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Augmentative and Alternative Communication Interventions for People with Autism Spectrum Disorders: Evidence, Communication Functions, and Directions for Promoting Inclusive Practice

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Abstract: Autism spectrum disorder (ASD) is a highly heterogeneous neurodevelopmental disorder that has become a major focus of clinical transformation as global healthcare models shift towards affirmative care for neurodiversity. Focusing on this evolving field, we narratively synthesize evidence from 2021 to 2025 and engage in in-depth discussions on a range of issues, from expanding communicative functions to promoting inclusive social practices. Research has shown significant breakthroughs in shifting intervention goals from basic requesting skills to advanced commentary and narrative abilities, as well as in the comparative application of various augmentative and alternative communication (AAC) models. Given the complexity of individual differences and the limitations of traditional isolation training, achieving communicative autonomy requires a comprehensive, eco-effective approach that integrates it into natural contexts such as co-reading and play. This article focuses on how emerging evidence can enhance clinical decision-making and explores the development of individualized, context-adaptive system designs. Recent research advances not only enrich the theoretical foundation of speech-language pathology but also provide new insights for addressing equity gaps and promoting genuine social inclusion in future research.

1. Introduction

Autism spectrum disorder (ASD) is a highly heterogeneous neurodevelopmental condition characterized by individual differences in social Communication and restrictive and repetitive behavioral patterns.[1] According to the most recent 2025 data from the Centers for Disease Control and Prevention (CDC), the prevalence of ASD among 8- year-olds born in 2022 is 1 in 31 (about 3.2%), and the prevalence in boys (1 in 20) is about 3.4 times higher than that in girls.[2] In recent years, the clinical and research paradigm has shifted from symptom correction to neurodiversity-

affirming care, which emphasizes supporting functional communication, respecting individual differences, and promoting participation and autonomy in real social situations.[3]

Although traditional spoken-based interventions are effective for some children with autism, about 25%-30% of individuals with autism remain minimally verbal or non-verbal by school age. This group after conventional treatment is often difficult to obtain reliable power of expression.[4] Long-term limited communication can lead to frustration, problem behaviors, and social isolation, which seriously affect the quality of life. Augmentative and alternative communication (AAC) is therefore recognized as an ASHA Communication Bill of Rights, which provides multimodal support for the least spoken individual. The goal is to promote the expression of intent, relationships, and social connections, rather than hinder the development of spoken language.[5]

Despite rapid advances in AAC tools and interventions, the evidence base remains fragmented. Although early studies demonstrated the efficacy of AAC for requesting skills, recent evidence has shifted toward advanced functions such as commentary and narrative, with mixed high-tech and low-tech modalities, and most interventions focus on device mastery rather than authentic social interaction and generalization in natural Settings.[6,7]

In addition, there is insufficient systematic discussion on inclusive practice in the current literature. Simply providing AAC devices cannot ensure effective use; Family, school and community environment of readiness, caregivers' participation, and system support directly affect the intervention effect and social inclusion.[8]

Therefore, this narrative review aimed to synthesize the evidence from 2021 to 2025 to examine the use of AAC interventions in children with autism, with a special focus on: (1) the effectiveness of different communication functions (e.g., request, comment, and narrative); (2) comparative analysis of intervention modalities; And (3) a framework for promoting inclusive practice in education and social contexts. This review adopts a neurodiversity perspective and emphasizes functional outcomes, including social participation and quality of life improvement, to provide integrative clinical implications for speech and language pathologists.

2. Description of Methodology

This review used a narrative synthesis approach rather than a systematic review. This approach is suitable for integrating evidence from intervention studies with high heterogeneity, and provides an integrated perspective on Augmentative and Alternative Communication (AAC) interventions for children with autism through thematic analysis and critical interpretation, without the need for rigorous quantitative synthesis.

Through narrative synthesis, this review focuses on topic induction and critical discussion, emphasizing the strengths of evidence (such as natural context embedding) and limitations (such as insufficient generalization data), and providing integrative implications for clinical practice.

3. Evidence Base and Study Characteristics

Research on Augmentative and Alternative Communication (AAC) interventions in the last five years (2021-2025) has been dominated by single-case experimental designs, such as multi-baseline, multi-probe, or alternating treatment designs, which are good at handling individual heterogeneity in children with ASD and rigorous examination of intervention causal effects.[9,10] Cohort design and randomized controlled trials, although few, have gradually increased and provided preliminary population-level evidence.[11] In addition, there has been an increase in qualitative and mixed methods research, focusing on parental perspectives, barriers to implementation, and social validity, complementing the ecological depth of quantitative research.[12]

Empirical studies with preschool and school-aged children with ASD with minimal speech or

complex communication needs were prioritized. The size of participants was usually 3-15, and the proportion of boys was significantly higher than that of girls. The exclusion criteria were: studies on adults only or other neurodevelopmental disorders, purely descriptive or opinion articles, and non-intervention-oriented observational studies. Finally, about 40-50 most representative studies were synthesized, which covered communication function, AAC modality, teaching strategy and clinical translation, representing the current evidence mainstream.

The literature search was mainly conducted through PubMed, Google Scholar and Web of Science databases, and the time range was limited to 2021-2025 to capture recent evidence progress. The search keywords included "augmentative and alternative communication", "autism spectrum disorder", "children", "intervention" and their Boolean combinations. The reference lists of relevant reviews were manually searched. Only peer-reviewed studies published in English were included.

The distribution of studies showed that requesting skills remained the dominant outcome measure, but evidence for advanced functions such as commentary, narrative, and social interaction grew significantly, reflecting a shift from basic function compensation to a sense of social agency and inclusion of participation.[6,7,13]

The strength of the evidence is that most interventions are embedded in natural contexts (e.g., shared reading, play, or the classroom) and delivered by parents or teachers, improving ecological validity and clinical feasibility while focusing on functional outcomes from a neurodiversity perspective.

However, there are significant limitations: the small sample size and the high heterogeneity of participants limit the external validity of the results. There is insufficient data on long-term maintenance and cross-context generalization. Furthermore, there is a significant underrepresentation of girls, children with comorbid severe intellectual disabilities, and those from ethnic minority or non-English speaking backgrounds, leading to an evidence bias toward specific subgroups.[14,15] These characteristics indicate that the current evidence is solid at the individual level of intervention, but larger samples, longitudinal and diverse studies are needed to improve generalization and equity.

4. AAC Modality and System Design

Augmentative and Alternative Communication (AAC) modalities are commonly described as unaided and aided.[16] Unaided AAC relies on an individual's body resources (e.g., gestures, manual signs, facial expressions), and may serve as part of early multimodal communication; however, its effectiveness can be constrained by communication partners' ability to interpret signals and by the consistency of the child's production, so unaided strategies are often combined with aided supports to improve clarity and reliability (e.g., pairing gestures with graphic symbols).[16]

Aided AAC introduces external tools, including low-tech systems (e.g., PECS, communication boards/books) and high-tech systems (e.g., SGDs, tablet-based AAC apps).[16] Low-tech AAC can be accessible and low-cost, and randomized evidence indicates that low-tech AAC interventions can improve communication outcomes even when delivered via different service models (e.g., face-to-face vs. remote), suggesting that delivery and implementation quality matter.[7] High-tech AAC offers features such as speech output, dynamic displays, and multimedia that may be leveraged for richer interaction; for example, in requesting instruction using a tablet AAC app, both VSD and grid-based organization formats supported gains, with efficiency potentially influenced by individual learner characteristics.[10]

For advanced social-communication outcomes (e.g., commenting and peer interaction), current literature supports that aided AAC interventions can promote these functions, but the evidence base does not yet justify claiming that high-tech AAC is inherently superior to low-tech AAC; rather,

high-tech features may provide additional affordances that can be useful in some contexts and for some learners.[6,9,17] Relatedly, clinicians should avoid “technology worship”: emerging work demonstrates that outcomes can depend heavily on instructional design and how AAC tools are embedded within evidence-based procedures (e.g., incorporating discriminative stimuli within AAC apps during FCT), underscoring the importance of partner responsiveness and individualized matching rather than device sophistication alone.[9]

AAC system design should therefore emphasize fit to context and individual characteristics. Vocabulary organization affects efficiency: visual scene displays (VSDs) embed photos/videos that provide contextual support and may be particularly helpful for beginning communicators by reducing decontextualized symbol demands; dynamic elements such as video VSD can further enhance engagement for some users, while sensory demands should be considered.[10,18] Grid displays arrange symbols in arrays and are commonly used to support access to larger vocabularies and more generative message construction; comparative instruction suggests that both VSD and grid formats can yield progress, and individual differences (e.g., visual preferences/attention) may guide selection.[10]

Lexical strategies often emphasize core vocabulary (high-frequency, multifunctional words such as “more,” “help,” “play”) to support flexible use across contexts, while acknowledging that current intervention studies still vary in quality and scope.[19]

Overall, AAC planning should be based on comprehensive assessment (cognitive, motor, sensory, language, and contextual needs), prioritize functional goals and partner training, and focus on sustained communication autonomy and social participation rather than hardware alone.

5. The Communication Function Targeted by the AAC

Augmentative and Alternative Communication (AAC) interventions aim for a progressive expansion of communication functions, a process that can be framed within Janice Light’s four domains of communicative competence: expressing needs and wants, developing social closeness, sharing information, and maintaining social etiquette.[20] Historically, the requesting function (falling under the 'needs and wants' domain) has dominated the evidence base, representing the highest proportion of intervention goals.[21,22] Numerous single-case studies demonstrate that AAC-mediated interventions effectively facilitate minimally verbal children's requests for objects or actions, fostering independence and significantly reducing challenging behaviors through rapid symbol acquisition.[22-24] This functional category is favored in research as it is easily measurable and integrates seamlessly with Functional Communication Training (FCT) or prompt-fading strategies.[22,24] However, over-focusing on requesting presents a critical limitation: it primarily serves behavioral regulation and material satisfaction, offering scant support for social closeness or reciprocity, thereby potentially restricting a child’s sense of communicative autonomy and social agency.[6,25,26]

In recent years, the research focus has shifted toward advanced social functions—such as commenting, narrative, and social micro-conversations—which are essential for building mutually beneficial relationships and sharing personal experiences.[6,26,27] A 2025 systematic review critically evaluated evidence on AAC commenting interventions, revealing that children can learn to initiate non-obligatory commenting (e.g., describing observations) through Visual Scene Displays (VSD) or modeling strategies, which enhance both interaction frequency and intrinsic motivation. [6] Despite this progress, evidence for these functions remains largely restricted to structured settings, with generalization to naturalistic environments remaining a prominent challenge. [6,26,27]

Narrative interventions represent the next frontier, focusing on story-building and personal

experience sharing to promote both macro-structural (e.g., plot) and micro-structural (e.g., lexical diversity) development.[25,28] Recent studies involving parent-mediated narrative interventions have shown significant increases in children's retelling skills, with gains maintained well above baseline levels.[25] Similarly, shared reading integrated with AAC supports children's ability to express autonomous perspectives and improves social connections.[29,30] These advances signal a transition from mere deficit compensation to empowering children to engage in meaningful narrative social interactions. [25,28]

Nonetheless, the overall evidence for advanced functions remains strikingly sparse compared to requesting.[6,21,22,25] While requesting studies are methodologically rigorous, studies on advanced functions rely heavily on small-sample single-case designs and lack large-scale randomized controlled trials (RCTs).[6,25,27] There is a significant dearth of longitudinal data to confirm the mechanisms behind the natural transition from requesting to commenting, or the long-term impact on quality of life indicators. Furthermore, the subjective experiences of children and the nuances of partner responsiveness are rarely captured. [25,28] Consequently, current findings should be interpreted with caution. Future research must prioritize longitudinal, multimodal studies with larger samples to systematically examine how functional expansion drives authentic social participation and inclusion. [25,28]

6. Teaching Strategies and Intervention Contexts

Augmentative and Alternative Communication (AAC) interventions draw on behavioral and naturalistic teaching approaches and aim to increase functional AAC use (including symbol-based communication) and support use across activities and partners. Across recent AAC-focused syntheses, intervention packages commonly include components such as prompting, modeling/aided input, and procedures aligned with functional communication training (FCT), and the selection and adaptation of components are typically individualized.[6]

Prompting is frequently used within AAC instruction and can be implemented with different levels of assistance; however, the present evidence base represented in this reference set does not provide direct comparative data to specify when one prompting hierarchy should be preferred over another. Accordingly, it is more appropriate to interpret prompting as one adjustable component whose effectiveness depends on how it is integrated into the overall teaching package and matched to learner needs.[6,27]

FCT-based approaches are often used to teach functionally equivalent communicative responses in place of challenging behavior. For example, one demonstration study embedded discriminative stimuli within an AAC device during FCT to support appropriate responding under relevant conditions, highlighting that outcomes may depend on instructional design features rather than device sophistication alone.[9]

These components are frequently embedded within broader naturalistic intervention frameworks. A systematic review and meta-analysis examining naturalistic developmental behavioral interventions (NDBIs) with aided AAC for minimally speaking autistic children supports the relevance of implementing AAC within interactive routines and responsive contexts, with available evidence indicating benefits for language outcomes.[27]

The intervention context and implementer support remain important considerations for translation. A randomized controlled trial comparing face-to-face versus remote delivery of a low-tech AAC intervention found improvements in communication outcomes under both service models, suggesting that effective implementation is possible across delivery formats.[7] In addition, telepractice-focused work highlights practical benefits (e.g., improved access) alongside challenges such as technology barriers and maintaining interaction quality, indicating the need for careful

attention to feasibility and user experience.[31]

Beyond clinician-delivered services, caregiver and educator involvement is commonly emphasized. An asynchronous online training program for caregivers has been evaluated and has shown improvements in caregiver use of AAC-related strategies in shared reading, supporting the feasibility of structured coaching and feedback-oriented training models.[32]

Finally, the evidence base for AAC is expanding beyond requesting outcomes to include more advanced social-communication targets. A systematic review of AAC interventions promoting commenting indicates that these functions can be taught, although the literature remains methodologically variable and often context-bound.[6] Complementing this, single-case studies have reported improvements in peer-play communication using video AAC technology and gains in AAC-supported narrative outcomes, illustrating emerging lines of work addressing interaction and narrative skills.[25] Evidence comparing organizational formats for requesting instruction suggests that both VSD and grid-based formats can support gains, with efficiency potentially influenced by individual learner characteristics, underscoring the need for individualized decision making rather than assuming one format is universally superior.[10]

7. Generalization, Maintenance, and Social Validity

Augmentative and Alternative Communication (AAC) intervention study generally report real-time acquisition effect is remarkable, such as requests, comments, or narrative skills in the context of training the rapid ascension, often reaches the preset standard.[9,10] However, evidence for generalization to new contexts, new partners, or untrained functions, and long-term maintenance is relatively limited. Most single-case designs show significant variation in generalization across contexts (e.g., from office to home or school) and often require specific programming strategies to support generalization, such as multiple exemplar training, loose training, or naturally reinforcing integration. To facilitate skill transfer, the focus must extend beyond basic skills.[7] However, the generalization of advanced features, such as narrative or spontaneous comments, presents greater challenges. In response, preliminary evidence suggests strengthening booster training sessions or enhancing partner-mediated support.[6]

Maintenance data are mostly limited to short-term follow-up (weeks to months), and the risk of decline is high, especially when support is reduced. Parents or teachers implementing interventions significantly improve maintenance time, providing opportunities for continued practice through embedding in daily activities, and a parent-mediated longitudinal study showed high retention of skills after 6-12 months, with behavioral improvements.[33]

The perspective of social validity is increasingly included, and the feedback from users and families is positive. Parents often report AAC enhancing family interaction, reduces frustration and to improve the overall quality of life. AAC is a highly accepted intervention program, especially in natural setting embedded and remote modes.[34] At the child level, indirect indicators show higher participation motivation and initiative, but direct assessments (e.g., preference selection, visual simulation interview, or self-report) are seriously insufficient, and subjective experiences (e.g., sense of autonomy, satisfaction) of individuals with ASD are rare.[14] Recent scope-based reviews have highlighted the inconsistent application of social validity tools such as questionnaires or qualitative interviews, ignoring individual prioritization from a neurodiversity perspective.[35]

The lack of generalization or maintenance evidence should not be interpreted as an ineffective intervention but rather a reflection of study limitations (e.g., short follow-up period, small sample size) and clinical realities (e.g., environmental variation, inconsistent partner response). The current findings recognize the potential of natural context embedding, multi-level support, and user engagement. However, more longitudinal, large-sample studies are needed to systematically

examine these outcomes and prioritize integrating direct feedback from individuals with autism to improve the external validity and equity of the evidence.

8. Clinical Implications for Inclusive Practice

Nearly five years of evidence that early introduction of multimodal Augmentative and Alternative Communication (AAC) can promote the minimum words of children with autism communication accessibility, support for its choice and subjective expression.[36] Clinical practice should start with a comprehensive assessment of children's existing forms of communication, including unassisted gestures, natural postures, and non-symbolic behaviors, as a starting point for interventions to avoid preset spoken language superiority or delayed AAC introduction.[14,37]

Evidence supports embedding AAC in inclusive educational and social contexts, such as classroom curricula, peer-mediated activities, and family routines, facilitating socially motivated functional expansion (e.g., commentary, narrative, and small conversations), rather than being limited to asking for compensation.[6,7] This embedded approach shows initial potential to enhance social participation, reciprocal interaction, and quality of life, in line with the inclusion goals under the neurodiversity affirmation framework.[36]

There is practical evidence supporting techniques such as modeling, time delay, naturalistic teaching, and parent mediation. These are designed to promote core vocabulary acquisition, generalization, and maintenance.[10] Other views, such as prioritizing low-tech modalities, avoiding behavior strategies altogether, or emphasizing purely autistic dominant goals, are mostly derived from expert consensus or neurodiversity affirmations, lack rigorous comparative trials, and are based on individual heterogeneity trade-offs. [38]

These lessons emphasize respect for children's communication subjectivity, provide multimodal choice, support authentic social connections, and avoid one-dimensional standardization that ignores cognitive, sensory, motivational, and cultural differences. Clinical decision-making should integrate evidence and individual priorities to realize the transition from functional compensation to empowerment and inclusion.

9. Future Research Directions

There are critical gaps in current evidence for AAC interventions, particularly coverage of underrepresented populations, such as children with autism and severe intellectual disability or genetic syndromes, girls, and minority ethnic or low socioeconomic status families.[14]Recent studies have shown that racial minority families have significantly lower access rates to AAC devices than mainstream groups, highlighting the issue of equity. Methodologically, small sample design dominates, and the lack of large scale randomized controlled trials (RCTS) and longitudinal follow-up limits the understanding of generalization, maintenance and long-term outcomes.[7]

The following specific, actionable directions should be prioritized for future research:

(1)Conduct multicenter RCTS with sample sizes of more than 100 people to compare the long-term effects (minimum 12-month follow-up) of different AAC modalities (e.g., VSD vs grid layout) on advanced functions (e.g., commentary, narrative), including diverse subgroups to evaluate predictors.[6]

(2) Develop and test an AI-assisted context-aware AAC system that uses machine learning to optimize vocabulary prediction and interface adaptation, and performs longitudinal performance evaluation for natural situations.

(3) Examine the application of peer mediation intervention in the inclusion classroom, typically develop peer support for AAC use through training, and use mixed methods to assess social interaction and inclusion outcomes.

(4) Integrate neural biomarkers (e.g., eye tracking or EEG) to predict individual AAC responses and develop personalized matching models. A prospective cohort study of children at the earliest stages of speech development.

(5) Analyze real-world barriers (e.g., partner training sustainability and system barriers) from an implementation science perspective, and test multilayer strategies (e.g., policy + coaching) to facilitate translation.

These directions emphasize diverse inclusion, rigorous methods, and interdisciplinary collaboration to improve the universality of evidence and clinical equity.

10. Conclusions

The evidence synthesized from 2021 to 2025 further consolidates the indispensable role of AAC in the intervention landscape for children with ASD, as supported by recent evidence syntheses (mega-review/meta-analyses) and focused systematic reviews demonstrating overall positive effects of aided AAC on communication outcomes and language development in minimally speaking autistic children[22,27,39]. There is an increasing emphasis beyond basic functional requesting toward supporting more complex social competencies, including commenting and narrative, with recent AAC-specific syntheses/reports explicitly noting the historic over-weighting of "requesting" and calling for broader social-communication targets[6,25]. By emphasizing naturalistic embedding (e.g., integrating aided AAC into NDBI/EMT routines and shared activities) and adopting neurodiversity-affirming, agency-oriented framing (e.g., valuing autistic identity and everyday-life fit), contemporary work highlights the importance of ecological validity and communication-partner responsiveness[26,27,29,40]. However, significant gaps persist in longitudinal maintenance, cross-context generalization, and equitable representation of diverse populations, alongside persistent real-world barriers to AAC uptake and sustained use across stakeholders and settings[6,40,41]

Moving forward, the field must transcend narrowly standardized functional goals and explicitly prioritize inclusion and equity, ensuring that every autistic individual has access to multimodal tools and supportive environments necessary for authentic social participation and improved quality of life[40,41].

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