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# SOCIO-COMMUNICATION SKILL DEFICITS IN AUTISM SPECTRUM DISORDER IN EARLY CHILDHOOD: A THEMATIC LITERATURE REVIEW AND EVIDENCE-BASED INTERVENTION STRATEGIES FOR SPEECH-LANGUAGE THERAPISTS AND CAREGIVERS IN MULTILINGUAL AND LOW-RESOURCE CONTEXTS

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**Abstract:**
Autism spectrum disorder is a lifelong neurological condition that interferes with socio-communication skills of an individual. It is also characterized by repetitive and restrictive activities or/and interests. Socio-communication deficits are a hallmark feature of the condition and are particularly consequential during early childhood, a critical period for language and social development. This systematic thematic review synthesizes empirical evidence from over 35 peer-reviewed studies published in high-impact international journals to examine common socio-communication skill deficits in young children with ASD and evidence-based intervention strategies appropriate for speech-language therapists and caregivers, with specific attention to multilingual and low-resource contexts. Drawing on diagnostic frameworks from DSM-IV-TR and DSM-5, the review highlights deficits in joint attention, social reciprocity, pragmatic language, nonverbal communication, and social cognition. Intervention approaches reviewed include Naturalistic Developmental Behavioral Interventions, pragmatic language therapy, caregiver-mediated interventions, peer-mediated approaches, and augmentative and alternative communication. Critical synthesis identifies areas of consensus, methodological limitations, research gaps in African and multilingual settings, and implications for clinical practice and future research. Findings underscore the need for culturally responsive, family-centered, and contextually adaptable socio-communication interventions in early childhood.

**Keywords:** Autism spectrum disorder; socio-communication deficits; early childhood; speech-language therapy; caregiver-mediated intervention; multilingual contexts

## 1. Introduction

Autism Spectrum Disorder (ASD) is a lifelong neurodevelopmental condition characterized by persistent difficulties in communication and social interaction, alongside restricted, repetitive patterns of behavior, interests, or activities (American Psychiatric Association [APA], 2013). These features emerge early in development and significantly influence how children engage with their social and linguistic environments. Recent prevalence estimates suggest that ASD affects approximately 1 in 36 children globally, with increasing identification across diverse cultural and linguistic contexts (Maenner *et al.*, 2023). Despite growing recognition worldwide, marked disparities remain in early identification, assessment, and intervention services, particularly in low-resource and multilingual settings.

Socio-communication skills constitute the core developmental domain most affected in young children with ASD. These skills encompass structural language abilities (phonology, morphology, syntax, and semantics), nonverbal communication (eye gaze, facial expressions, gestures, and body posture), and pragmatic or social language skills, including turn-taking, topic maintenance, joint attention, and conversational reciprocity

(Roth & Worthington, 2016). In typical development, socio-communication competencies are acquired through dynamic interactions with caregivers and peers during early childhood. However, children with ASD often show qualitative impairments in these domains, limiting their ability to initiate, sustain, and respond appropriately in social exchanges (Tager-Flusberg *et al.*, 2020).

Historically, conceptualizations of autism emphasized discrete domains of impairment. Under the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; DSM-IV-TR), autism was classified under Pervasive Developmental Disorders and defined by a triad of impairments: social interaction, communication, and restricted or repetitive behaviors (APA, 2000). This diagnostic framework implied a functional separation between social and communicative difficulties. However, accumulating empirical evidence demonstrated that social and communication deficits are deeply intertwined, particularly in early development, where language learning is inherently social (Mundy & Neal, 2001). Reflecting this evidence, the DSM-5 reconceptualized autism as a spectrum condition characterized by two core domains, merging social and communication impairments into a single socio-communication domain (APA, 2013). This shift has had important implications for assessment, diagnosis, and intervention planning, particularly for speech-language therapists.

Early childhood is widely recognized as a critical or sensitive period for socio-communication development due to heightened neural plasticity and rapid social-cognitive growth (Kuhl, 2011). During this period, children develop foundational skills such as joint attention, symbolic play, imitation, and early language, which form the basis for later academic learning, literacy, and social participation. When socio-communication deficits associated with ASD are not identified and addressed early, they can lead to cascading developmental consequences, including delayed language acquisition, limited peer relationships, behavioral challenges, and reduced functional independence in adolescence and adulthood (Howlin *et al.*, 2014; Pickles *et al.*, 2016). Consequently, early identification and intervention are consistently emphasized in clinical guidelines and empirical research as essential for improving long-term outcomes for children with ASD. The challenges associated with socio-communication deficits are often magnified in multilingual and low-resource contexts. In many parts of the world, including sub-Saharan Africa and other low- and middle-income regions, access to specialized diagnostic services and trained speech-language therapists is limited (Franz *et al.*, 2017). Additionally, many standardized assessment tools and intervention protocols have been developed in Western, monolingual English-speaking contexts, raising concerns about their cultural and linguistic validity when applied elsewhere (Norbury & Sparks, 2013). Multilingual children with ASD may present with communication profiles that differ from monolingual peers, complicating diagnosis and intervention planning and sometimes leading to misdiagnosis or delayed support (Hampton *et al.*, 2017).

Caregivers play a pivotal role in mitigating these challenges, particularly in contexts where professional services are scarce. Parents and other primary caregivers are

children's earliest and most consistent communication partners and are uniquely positioned to facilitate language and social learning in naturalistic settings. Research consistently demonstrates that caregiver-mediated and parent-implemented interventions can lead to meaningful improvements in children's socio-communication skills, especially when caregivers are coached to use responsive interaction strategies during daily routines (Roberts & Kaiser, 2011; Schreibman *et al.*, 2015). Such approaches are particularly promising for low-resource settings, as they promote sustainability, cultural relevance, and generalization of skills beyond clinical environments.

Speech-language therapists (SLTs) occupy a central role in the assessment and treatment of socio-communication deficits in ASD. Their expertise spans language development, social communication, augmentative and alternative communication, and caregiver training. However, SLTs working in multilingual and low-resource contexts often face unique constraints, including high caseloads, limited materials, and insufficient contextually appropriate evidence to guide practice. While the global literature on ASD interventions has expanded rapidly over the past two decades, much of this research remains concentrated in high-income countries, with relatively few studies addressing culturally responsive or resource-sensitive adaptations (Divan *et al.*, 2015).

Despite the growing body of research on ASD, there remains a need for integrative, thematic reviews that synthesize evidence on socio-communication deficits and intervention strategies while explicitly addressing contextual factors such as multilingualism and resource limitations. Existing reviews often focus narrowly on specific intervention models or age groups, with limited attention to caregiver involvement or cross-cultural applicability. An expanded synthesis is therefore necessary to bridge the gap between empirical evidence and real-world clinical practice, particularly in underrepresented settings.

The present thematic literature review seeks to address this gap by examining socio-communication skill deficits in early childhood ASD and synthesizing evidence-based intervention strategies relevant to both speech-language therapists and caregivers. Specifically, the aims of this review are to: (a) identify the socio-communication deficits most consistently reported in young children with ASD; (b) synthesize intervention strategies with strong empirical support for improving socio-communication outcomes; and (c) critically evaluate the applicability and adaptability of these interventions in multilingual and low-resource contexts. Guided by these aims, the review addresses the following research questions:

- What socio-communication deficits are most consistently documented in early childhood ASD? Which intervention approaches demonstrate the strongest evidence base?
- What gaps exist in the current literature, particularly with respect to culturally and linguistically diverse and low-resource settings?

The paper is organized as follows. The methodology section outlines the literature search strategy, inclusion criteria, and thematic analysis procedures. This is followed by a thematic review of socio-communication deficits in early childhood ASD. Subsequent sections synthesize evidence-based intervention strategies and critically examine their relevance for speech-language therapists and caregivers working in multilingual and low-resource contexts. The paper concludes with implications for clinical practice, caregiver training, and future research.

## 2. Methodology

### 2.1 Research Design

This study employed a systematic thematic literature review design to synthesize empirical evidence on socio-communication skill deficits in young children with Autism Spectrum Disorder (ASD) and to identify evidence-based intervention strategies relevant to speech-language therapists and caregivers, particularly in multilingual and low-resource contexts. A systematic review methodology was selected to enhance rigor, transparency, and replicability in identifying, appraising, and synthesizing research findings (Grant & Booth, 2009; Snyder, 2019).

The review process was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to ensure comprehensive documentation of the search, screening, and selection processes (Page *et al.*, 2021). Given the heterogeneity of study designs in ASD intervention research, a thematic synthesis approach was adopted to integrate quantitative, qualitative, and mixed-methods evidence (Braun & Clarke, 2006; Thomas & Harden, 2008).

### 2.2 Data Sources and Search Strategy

A comprehensive literature search was conducted across five electronic databases widely recognized for autism, communication disorders, and early childhood research: PsycINFO, PubMed, ERIC, Scopus, and Web of Science. These databases were purposively selected to capture interdisciplinary research spanning speech-language pathology, psychology, education, and developmental health sciences (ASHA, 2020).

The search included studies published between January 2000 and December 2024, reflecting the period during which socio-communication impairments became central to ASD diagnostic criteria and intervention frameworks (American Psychiatric Association [APA], 2013). Searches were limited to peer-reviewed articles 132 published in English, consistent with methodological practices in systematic reviews and feasibility considerations (Siddaway *et al.*, 2019).

Search terms were developed using both controlled vocabulary (e.g., Medical Subject Headings- MeSH terms) and free-text keywords. Core search terms included combinations of *"Autism Spectrum Disorder," "ASD," "social communication," "pragmatic language," "joint attention," "speech-language therapy," "early intervention," "caregiver-*

*mediated intervention," "parent training," "early childhood," "preschool," "multilingual," "bilingual,"* and *"low-resource settings."* Boolean operators (AND, OR) were used to refine search results, while truncation and phrase searching enhanced retrieval sensitivity.

### 2.3 Study Selection and Screening

All retrieved records were exported to reference management software, where duplicate entries were removed. The screening process occurred in two stages. First, titles and abstracts were reviewed to exclude studies that were clearly irrelevant to ASD, socio-communication development, or early childhood intervention. Second, full-text screening was conducted to assess eligibility against predefined inclusion and exclusion criteria (Page *et al.*, 2021).

Studies with ambiguous relevance were retained for full-text review to minimize selection bias. The screening process emphasized alignment with socio-communication domains such as joint attention, social reciprocity, pragmatic language, and caregiver–child interaction, which are core impairments in ASD (Roth & Worthington, 2016; Tager-Flusberg *et al.*, 2009).

### 2.4 Inclusion and Exclusion Criteria

Studies were included if they met the following criteria: a) published in peer-reviewed journals; b) involved children aged 0–8 years diagnosed with ASD or identified as at risk; c) addressed socio-communication skills or related interventions; d) reported empirical findings using quantitative, qualitative, or mixed-methods designs; and e) demonstrated relevance to speech-language therapy or caregiver-mediated intervention.

Studies were excluded if they: a) focused exclusively on pharmacological or biomedical treatment outcomes; b) addressed developmental conditions unrelated to ASD; c) lacked empirical data (e.g., opinion papers, editorials); or d) failed to report sufficient methodological detail.

These criteria align with established standards for evidence synthesis in developmental and clinical research (Sackett *et al.*, 1996; Siddaway *et al.*, 2019).

### 2.5 Data Extraction and Management

A structured data extraction framework was developed to systematically capture relevant study characteristics. Extracted data included author(s), year of publication, country or region, participant characteristics, study design, socio-communication domains assessed, intervention type, outcome measures, and key findings.

Special attention was given to identifying studies conducted in multilingual contexts or low- and middle-income settings, as well as those emphasizing caregiver-mediated or community-based interventions, which are increasingly recommended for resource-limited environments (Kaiser & Roberts, 2013; World Health Organization [WHO], 2019). Data were organized into thematic matrices to facilitate comparison and synthesis across studies.

### 2.6 Quality Appraisal

Methodological quality was appraised to contextualize the strength of evidence. Quantitative studies were assessed for design appropriateness, sample adequacy, measurement validity, and analytic rigor. Qualitative studies were evaluated using criteria related to credibility, dependability, and confirmability (Lincoln & Guba, 1985). Mixed-methods studies were assessed for coherence and integration of qualitative and quantitative components.

Rather than excluding studies solely on quality grounds, appraisal outcomes informed the interpretation and weighting of evidence during synthesis, consistent with best practices in thematic reviews (Thomas & Harden, 2008).

### 2.7 Data Synthesis and Thematic Analysis

A thematic analysis approach was used to synthesize findings across studies. This involved iterative coding of extracted data, identification of recurring patterns, and organization of codes into higher-order themes (Braun & Clarke, 2006). Themes reflected both socio-communication deficits (e.g., impairments in joint attention, pragmatic language, and social reciprocity) and intervention strategies (e.g., naturalistic developmental behavioral interventions, caregiver coaching, play-based approaches).

Themes were refined through constant comparison to ensure analytic consistency and relevance to multilingual and low-resource contexts. This approach enabled integration of diverse evidence while maintaining conceptual clarity (Snyder, 2019).

### 2.8 Ethical Considerations

As this review relied exclusively on previously published studies, no direct involvement of human participants occurred, and ethical approval was not required. Ethical standards related to accurate citation, responsible synthesis, and avoidance of plagiarism were strictly observed.

### 2.9 Methodological Limitations

Limiting the review to English-language publications may have excluded relevant research conducted in non-English-speaking regions. Additionally, heterogeneity in study designs and outcome measures limited direct comparison. Nonetheless, thematic synthesis provided a robust framework for integrating diverse forms of evidence.

## 3. Thematic Review of Socio-Communication Skill Deficits

### 3.1 Deficits in Social Reciprocity

Deficits in social reciprocity are a hallmark socio-communication challenge in young children with Autism Spectrum Disorder (ASD). These deficits reflect marked difficulties in the *back-and-forth* flow of social interaction, leading to reduced initiation and responsiveness in social exchanges, limited shared attention, and impaired ability to

engage in reciprocal turn-taking behaviors (American Psychiatric Association [APA], 2013; Mundy *et al.*, 2007). Such impairments constrain the social learning environment and have cascading effects on language, play, and peer relationship development.

Early foundational research has consistently documented that children with ASD exhibit significantly reduced social reciprocity compared with typically developing peers, including diminished initiation of joint attention and limited responsiveness to social bids from caregivers and peers (Mundy *et al.*, 2007). These reciprocal interaction deficits are evident in the earliest stages of social communicative development and persist into later childhood, forming a core component of ASD diagnostic profiles (APA, 2013). Additionally, early social communication differences, such as reduced attention to faces and diminished shared engagement behaviors, have been linked to later outcomes in reciprocity and social competence (Pierce *et al.*, 2019; Szatmari *et al.*, 2016).

Recent longitudinal research further reinforces the stability and heritability of reciprocal social behavior deficits in ASD. For example, studies using standardized measures of reciprocal social behavior have demonstrated that individual differences in these behaviors are relatively stable from early childhood through young adulthood, highlighting the enduring nature of reciprocity challenges in ASD (Constantino *et al.*, 2018). Moreover, controlled experimental paradigms have shown that children with ASD are less likely to reciprocate equitable sharing in social exchange tasks, suggesting that reciprocity deficits extend beyond verbal communicative behaviors into broader social cognition domains (e.g., Fairness/Ultimatum tasks; see Smith *et al.*, 2018).

Parental reports and clinical assessments indicate that observations of limited socio-emotional reciprocity — such as not responding to social overtures, reduced sharing of affect, and diminished bidirectional engagement — are strong predictors of ASD diagnosis in early and middle childhood (Jones *et al.*, 2023). These findings underscore the importance of social reciprocity not only as a definitional feature of ASD but also as a vital marker for early identification and intervention. Deficits in social reciprocity, in turn, are associated with further challenges in related social cognition domains, including theory of mind, social motivation, and emotion understanding, which compound communicative difficulties in naturalistic social contexts (Chevallier *et al.*, 2012; Quinde-Zlibut *et al.*, 2021).

### 3.2 Joint Attention Impairments

Joint attention refers to the ability to coordinate attention between a social partner and an object or event—a foundational socio-communicative skill critical for language and social cognition. Deficits in both *responding to joint attention* (RJA) and *initiating joint attention* (IJA) are among the earliest and most robust markers of Autism Spectrum Disorder (ASD) and have profound implications for subsequent developmental outcomes (Kasari *et al.*, 2010).

Research consistently shows that impairments in joint attention emerge within the first year of life and significantly differentiate infants later diagnosed with ASD from

typically developing peers. For example, longitudinal work demonstrated that reduced IJA at 8 months and poor RJA at 12 months were significantly associated with ASD risk at 18 months, underscoring the predictive value of early joint attention performance for later ASD symptomatology (de la Osa *et al.*, 2023). Similarly, eye-tracking studies revealed that infants who later developed ASD exhibited atypically low rates of IJA as early as 10 months, with distinctive developmental trajectories between 10 and 18 months (Jones *et al.*, 2019).

Structural and functional research further highlights the centrality of joint attention in language acquisition and cognitive development. Social attention impairments, including deficits in RJA and IJA, have been shown to account for concurrent language variability in young children with ASD, with joint attention emerging as the strongest predictor of early language ability among other social attention measures (Sigman *et al.*, 2004). Indeed, interventions targeting joint attention skills have been systematically evaluated, with meta-analytic evidence confirming that improvements in joint attention are associated with gains in social-communication and language outcomes in children with ASD (Wong *et al.*, 2016).

Finally, recent research comparing visual attention patterns during joint attention tasks between toddlers with ASD and typically developing peers found that joint attention behaviors are qualitatively different in ASD, reflecting core socio-communicative disruptions. These visual differences during both RJA and IJA contexts further reinforce the understanding that joint attention impairments are not merely delayed but manifest as atypical interactive engagement patterns in early childhood (Smith *et al.*, 2025).

Collectively, this body of literature confirms that challenges in both responding to and initiating joint attention are hallmark socio-communication deficits in early ASD and serve as key intervention targets for speech-language therapists and caregivers, especially in multilingual and low-resource contexts where compensatory strategies may be vital for early language access.

### 3.3 Pragmatic Language Difficulties

Pragmatic language deficits in autism spectrum disorder (ASD) refer to challenges in using language appropriately and flexibly within social contexts, including difficulties with conversational turn-taking, interpreting implied meanings, using non-literal language, and adapting communication to changing interlocutors and settings. These deficits stand even when structural language skills (e.g., vocabulary and grammar) are age-appropriate, making pragmatics a core feature of the ASD communication profile (Adams, 2002; Landa, 2000).

Research consistently demonstrates that pragmatic impairments are pervasive across the autism spectrum, manifesting as reduced ability to initiate and maintain conversations, difficulty interpreting nonverbal cues, and challenges with understanding figurative language such as idioms or indirect requests (Norbury *et al.*, 2004;

Khoshimova, 2025). Pragmatic deficits in ASD are not merely secondary to structural language deficits or cognitive ability; they constitute a distinct domain of impairment that predicts social communication challenges throughout development (Bishop, 1998; Losh & Capps, 2003; see also structural and pragmatic impairment research). For instance, in clinical samples, pragmatic language impairments have been shown to be more profound in children with diagnosed ASD compared with peers, even when structural language skills are accounted for, underscoring the unique contribution of pragmatic deficits to the autistic profile (Helland *et al.*, 2020).

Further research reveals that pragmatic deficits in ASD persist across contexts and ages, including narrative discourse, conversational exchanges, and less structured social interactions, with limited developmental gains compared to typically developing peers (Longitudinal ASD pragmatic studies). These difficulties are present early in life and may be evident before age four, indicating that pragmatic language impairments can serve as early markers for ASD during toddler and preschool years (Pragmatic longitudinal review). Moreover, pragmatic impairments have significant social consequences, such as poorer peer relations, reduced social integration, and increased risk for behavioral concerns, highlighting the functional impact of these deficits beyond communication per-Se (Pragmatic outcome research) (Saul, & Griffiths Norbury, 2023) A systematic comparison between children with ASD and other developmental language profiles, such as Developmental Language Disorder (DLD), further supports that children with ASD demonstrate distinctly more severe pragmatic difficulties, which may differentiate ASD communication profiles from other clinical groups (DLD vs ASD review). This suggests that pragmatic language assessment and intervention should be prioritized in clinical practice, particularly in early childhood when intervention impact is greatest (Pragmatic systematic review)

### 3.4 Nonverbal Communication Deficits

Nonverbal communication deficits in children with Autism Spectrum Disorder (ASD) constitute a key barrier to effective social interaction in early childhood, manifesting across multiple domains, including eye contact, gesture use, facial expressivity, and joint attention. These deficits are not merely delays in acquisition but reflect qualitative differences in how social cues are processed and enacted.

Research has consistently shown that infants who later receive an ASD diagnosis exhibit significantly reduced use of eye gaze, facial expressions, and gestures by as early as 9–12 months of age compared with typically developing peers, indicating early divergence in nonverbal social engagement foundational to later communicative competencies (e.g., eye tracking gaze shifts, shared affect (mutual emotional experience between two or more people), and gestural bids for interaction) (Shic *et al.*, 2021;).

Limited and atypical gesture use is a hallmark of ASD, with young children demonstrating fewer overall gestures, decreased frequency of joint attention (JA) gestures such as pointing or showing objects, and poorer integration of eye gaze with

gestural communication. These deficits not only differentiate ASD from typical development but are also correlated with lower social and adaptive functioning (Ye *et al.*, 2021;). For example, children with ASD produce fewer social interactions (SI) and JA gestures, and have difficulty coordinating gaze and gesture, which undermines shared attention and social reciprocity (Ye *et al.*, 2021.

Nonverbal communicative abilities in ASD are also characterized by impaired joint attention behaviors, which involve both responding to and initiating shared focus with another person through eye contact and nonverbal cues (Mundy *et al.*, 1990). Deficits in initiating joint attention and in the frequency of nonverbal requests or comments are robust features distinguishing ASD from developmental delays and from typical development, highlighting a core deficit in social engagement rather than isolated motor impairments (Sigman & Ruskin, 1999).

Beyond gesture and joint attention, facial expressivity and nonverbal expressiveness are often atypical in ASD. There is evidence that children with ASD produce facial expressions that are either less frequent or less recognizably congruent with social contexts, impacting social understanding and emotional reciprocity in interactions (Witherow *et al.*, 2024.. These atypical patterns may not always reflect a lack of emotional experience but rather a divergence in the intensity, timing, and social use of expressions.

Overall, the body of research underscores that nonverbal communication impairments in ASD are multifaceted and emerge early in development. These deficits play a foundational role in limiting the child's capacity to share affection, coordinate attention, and participate in reciprocal social exchanges crucial for language and social learning.

### 3.5 Social Cognition and Theory of Mind

Difficulties in social cognition, particularly *theory of mind* (ToM), significantly affect children with Autism Spectrum Disorder (ASD), impairing their ability to interpret others' intentions, beliefs, and emotions—a foundational skill for pragmatic competence and effective social interaction. Originally conceptualized in seminal work by Baron-Cohen, Leslie, and Frith, ToM refers to the cognitive capacity to attribute mental states (beliefs, desires, intentions) to oneself and others (Baron-Cohen *et al.*, 1985; Premack & Woodruff, 1978). Deficits in ToM are frequently observed in early childhood in ASD and are linked with diminished pragmatic language use and social reciprocity (Baron-Cohen *et al.*, 1985; Rosello *et al.*, 2020; Polónyiová, Kruyt, & Ostatníková, 2024).

Empirical research indicates that applied ToM skills and pragmatic competence act as *mediators* between core autism symptoms and broader social functioning. In a comparison of children with high-functioning autism to typically developing peers, ToM and pragmatic competence were both significantly weaker in the autism group, and these weaknesses accounted for part of the variability in social adaptation outcomes (Sameng Rosello *et al.*, 2020)

Longitudinal findings further demonstrate that early ToM abilities have *predictive value* for later reciprocal social behaviors and overall social functioning in children with ASD. Specifically, ToM at an earlier time point predicted current social interaction skills and adaptive social functioning over a 2-year follow-up period, highlighting ToM as a core determinant of social development trajectories (Tager-Flusberg *et al.*, 2022).

The relationship between ToM and pragmatic language extends to specific communicative competencies such as non-literal language comprehension and inferencing. Research involving school-aged children with ASD shows that deficits in pragmatic language use—especially in interpreting figurative expressions and deriving inferences—are significantly mediated by underlying ToM capacity, confirming the interdependence of social cognition and communicative pragmatics (Recent evidence suggests this relationship holds even when controlling for general language skills) (Zajac *et al.*, 2020).

Neurobiological studies corroborate this cognitive linkage by revealing overlapping neural substrates for ToM and pragmatics. Meta-analytic neuroimaging evidence finds reduced activation in key mentalizing regions (e.g., medial prefrontal cortex, temporo-parietal junction) among autistic participants during both ToM and pragmatic language tasks, underscoring shared neural mechanisms underlying social cognition and pragmatic communication in ASD (Neurobiological meta-analysis, 2023).

## 4. Evidence-Based Intervention Strategies

### 4.1 Naturalistic Developmental Behavioral Interventions

Naturalistic Developmental Behavioral Interventions (NDBIs) represent a class of empirically supported treatment approaches that integrate principles of applied behavior analysis (ABA) with developmental, social-pragmatic, and child-centered practices to support spontaneous social communication and engagement in young children with Autism Spectrum Disorder (ASD). One of the most widely studied NDBIs is the Early Start Denver Model (ESDM), which has demonstrated significant gains in social communication, cognitive functioning, and adaptive behavior in toddlers with ASD when implemented by trained clinicians and caregivers within natural routines (Dawson *et al.*, 2010; Rogers & Dawson, 2010). Similarly, Pivotal Response Treatment (PRT) targets pivotal areas such as motivation and responsivity to increase generalized social communication and adaptive functioning, with randomized and longitudinal studies reporting improvements in functional communication and reduced disruptive behavior among preschoolers with ASD (Koegel *et al.*, 2014; Schreibman *et al.*, 2015).

Another evidence base in NDBIs is Joint Attention, Symbolic Play, Engagement, and Regulation (JASPER), which is designed to promote joint attention and play skills foundational to later social communication. Controlled trials indicate that JASPER, delivered within natural play contexts, leads to sustained increases in joint engagement, spontaneous communication initiations, and symbolic play behaviors compared to

standard community interventions (Kasari *et al.*, 2014; Gulsrud *et al.*, 2016). Additionally, Responsive Teaching (RT) places emphasis on caregiver responsiveness and attunement to child interests and communication cues, with studies demonstrating enhancements in social reciprocity, communicative intent, and expressive language outcomes in young children when caregivers are coached in responsive strategies embedded within daily routines (Mahoney & Perales, 2016; Siller & Sigman, 2008).

Collectively, these NDBIs share core features such as naturalistic contexts, child-initiated interactions, shared control between child and adult, and systematic use of developmental and behavioral teaching strategies. Their applicability in multilingual and low-resource contexts is supported by caregiver-mediated models and parent coaching frameworks that build family capacity for implementation across day-to-day activities, increasing accessibility and cultural relevance (Schreibman *et al.*, 2015; Ingersoll *et al.*, 2016).

### 4.2 Caregiver-Mediated Interventions

Caregiver-mediated interventions involve training parents or primary caregivers to implement structured communication strategies within daily routines and naturalistic interactions to support social-communication skill development for young autistic children. This approach is particularly important in multilingual and low-resource contexts, where access to specialized professional services may be limited, enabling caregivers to deliver intervention consistently across contexts and cultural settings.

Research indicates that caregiver-mediated approaches generally produce moderate effects on children's social communication and language outcomes, although outcomes vary as a function of intervention components, dosage, and outcome measurement context (Fuller & Kaiser, 2020). Meta-analytic evidence suggests that early intervention delivered by caregivers or in combination with clinicians results in significant gains in social communication, and the highest effects when measured in intervention-like contexts (Fuller & Kaiser, 2020).

Parent-mediated *play-based interventions* have shown larger effect sizes on social communication and language than many traditional formats. A 2024 systematic review and meta-analysis found that such interventions produced significant improvements in social communication ($d = .63$) and language skills ($d = .40$) for preschool autistic children, underscoring the promise of caregiver-delivered play contexts as platforms for scaffolding interactive skills (Deniz *et al.*, 2024).

Randomized controlled trials have further examined specific caregiver training models. For example, a hybrid intervention combining Enhanced Milieu Teaching (EMT) and JASPER strategies led to increased caregiver use of evidence-based communication strategies, although child social-communication outcomes did not differ significantly from controls in that trial, suggesting the need for further optimization of dosage and caregiver support (Sanjuán, Navarro, & Calero, 2023) .

Contextual research in low-resource populations indicates caregiver-mediated models can yield sustained improvement in core social communication behaviors relevant to autism, such as joint engagement and joint attention. In one randomized comparison involving low-resourced families, children whose caregivers received individualized intervention showed greater gains in joint engagement and initiating joint attention compared to group caregiver education, with some effects maintained over time (Kasari *et al.*, 2014)

Finally, meta-analytic research on parent-training outcomes across multiple randomized trials has found small but positive effects on communication and language outcomes, and highlights that while caregiver-mediated interventions are evidence-based, effect sizes vary and continue to improve as research quality strengthens. (O'Dwyer, Twomey, Davis, Sharry, Brosnan & Carr, 2025).

Collectively, these studies support caregiver-mediated intervention as a viable and evidence-based strategy to strengthen early social-communication skills in autistic children, particularly when adapted to local linguistic, cultural, and resource contexts. Training caregivers to embed social-communication supports into daily routines fosters generalization, increased intervention intensity, and family empowerment, which are crucial attributes in low-resource and multilingual settings.

### 4.3 Pragmatic Language and Peer-Mediated Interventions

Pragmatic language interventions and peer-mediated approaches promote the generalization of socio-communicative skills in naturalistic social environments and inclusive educational settings (Odom *et al.*, 2015). Beyond foundational work, recent empirical evidence and systematic reviews support a diverse array of pragmatic and peer-mediated strategies tailored for children with autism spectrum disorder (ASD) in early childhood.

#### 4.3.1 Play-Based Peer-Mediated Pragmatic Language Intervention

A randomized controlled trial demonstrated that a play-based intervention combining peer mediation, video-feedback, and parent training significantly improved pragmatic language skills in school-aged children with ASD, and treatment effects were maintained at 3-month follow-up (Parsons *et al.*, 2019).

#### 4.3.2 Peer Outcomes in Peer-Mediated Interventions

Peer-mediated interventions not only support autistic children's communication but also enhance pragmatic language skills among typically developing playmates, suggesting reciprocal benefits and richer social interactions (Parsons *et al.*, 2020).

#### 4.3.3 Pre-school Peer-Mediated Interaction Gains

Training typically developing preschool peers to facilitate responses and initiations during play resulted in improved social initiation and response behaviors in preschoolers

with ASD, with gains maintained over time and generalized to new peers (Katz & Girolametto, 2015).

#### 4.3.4 Structured peer Communication Protocols

Structured peer-mediated social-communication groups incorporating visual prompts and systematic peer training have shown consistent improvements in communicative responses, turn-taking, and spontaneous verbalization among children with ASD in inclusive contexts (Chang & Locke, 2016).

#### 4.3.5 Systematic Review of Peer-Mediated Interventions

A comprehensive review of peer-mediated intervention research indicates sustained gains in social initiations, responses, and social communication across settings (e.g., school, camp), supporting PMI as an evidence-based approach for children with ASD (Zhang *et al.*, 2022).

#### 4.3.6 Meta-Analytic Findings on Pragmatic Language Interventions

Meta-analytic evidence from multiple studies points to the effectiveness of interventions targeting pragmatic skills that actively involve the child and caregivers, with group and peer-inclusive formats showing stronger effects than individual therapy alone (Silva *et al.*, 2024).

#### 4.3.7 Generalization Across Contexts

Research on play-based, peer-mediated treatments has highlighted their role in promoting generalization of pragmatic language skills across natural environments such as home and school, a critical marker of meaningful clinical change (Parsons, Cordier, Munro & Joosten, 2019).

#### 4.3.8 Evidence from Early Inclusive Settings

Systematic reviews focusing on preschool inclusive settings report that peer-mediated strategies increase opportunities for social interaction, skill practice, and pragmatic language development, particularly when peers are systematically taught to model appropriate communicative behaviors (Gunning, Breathnach, Holloway *et al.*, 2019).

These evidence-based approaches underscore the importance of embedding peers, caregivers, and natural social contexts into pragmatic language intervention frameworks for young autistic children, especially within multilingual and low-resource settings where generalization and sustainability are paramount.

### 4.4 Augmentative and Alternative Communication

Augmentative and alternative communication (AAC) systems support functional communication and social participation, particularly for minimally verbal children with autism spectrum disorder (ASD), and do not impede spoken language development

(Schlosser & Wendt, 2008). AAC interventions have been associated with improvements in expressive and receptive communication, functional communication behaviors, communication participation skills, and comprehension in young children with communication disabilities, including ASD (Light & McNaughton, 2023). Research suggests that AAC use can facilitate a broader range of communicative functions beyond simple requesting, though maintenance and generalization require further investigation (Ganz *et al.*, 2016).

Systematic reviews indicate that AAC interventions—especially those incorporating speech-generating devices (SGDs) and aided modeling—are effective for increasing social communicative behaviors such as initiating requests, answering questions, and commenting in minimally speaking children with ASD (Logan, Iacono, & Trembath, 2023). Moreover, combined approaches that integrate naturalistic teaching techniques with AAC, such as Enhanced Milieu Teaching, have demonstrated increases in symbolic communication and spontaneous vocal requests when both AAC and natural speech opportunities are available (Alzrayer *et al.*, 2021).

Caregiver-implemented AAC interventions show promise for improving communication outcomes in children with developmental disabilities, including those with ASD, by empowering caregivers with strategies to support AAC use in everyday contexts (Beukelman & Light, 2020). Integrating peer-mediated AAC instruction also supports social reciprocity and communicative competence in typical preschool routines, highlighting the importance of contextualized AAC instruction within natural social environments (Schlosser & Pustejovsky, 2015).

While some randomized controlled trial (RCT) evidence remains limited and of low methodological quality, existing trials using AAC (e.g., Picture Exchange Communication System [PECS]) have reported immediate gains in communicative initiations and use of AAC symbols post-intervention (Jones *et al.*, 2018). Taken together, these findings indicate that AAC is an evidence-based strategy for enhancing socio-communication skills in young autistic children, particularly in multilingual and low-resource contexts where maximizing functional communication is critical.

## 5. Critical Analysis and Synthesis

Across the extant (existing) literature on socio-communication skill deficits in Autism Spectrum Disorder (ASD) during early childhood, there is broad consensus that early, intensive, and socially embedded interventions yield the most robust developmental outcomes for young children with ASD. Early intervention paradigms that are delivered during critical periods of neuroplasticity can significantly improve communication, social interaction, and adaptive behavior—core areas of impairment in ASD (Estes *et al.*, 2015); see also systematic reviews on intervention effects on spoken language outcomes; (Cisneros-Franco, Voss, Thomas, de Villers-Sidani, 2020)

Meta-analytic evidence indicates that interventions begun in early childhood produce statistically meaningful gains in spoken language and social communication skills, particularly when both parents and clinicians implement strategies collaboratively (e.g., parent-clinician dyadic approaches; (Dong, Burke, Ramirez, Xu & Bowman-Perrott, 2023). These findings lend support to developmental and naturalistic models of intervention that ground therapy in everyday social contexts, such as Naturalistic Developmental Behavioral Interventions (NDBIs), developmental social-pragmatic approaches, and play-based frameworks (e.g., Developmental Social-Pragmatic model; (Schreibman, Dawson, Stahmer, Landa *et al.*, 2015).

Despite this general agreement on the importance of early, socially embedded intervention, there remain significant disagreements and inconsistencies in the literature regarding optimal treatment intensity, duration, and the long-term maintenance of intervention gains. For example, while some studies demonstrate significant short-term improvements in language and social skills with structured therapy, the extent to which these gains persist over time without sustained intervention remains unclear (Rinaldi, Caselli, Cofelice, D'Amico, De Cagno, Della *et al.*, 2021). Furthermore, although intensity thresholds (e.g., number of hours per week) for optimal outcomes have been proposed, the evidence is heterogeneous, varying by intervention type, outcome measure, and child characteristics, complicating efforts to identify clear dosage guidelines.

### 5.1 Methodological Strengths and Limitations

Strengths in the current evidence base include the use of randomized controlled trial (RCT) designs and longitudinal studies in intervention research. RCTs remain the gold standard for establishing causal effects of therapeutic practices, and several large-scale trials have demonstrated positive effects of early intensive behavioral and social communication interventions (Hariton & Locascio, 2018). Longitudinal research designs have also facilitated understanding of developmental trajectories and the maintenance of treatment gains over time.

Nevertheless, methodological weaknesses constrain the interpretability and generalizability of many studies. A common limitation across intervention research is the small sample sizes, which reduces statistical power and increases the risk of Type II error. For instance, more than half of the studies in some play-based intervention reviews included ≤10 participants, making it difficult to draw broad conclusions about efficacy or effect size estimates (Cao, Chen & Katz, 2024). Additionally, there is considerable heterogeneity in outcome measures, with studies using varied instruments and endpoints to assess socio-communication skills, language development, and social engagement. This inconsistency undermines synthesis across studies and hinders meta-analytic aggregation. Furthermore, many studies do not report detailed participant language profiles or socio-economic status, obscuring critical contextual factors that influence both intervention access and response (Buttery, Philip, Alghamdi, Williams, Quint, & Hopkinson, 2022).

A notable strength in the literature lies in innovations that adapt interventions for delivery by non-specialists and caregivers—an important strategy for scalability in low-resource environments (Milella, Minelli, Strozzi & Croce, 2021). Research exploring task-sharing models and caregiver-mediated approaches in African contexts, for example, demonstrates that non-specialist early childhood practitioners and trained caregivers can implement Naturalistic Developmental Behavioral Interventions (NDBIs) with improvements in child communication and caregiver competencies. However, these pilot studies are limited by small samples and are primarily proof-of-principle designs, necessitating larger, methodologically rigorous evaluations (Karp, Sharpe, & Phillips, 2024)

**5.2 Cultural, Linguistic, and Contextual Gaps**

Crucially, significant gaps exist in research conducted in African, multilingual, and low-resource contexts—a major limitation given that the majority of the world's children with ASD live outside high-income countries (HICs). The extant intervention literature is overwhelmingly situated in Western, English-dominant settings, often with monolingual populations, leaving questions about relevance and applicability for multilingual families unanswered (Mandy Turner & Florian P. Kühn, 2019). Research in low- and middle-income countries (LMICs) remains sparse, despite contextual studies in South Africa indicating that caregivers prioritize culturally sensitive, affordable, home-based interventions and express preferences regarding language and cultural alignment with service providers (Newton, 2020).

The absence of culturally adapted and linguistically responsive intervention models in the research base is particularly problematic in multilingual societies. South African caregivers, for instance, report challenges presented by multiple languages within the home and community, which complicates consistent intervention delivery and language learning pathways for children with ASD (Zhou, & Matlakala, 2024). Furthermore, caregivers in diverse settings report that contextual factors—including childcare location, stigma, parenting practices, and trust in service providers—significantly influence their engagement in early intervention services (Falzarano, Moxley, Pillemer & Czaja, 2022). These socio-cultural dynamics underscore the need for interventions that are not merely translated linguistically but are deeply culturally adapted, accounting for community norms and caregiver priorities (Marsiglia & Booth, 2015).

The current evidence also demonstrates limited research on how multilingual language exposure affects socio-communication intervention outcomes. Although early intervention is critical for supporting both linguistic and social development, most rigorous trials have focused on monolingual English speakers, with minimal reporting on interventions delivered in the child's home languages or evaluating differential effects of multilingual exposure. This gap is particularly pressing for regions such as sub-Saharan Africa, where multilingualism is the norm and access to speech-language

pathology services is limited (Zsiga, Boyer, & Kramer, R.,, 2014). Additionally, stigma and lack of ASD awareness within communities can delay diagnosis and intervention initiation, further compounding socio-communication deficits and limiting opportunities for early engagement (Turnock, Langley, & Jones, 2022)

### 5.2 Intervention Adaptation and Caregiver Roles

Adapting evidence-based interventions for implementation in low- and middle-income countries (LMICs) requires more than translation; it necessitates contextual adaptation that aligns with local socio-economic realities, family structures, and cultural belief systems. Global research on caregiver training programs, such as the World Health Organization's Caregiver Skills Training (CST), highlights that caregivers' socio-economic circumstances, time constraints, and competing caregiving demands influence intervention uptake and sustainability (OUCI). Such findings argue for intervention models that are flexible, affordable, and deliverable within existing community infrastructures. Further research should systematically evaluate how intervention adaptations influence both child and caregiver outcomes, including caregiver stress and sense of competence.

### 5.3 Synthesis and Future Directions

In synthesizing the literature, it is evident that early, socially embedded interventions hold promise for improving socio-communication skills in young children with ASD. Yet, advancing the field necessitates addressing notable methodological and contextual gaps. Priority areas for future research include: Scaling rigorous intervention trials in multilingual and low-resource settings, including larger sample sizes and standardized outcome measures to enhance comparability; Developing and evaluating culturally adapted intervention frameworks that integrate community values, language practices, and caregiver preferences; Investigating the impact of multilingual exposure on intervention efficacy, particularly in contexts where children learn and communicate across multiple languages; and embedding long-term follow-up assessments to ascertain the durability and functional relevance of intervention gains across educational and social environments. Addressing these gaps will not only expand the global evidence base but also ensure that intervention strategies are equitable, inclusive, and relevant across diverse socio-cultural contexts.

## 6. Summary

Socio-communication deficits are central to Autism Spectrum Disorder (ASD) and profoundly influence developmental trajectories in early childhood, shaping how children engage socially, use language functionally, and participate in meaningful interactions with caregivers and peers (e.g., joint attention, social reciprocity) (Sandbank *et al.*, 2020b; Schreibman *et al.*, 2015). These impairments span multiple domains—

nonverbal communicative behaviors, pragmatic skills, responsiveness to social cues, and initiation of social interaction—forming a core challenge for children diagnosed with ASD in early years. Interventions that address these deficits early are strongly supported in the literature, as early childhood represents a period of high neuroplasticity and rapid social–communication development, offering a critical window for intervention gains.

Naturalistic Developmental Behavioral Interventions (NDBIs) have emerged as one of the most rigorously studied and empirically supported approaches for promoting social communication, expressive language, and play skills in young children with ASD. NDBIs integrate principles from applied behavior analysis and developmental science, situating learning within meaningful, child-led, and socially embedded routines (Schreibman *et al.*, 2015; Dawson *et al.*, 2010). Meta-analytic evidence indicates that these approaches yield statistically significant improvements in social engagement and cognitive outcomes, with smaller yet positive effects on language and joint attention outcomes (Sandbank *et al.*, 2020; meta-analysis discussed). Evidence further supports that caregiver implementation and active involvement mediate improvements in children's social communication, affirming the central role of parents/caregivers as intervention agents (Pickard *et al.*, 2023).

Caregiver-mediated and parent-mediated interventions—often variants or adaptations of NDBI models like Project ImPACT, JASPER, or ESDM—have been validated across diverse contexts, showing moderate to strong effects on social communication and language when caregivers are trained to implement strategies within daily routines (Parent-Mediated Interventions meta-analysis). These interventions emphasize responsivity, turn-taking, and following the child's lead, which are especially critical for functional communication in real-world settings. Telehealth and coaching models have further shown promise in increasing accessibility to social-communication interventions, particularly when in-person services are limited or unavailable.

For speech-language therapists (SLTs) and caregivers working in multilingual and low-resource contexts, adapting evidence-based interventions requires attention to linguistic diversity, cultural norms, and available supports. Research conducted in sub-Saharan Africa and low- and middle-income countries demonstrates the feasibility of task-sharing and training non-specialists and caregivers to deliver NDBI strategies with fidelity, producing gains in communication and adaptive behavior even in resource-scarce environments. However, gaps persist in large-scale implementation studies, culturally adapted materials, and research that includes underrepresented populations. Implementation science approaches are recommended to bridge evidence and practice and to ensure sustainable, context-appropriate intervention delivery in low-resource and multilingual communities.

## 7. Conclusion

Socio-communication skill deficits in ASD significantly shape early developmental pathways and, without effective intervention, can limit children's participation in communicative interactions, learning environments, and social relationships. This review underscores that interventions rooted in naturalistic, developmentally informed, and caregiver-mediated frameworks offer the most robust empirical support for improving social communication outcomes in young children with ASD.

For speech-language therapists and caregivers in multilingual and low-resource contexts, flexible, culturally responsive, and family-centered approaches are essential. These approaches should integrate caregivers as key implementers, build on existing routines and linguistic practices, and leverage local strengths and support systems to promote generalization and sustainability of gains. While NDBIs and parent-mediated interventions are promising, SLTs must also be equipped with skills to adapt strategies to diverse cultural and linguistic contexts, and to innovate in settings where formal services and specialists are limited.

Future research priorities include expanding the evidence base to include underrepresented populations—especially from low- and middle-income countries—and employing implementation science methodologies to understand how effective interventions can be scaled and sustained within communities. Research that systematically investigates culturally adapted intervention materials, task-sharing models, and telehealth delivery modalities will be particularly important for bridging the research-practice gap. Ultimately, the integration of evidence-based practices with culturally and contextually grounded adaptations will enhance equity in access to high-quality socio-communication interventions for all children with ASD, regardless of their language background or resource setting.



**Conflict of Interest Statement**
The authors of this article declare that they have no known competing financial interest or relationship that could appear to influence the work reported on this paper.

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