taking, social interaction, communication modes	Medial and distal
Barlow et al. (2013)	Picture exchange and manual sign	Low-tech	Aided and unaided	Behavioural	EIBI service, home and school	Responses	Proximal
Bethune and Boyle (2023)	PECS and SGD (iPod Touch + Proloquo2Go)	Low-tech and high-tech	Aided	Behavioural	School	Responses, behaviour changes, AAC preference	Proximal, medial and distal
Bishop et al. (2020)	SGD (iPad + Proloquo2Go)	High-tech	Aided	Behavioural	Clinic	Vocalisations	Proximal
Boesch et al. (2013)	PECS and SGD (Logan ProxTalker communication device)	Low-tech and high-tech	Aided	Behavioural	Clinic and home (one participant)	Social interaction, social communication behaviours	Medial
Bourque and Goldstein (2020)	SGD (iPad + TouchChat HD)	High-tech	Aided	Peer-mediated	School and SLP's office (one participant)	Request, interactions, responses, initiations, communication modality	Proximal, medial and distal
Carnett and Ingvarsson (2016)	SGD (iPad Mini + Proloquo2Go)	High-tech	Aided	Behavioural	School	Responses	Proximal
Carnett et al. (2019)	SGD (iPad mini + Proloquo2Go)	High-tech	Aided	Behavioural	Clinic and school	Requests	Proximal
Caron et al. (2018)	VSD (tablet + EasyVSD)	High-tech	Aided	Behavioural	School	Turn-taking, behaviour-change, engagement	Medial and distal
Chang et al. (2018)	SGD (iPad or DynaVox)	High-tech	Aided	Naturalistic/Developmental	Clinic	Play	Distal

(Continues)

TABLE 3 | (Continued)

Study	Type of AAC (device/s and system/s)	Technology type	Aided/Unaided	Teaching method/Intervention	Setting	Outcome type	Proximal/Medial/Distal
Chung and Douglas (2015)	SGD (Proloquo2Go + SymbolStix)	High-tech	Aided	Peer-mediated	School	Responses, initiations	Medial
Cornelius Habarad (2015)	PECS and manual sign	Low-tech	Aided and unaided	Behavioural	Clinic	Requests, behaviour change	Proximal and distal
Desai et al. (2014)	BIGmack and SGD (iPad + GoTalk Now)	High-tech	Aided	Access technology delivery protocol	School	Requests, initiations, behaviour change, independent actions	Proximal and distal
Dimian et al. (2018)	SGD (Tobii Dynavox T10 device)	High-tech	Aided	Behavioural	Home via telehealth	Requests, behaviour change	Proximal and distal
DiStefano et al. (2016)	SGD	High-tech	Aided	Naturalistic/Developmental	Clinic	Turn-taking, social interactions, initiations	Medial
Douglas et al. (2023)	SGD (iPad + Proloquo2Go)	High-tech	Aided	Caregiver training, caregiver modelling	Home	Initiations, independent actions	Medial
Falcomata et al. (2013)	Manual sign and communication cards	Low-tech	Aided and unaided	Behavioural	Clinic	Requests, behaviour change	Proximal and distal
Ganz et al. (2013)	PECS and iPad + PECS app	Low-tech and high-tech	Aided	Behavioural	Clinic	Requests, AAC preference	Proximal
Ganz et al. (2015)	VSD (iPad mini + GoTalk Now Plus) and EBC book	Low-tech and high-tech	Aided	Behavioural	Clinic	Responses using VSD and speech, comments, AAC preference	Proximal
Genc-Tosun et al. (2023)	SGD (iPad + Dokun Konus)	High-tech	Aided	Behavioural	Home or school	Responses	Proximal
Gevarter et al. (2016)	SGD (iPad + GoTalk Now)	High-tech	Aided	Behavioural	Home	Responses, measured vocalisations	Proximal
Gevarter and Horan (2019)	SGD (GoTalk1)	High-tech	Aided	Behavioural	Preschool (therapy room)	Responses, vocalisations, words, word approximations	Proximal
Gevarter et al. (2020)	SGD (iPad + GoTalk NOW) and VSD (iPad + GoTalk NOW)	High-tech	Aided	Behavioural, naturalistic/developmental	Preschool (therapy room)	Responses, AAC preference	Proximal

(Continues)

TABLE 3 | (Continued)

Study	Type of AAC (device/s and system/s)	Technology type	Aided/Unaided	Teaching method/Intervention	Setting	Outcome type	Proximal/Medial/Distal
Gilroy et al. (2018)	PECS and tablet with app (not reported)	Low-tech and high-tech	Aided	Behavioural	School	Requests and responses	Proximal
Gilroy et al. (2023)	PECS + tablet with app (not reported)	Low-tech and high-tech	Aided	Behavioural	School	Requests, responses, functional communication	Proximal
Greenberg et al. (2014)	PECS	Low-tech	Aided	Behavioural	Clinic and home	Vocalisations	Proximal
Griffen et al. (2024)	SGD (iPad + Proloquo2Go)	High-tech	Aided	Behavioural	Clinic	Responses, vocalisations, smiling	Proximal and distal
Hampton et al. (2020)	SGD (iPad + Proloquo2Go)	High-tech	Aided	Behavioural, naturalistic/developmental, caregiver training (only intervention group)	Clinic and home	Joint attention, social communicative utterances	Proximal
Hill and Flores (2014)	PECS and SGD (iPad + Proloquo2Go)	Low-tech and high-tech	Aided	Behavioural	Classrooms (rooms in school)	Requests	Proximal
Holyfield et al. (2019)	VSD (tablet + EasyVSD)	High-tech	Aided	Naturalistic/Developmental	School	Turn-taking	Medial
Holyfield (2021)	SGD (iPad Pro + Proloquo2Go) and iPad + LAMP	High-tech	Aided	Naturalistic/Developmental	Classroom	Responses	Proximal
Hong et al. (2014)	SGD (iPad + Tap to Talk)	High-tech	Aided	Behavioural + carer training	Clinic	Requests, independent AAC use	Proximal
Hu and Lee (2019)	PECS	Low-tech	Aided	Behavioural	Clinic, home and preschool	Requests, responses, behaviour change	Proximal and distal
Kasari et al. (2014)	SGD (iPad or DynaVox)	High-tech	Aided	Naturalistic/Developmental	University clinic playroom	Requests, comments, novel words	Proximal and medial
King et al. (2014)	SGD (iPad + Proloquo2Go)	High-tech	Aided	Behavioural	School	Requests	Proximal
Laubscher et al. (2022)	VSD (iPad + GoVisual)	High-tech	Aided	Peer-mediated	School	Turn-taking	Medial
Lerna et al. (2014)	PECS	Low-tech	Aided	Behavioural	Preschool	Developmental level and adaptive functioning	Proximal and medial

(Continues)

TABLE 3 | (Continued)

Study	Type of AAC (device/s and system/s)	Technology type	Aided/Unaided	Teaching method/Intervention	Setting	Outcome type	Proximal/Medial/Distal
Lesser and Ebert (2020)	Communication board	Low-tech	Aided	Behavioural and naturalistic/developmental	Preschool	Requests, social interaction behaviour change, joint attention	Proximal and distal
Logan et al. (2024)	Communication board	Low-tech	Aided	Naturalistic/ developmental	Home	Requests, initiations, calling, acknowledgement, comments	Proximal
Lorah and Parnell (2017)	SGD (iPad Mini + Proloquo2Go)	High-tech	Aided	Behavioural	Preschool	Responses	Proximal
Lorah (2018)	SGD (iPad Mini + Proloquo2Go)	High-tech	Aided	Behavioural	Classroom	Requests, responses	Proximal
Lorah et al. (2019)	SGD (iPad Mini + Proloquo2Go)	High-tech	Aided	Peer-mediated	Preschool clinic	Requests	Proximal
Lorah and Griffen (2023)	SGD (iPad Mini + Proloquo2Go)	High-tech	Aided	Behavioural	Preschool classroom	Requests	Proximal
Meeks (2017)	SGD (iPad + Go Talk Now)	High-tech	Aided	Behavioural	Preschool	Requests	Proximal
Naguib Bedwani et al. (2015)	SGD (LAMP + Vantage Lite device)	High-tech	Aided	Behavioural, naturalistic/developmental	Home and school	Requests, responses, initiations	Proximal and medial
Neeley et al. (2015)	SGD (Prentke Romich Vantage Lite)	High-tech	Aided	Not reported	Home-based speech pathology sessions	Requests, responses, communication acts	Proximal
Nepo et al. (2017)	SGD (iPod Touch + MyTalk)	High-tech	Aided	Behavioural	Centre-based vocational training program	Requests, responses, AAC preference	Proximal
Orozco et al. (2023)	PECS, American Sign Language and SGD (iPad + Visuals2Go or Proloquo)	Low-tech and high-tech	Aided and unaided	Behavioural	Home, preschool and therapy room	Requests, AAC preference	Proximal
Roche et al. (2014)	SGD (iPad + Proloquo2Go)	High-tech	Aided	Behavioural	Clinic	Requests	Proximal
Schreibman and Stahmer (2014)	PECS	Low-tech	Unaided	Behavioural	Clinic and home	Requests, comments, spoken vocabulary	Proximal

(Continues)

TABLE 3 | (Continued)

Study	Type of AAC (device/s and system/s)	Technology type	Aided/Unaided	Teaching method/Intervention	Setting	Outcome type	Proximal/Medial/Distal
Shillingsburg et al. (2019)	Not reported- varied between participants	High-tech	Aided	Behavioural	School	Requests	Proximal
Simeoli et al. (2024)	SGD and PECS	High-tech and low-tech	Aided	Behavioural	Clinic	Communicative behaviour, behaviour change, vocalisations, preference	Proximal and distal
Sonawane and Varshneya (2020)	Electronic picture exchange (android mobile phone + Avaz)	High-tech	Aided	Not reported	School	Not reported	Proximal
Srinivasan et al. (2022)	Picture exchange (Jello flashcards and iPad + Jellow)	Low-tech and high-tech	Aided	Behavioural	School	Requests, responses, wellbeing, quality of life, self-esteem, general communication	Proximal, medial and distal
Stephenson (2016)	SGD (iPad + Choiceboard Creater Version 1.10)	High-tech	Aided	Behavioural	School	Requests, comprehension	Proximal
Strasberger and Ferreri (2014)	SGD (iPod touch and iMainGo 2 speaker + Proloquo2Go)	High-tech	Aided	Behavioural, peer-mediated	School	Requests, responses	Proximal
Suberman and Cividini-Motta (2020)	SGD (iPad + Proloquo2Go)	High-tech	Aided	Behavioural	Home	Requests	Proximal

(Continues)

TABLE 3 | (Continued)

Study	Type of AAC (device/s and system/s)	Technology type	Aided/Unaided	Teaching method/Intervention	Setting	Outcome type	Proximal/Medial/Distal
Tan et al. (2014)	Key Word Sign	Low-tech	Unaided	Naturalistic/developmental	Clinic	Signs, spoken words, gestures	Medial
Tan and Alant (2018)	SGD (iPad + TouchChat)	High-tech	Aided	Peer-mediated	School	Interactions, responses, initiations	Proximal
Thiemann-Bourque et al. (2016)	PECS	Low-tech	Aided	Behavioural, peer-mediated	Intervention Centre	Requests, social interaction, initiations, comments	Proximal, medial and distal
Thiemann-Bourque et al. (2017)	SGD (GoTalk4+)	High-tech	Aided	Peer-mediated	Preschool	Requests, social interaction, responses, initiations, comments, gaining attention	Proximal, medial and distal
Thiemann-Bourque et al. (2018)	SGD (iPad 2 + SoMuch2Say/Touch Chat HD/Proloquo2Go)	High-tech	Aided	Peer-mediated, school-staff implemented, peer interaction	Preschool	Requests, turn-taking, social interactions, initiations, behaviour change	Proximal, medial and distal
van der Meer et al. (2014)	SGD (iPad + Proloquo2Go)	High-tech	Aided	Behavioural	Home	Requests, social interactions, responses, initiations	Proximal and medial
Waddington et al. (2017)	SGD (iPad + Proloquo2Go)	High-tech	Aided	Behavioural	Clinic, home and school	Requests	Proximal
Wendt et al. (2019)	SGD (iPad + SPEAKall!)	High-tech	Aided	Behavioural	Clinic	Requests and speech outcomes	Proximal
Xin and Leonard (2015)	SGD (iPad + Sonoflex)	High-tech	Aided	Behavioural	School	Requests, responses, comments	Proximal

Abbreviations: AAC, augmentative and alternative communication; EIBI, early intensive behavioural intervention; LAMP, language acquisition through motor planning; PECS, picture exchange communication system; SGD, speech generating device; VSD, visual scene display.

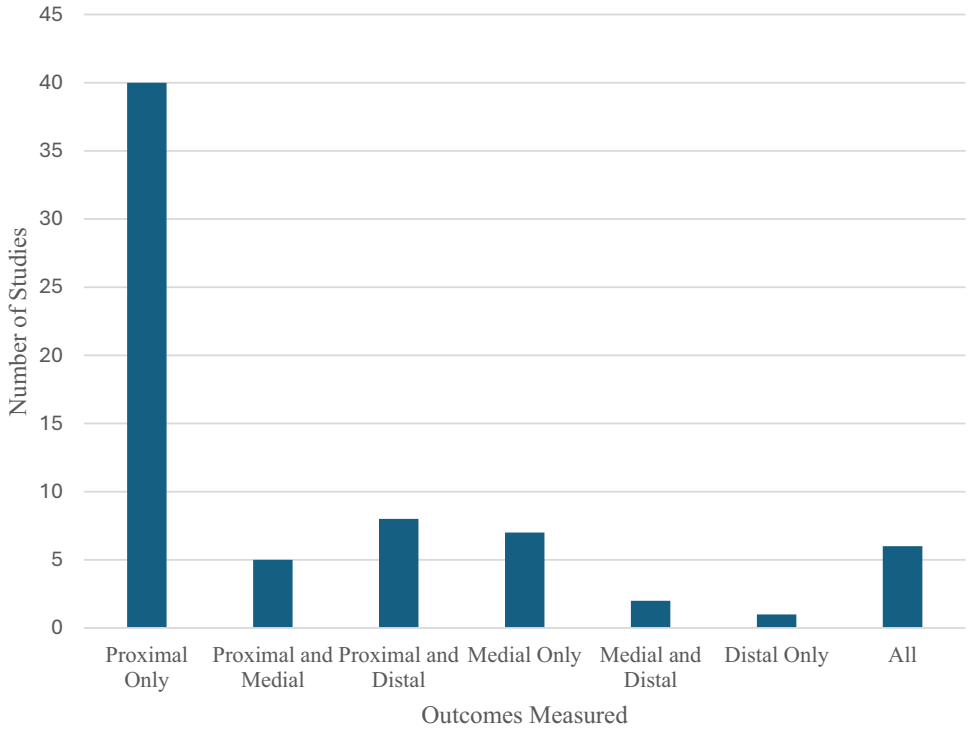

FIGURE 2 | Distribution of Reported Outcomes

interactions that resulted from the intervention but were not specifically taught) or distal (e.g., wellbeing, behaviour changes that were a result of the AAC use but were not part of the intervention). Some studies measured and reported on more than one outcome. As seen in Figure 2, proximal outcomes were the most commonly reported ($n = 40$). Fifteen studies combined two outcome types (e.g., proximal and medial, proximal and distal, medial and distal), and six measured all outcome categories. Another outcome type that was assessed in nine studies (13%) was AAC preference.

3.5 | Study Quality

Using the SMRS (National Autism Centre 2009), scientific merit of the included studies was evaluated on a scale of 0–5; five is indicative of strong scientific rigour and zero indicative of a weak rigour. A mean weighted SMRS score of 2 was achieved across all included studies (see Table 2). Across the 69 studies, just over half ($n = 37$) were rated as having sufficient scientific rigour; 32 studies received a weighted score of 3, four studies received a weighted score of 4 and no studies received a weighted score of 5 (see Figure 3). Participant ascertainment was very limited across the papers, with a mean score of 1.5 (out of 5, range 0–5), indicating poor rigour in the majority of studies. Some papers had a large discrepancy between the measurement of independent and dependent variables in comparison to other SMRS domains such as generalisation, resulting in elevated weighted SMRS scores. Of the remaining studies ($n = 32$), 25 received a weighted score of 2, three received a weighted score of 1 and four received a weighted score of 0, indicating a lack of scientific rigour.

4 | Discussion

The current systematic search and review aimed to synthesise and report on the AAC interventions used with autistic adults and children, the communication and other outcomes of the AAC interventions, and to evaluate the quality of the existing literature. Within the 69 included studies, the majority focused on the use of AAC systems to support proximal communicative functions such as requests and responses. These findings are consistent with previously published systematic reviews (Carnett et al. 2023; Logan et al. 2017, 2022; White et al. 2021) exploring the use of AAC primarily for requests of objects or actions and vocalisations. Other outcomes identified in this review included initiations, turn-taking, play, social interaction and behaviour changes. Studies were largely set in clinics or isolated rooms within school settings rather than naturalistic settings of homes, classrooms and workplaces, limiting the generalisability of learnt functions into participant's real lives. Only one study by Dimian et al. (2018) explored the use of an SGD at home with parent training provided via telehealth. The quality of included studies was relatively low, with 32 of the 67 papers indicating insufficient scientific rigour and no studies receiving an SMRS rating of 5. The variability of these scores and overall quality of studies across these domains indicate the need for better quality research designs, improved diagnostic ascertainment of participants and consideration for generalisation data to improve the quality of literature.

Results of this review provide a new insight into the outcomes of AAC use with autistic individuals. Previous research has focused on the attainment of discrete communication skills, and while the current findings suggest that AAC systems have the potential

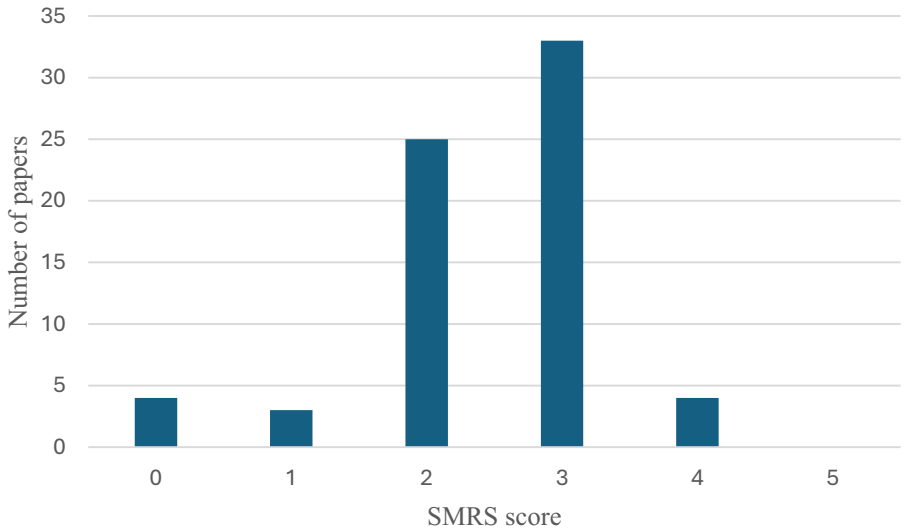

FIGURE 3 | Scientific merit rating scales (SMRS)

to facilitate the achievement of medial and distal outcomes to support social communication and functioning, these outcomes were rarely the focus of the included intervention studies. The literature reviewed largely focused on participants performing simple requests for preferred objects or actions, likely due to their alignment with autistic children's early communicative development for behaviour regulation (Logan et al. 2017). Whilst this goal may be developmentally appropriate to a degree, focus on requests alone means that the communication skills taught are unsuitable for most social purposes such as the initiation of spontaneous social interactions, expressing emotions, resolving conflicts, and reciprocal conversation. In addition, the studies that taught requesting often failed to include generalisation as a goal or outcome measure. For example, a randomised control trial by Gilroy et al. (2018) resulted in improvements in the participants' ability to request (i.e., 'Train' or 'I want train') and respond (i.e., 'I hear dog'), but generalisation was not measured. Without the measurement of generalisation data, it is unknown whether participants were able to make requests for everyday items with caregivers or teachers. Further, the lack of measurement of distal outcomes among children means that little is known about the long term, or bigger picture impact of AAC on communication and quality of life in autistic youth.

Even less is known about distal outcomes such as adaptive functioning and quality of life with autistic adults. Of the 421 included participants in the studies in this review, only five were adults and these studies focused solely on requests. Generalisation of SGD use for other requests and responses or other functions were not explored. Supporting autistic individuals in using AAC systems beyond discrete requests and responses may allow for the development of greater competency in engaging in social interactions with communication partners and peers, supporting their social participation and well-being (McConnell 2002). These findings suggest that there is a strong need for comprehensive studies focusing on the impact of AAC on distal outcomes with consideration for the maintenance of these skills and their generalisation across contexts. Additionally, further research with autistic adults using AAC is needed to better understand its effectiveness in addressing autistic adults' unique communication goals (i.e., independence, employment) compared to autistic children (Roth et al. 2014).

The main teaching methods explored in the included studies were behavioural, along with smaller numbers of studies involving peer-mediated interventions, naturalistic developmental models and others. The behavioural studies showed a strong focus on proximal outcomes; in fact 95% of studies using or comparing behavioural interventions considered proximal outcomes as a primary or secondary measure. It is interesting to note that a higher number of behavioural studies were published in the earlier years of our date range, suggesting there has been some movement in the research field away from behavioural interventions. Whilst there is extensive literature reporting on the use of behavioural intervention supporting AAC use with autistic adults and children, there is a need for better quality research design, participant diagnostic ascertainment and generalisation data. These results are consistent with findings from Roth et al. (2014), where the rate of high-quality behaviour intervention studies being published on autistic adults and adolescents was low. Furthermore, as clinical practice progresses to more neurodiversity-affirming practices, the use of behavioural interventions that focus on 'normalisation', rely on withholding desired objects, or focus on teaching single skills through rewards or punishment are viewed as problematic, with neurodiversity activists and researchers calling for an increased focus in empowering intervention procedures rather than conformity to typical social functions (Leaf et al. 2022). Future research and clinical practice should consider focusing on naturalistic and peer-mediated intervention methods more, allowing for learning to occur in contextually relevant settings and replicating social interactions that autistic individuals will have with a range of communication partners, promoting generalisation and individualised learning.

The majority of AAC systems investigated were high-tech and aided interventions only. Most high-tech systems used iPads and tablets with systems including Proloquo2Go and GoTalk NOW; it is highly likely that the relatively easy access, low cost and social acceptability of iPads and tablets is at least somewhat related to the high number of studies of this type of device. As early

as 2013, McNaughton and Light noted the potential benefits of these devices, but did caution that a focus on communication, not just technology was crucial. More recently, Lorah et al. (2022), reported that handheld devices (such as iPads) used as SGDs were not only more highly preferred by participants, but participants also showed better performance when using these when compared with low tech options. From the studies included, there is a clear demonstration that high-tech and aided AAC have the potential to be effective supports with the acquisition of communication skills such as requests, responses and initiations. However, it remains important to consider the impact of other types of AAC, including low-tech and unaided AAC (e.g., key word sign, manual sign, gestures) with greater research needed on their use to support function and participation given the even greater accessibility of these and the importance multimodal communication options.

4.1 | Limitations and Future Directions

Limitations of the current study include omission of non-English publications and the exploration of six databases, where some literature may have been missed. Additionally, the review's 2013 eligibility deadline was used to capture studies using the most recent autism diagnosis criteria in line with the DSM-5, where diagnostic revisions included the removal of diagnostic subcategories (i.e., Autistic Disorder, Asperger's Disorder, Pervasive Developmental Disorder, Rett's Syndrome and Childhood Disintegrative Disorder) and removal of strict age of onset restrictions. However, some included papers used the DSM-IV-TR criteria to determine participant diagnosis, therefore characteristics of participants included in the current study may be varied. Additionally, whilst the research team has strong clinical experiences in the autism field and autistic family members, there were no autistic authors on the research team, presenting as a limitation. Inclusion of an autistic co-author, or expert reference group of autistic people may have helped to guide the formulation of the research questions, interpret and prioritise the findings and to help set goals for future research that are grounded in lived experience. Future investigations of AAC use with autistic people should examine a broader range of outcome measures, including distal outcomes such as adaptive functioning and quality of life (Simpson et al. 2024). Additionally, future studies should consider using outcome measures that are inclusive to the autistic community and are considerable of the varying profiles on the spectrum such as the Autism Spectrum Quality of Life (ASQoL) and Quality of Life for Children with Autism Spectrum Disorder Scale (QOLASD-C; Simpson et al. 2024). The strengths of this paper include the rigorous search methodology that ensured a comprehensive investigation of the literature, as well as the identification of research gaps, where despite the high volume of papers published the review identified a clear concentration of research of children and proximal outcomes.

5 | Conclusion

This search and review aimed to synthesise considerable research on the use of AAC interventions for autistic children and adults, and found a predominant focus on discrete communicative skills and the use of behavioural techniques. It is clear that very little is known about the long-term or broader impacts of these interventions beyond childhood and beyond the immediate acquisition of discrete skills, with better quality research needed. There were few studies reporting on any outcomes of AAC use with autistic adults.

The findings of this review may help to advocate for a more inclusive and neurodiversity affirming approach to communication, where AAC should be used in a range of settings to support everyday life. It challenges the idea that spoken language should always be the goal, and that simply teaching a person to request is enough. Researchers are encouraged to consider the broader outcomes of AAC supports and provide guidance to clinicians in viewing AAC interventions as tools to empower autistic individuals.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data is available from the authors on request

Endnote

[1]This review will use identity-first language (e.g., 'autistic people', rather than 'people with autism'), in line with community preferences and the broader neurodiversity-affirming movement, where strengths, weaknesses and differences associated with autism are viewed as central to a person's identity (Kapp et al. 2013; Taboas et al. 2023).

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Appendix 1

Full Search Strategy and Syntax

PICO element	Search strategy
Autism (P)	('autism' OR 'asd' OR 'spectrum disorder' OR 'asperger's disorder' OR 'autis*')
AAC (I)	('augmentative communication' OR 'AAC' OR 'speech generating devices' OR 'voice output devices' OR 'picture boards' OR 'sign' OR 'manual sign')
Comparison (C)	*Not applicable*
Outcome (O)	*Not applicable*

Limitations: peer-reviewed journal, human, English language, journal article and year 2000-current

('autism' OR 'asd' OR 'spectrum disorder' OR 'asperger's disorder' OR 'autis*') AND ('augmentative communication' OR 'AAC' OR 'speech generating devices' OR 'voice output devices' OR 'picture boards' OR 'sign' OR 'manual sign')

Exclusion Reasons for Excluded Papers

Exclusion reason	Paper/s excluded	Number
Outcomes other than inclusion criteria	Alzrayer et al. (2017); Alzrayer et al. (2019); Babb et al. (2019); Cagliani et al. (2017); Cariveau et al. (2022); Chavers et al. (2021); Couper et al. (2014); Domanska et al. (2022); Genc-Tosun and Kurt (2017); Gevarter et al. (2014); Gevarter et al. (2017); Gevarter et al. (2018); Hong et al. (2019); Lorah et al. (2014); Muharib et al. (2021); Roche et al. (2014); Sawchak et al. (2023); Sigafoos et al. (2013); van der Meer et al. (2013); Waddington et al. (2014)	20
Interventions other than AAC for communication	Biggs et al. (2018); Frampton et al. (2020); Gevarter et al. (2014); Gevarter et al. (2020); Gevarter et al. (2021); Hyppa-Martin et al. (2020); Lorah and Griffen (2023); McLay et al. (2015); Miller and Thiemann-Bourque (2016); Shih et al. (2014); Sterrett et al. (2023); Still et al. (2015)	12
Not experimental study design	Chua and Poon (2018); Dorney and Erickson (2019); Koudys et al. (2022); McLay et al. (2017); Mohan et al. (2019); Richardson et al. (2019); Sutherland (2013); Trembath et al. (2014); Walker et al. (2022); Webster et al. (2016)	10
Not published in English	Pereira et al. (2020)	1
Individual/s not autistic	Lorah (2016); Talkington et al. (2013); Therrien and Light (2018)	3
Total		46