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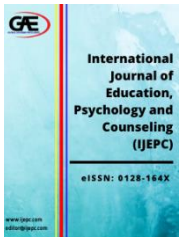

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CRITICAL ELEMENTS OF PARENT-IMPLEMENTED SOCIAL COMMUNICATION INTERVENTIONS IN AUTISM: A SCOPING REVIEW

Analiza Anis Ab Aziz[1,6], Natrah Nordin[2], Nor Azrita Mohamed Zain[3*], Masnira Jusoh[4], Rozanizam Zakaria[5]

[1] Department of Audiology and Speech-Language Pathology, International Islamic University Malaysia, Malaysia
Email: analiza.anis@live.iium.edu.my
[2] Department of Audiology and Speech-Language Pathology, International Islamic University Malaysia, Malaysia
Email: natrah@iium.edu.my
[3] Department of Audiology and Speech-Language Pathology, International Islamic University Malaysia, Malaysia
Email: znazrita@iium.edu.my
[4] Department of Audiology and Speech-Language Pathology, International Islamic University Malaysia, Malaysia
Email: masnirajusoh@iium.edu.my
[5] Department of Psychiatry, International Islamic University Malaysia, Malaysia
Email: nizamzakaria@iium.edu.my
[6] Ministry of Health Malaysia, Malaysia
Email: analiza@hpj.gov.my
[*] Corresponding Author

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Abstract:

In early intervention programs, parents' roles are pivotal in children's development. This review analysed global parent-implemented social communication-based intervention practices in children with Autism Spectrum Disorder (ASD), whereby this approach gained attention with the rise in ASD prevalence. A comprehensive literature search found three key themes. First, the review identified the study characteristics, including years of study published, countries of the studies conducted, and study design. Second, this review focused on intervention programs embedded in parent-implemented intervention and its related findings. Third, the review documented critical elements contributing to positive outcomes for parents and their children. This review highlights diverse elements in the parent-implemented intervention approach, which provides a preliminary understanding of how to support parents in delivering the intervention effectively to their children, thus supporting social communication development among young children with ASD.

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Keywords:

ASD, Early Intervention, Parent-Implemented, Social Communication

Introduction

Autism or ASD has become more common, with the prevalence increasing by approximately 300% in the last 20 years, showing that 1 in 36 children in the United States have ASD characteristics (Centres for Disease Control and Prevention [CDC], 2022; Maenner et al., 2023). The gap between available resources for the ASD population and consumer demand has been significant (Green, 2019) every year, particularly in developing countries (Wang et al., 2022).

With increasing cases of ASD, parents play a critical role in determining intervention successes. The recommended practice guidelines for early behavioural intervention for children with ASD emphasise the importance of enhancing parents' capacity to support their child's behaviour in daily life (Division for Early Childhood, 2014; National Research Council, 2001). Through parent-implemented intervention, trained professionals educated and coached parents to improve their communication skills with their children with developmental delays or disorders, which has been proven effective across low-, middle-, and high-income countries (Jeong et al., 2021).

In recent years, there has been significant research interest in the parent-implemented intervention approach, as it has been proven beneficial for the learning and development of parents and children with ASD (National Autism Centre, 2015; Cheng et al., 2023). Nevertheless, each parent-implemented intervention program represents a stunning range of intervention characteristics and outcomes for parents and children (Akamoglu & Meadan, 2018; John et al., 2021). On top of that, the terms to refer to parent-delivered intervention approaches have also been described interchangeably in the ASD literature (Bearss & Stewart, 2015). Besides, the early intervention programs focusing on social communication intervention are limited, though there is an abundance of programs available for children with ASD (Watkins et al., 2015). These vast differences lead to variable outcomes, thus making it difficult to determine the elements that contribute to the successes of the parent-implemented intervention program from one to another based on standard measurement (Fettig & Barton, 2022).

According to Uzonyi and her colleagues (2023), no known reviews have identified the essential elements or key components of parent-implemented interventions that enhance the social communication outcomes of young children with ASD. There is a lack of global knowledge regarding elements in parent-implemented intervention that contribute to programs' effectiveness, despite the fact that ASD is becoming more common around the world and that parent-implemented intervention approaches are essential to ensure improvement in children's social communication development. Parents' roles undeniably influence children's development; however, there are gaps in the parent-implemented intervention practices that may benefit both parents and their children.

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Through scoping reviews (Levac et al., 2010), this review aims to address these knowledge gaps by systematically examining the fundamental elements in the parent-implemented intervention practices globally that promote children's social communication skills development, ultimately ensuring program success and thus positively impacting the parents and the children with ASD. This information could also be highly worthwhile to clinicians and researchers in ASD intervention to plan and design effective early intervention programs for this population (Widianti & Chamidah, 2024), particularly in developing countries with low resources available (Cullenward et al., 2024).

Literature Review

Two main points will be discussed in this section.

Definition of Social Communication

ASD is a neurodevelopmental disorder characterised by two key features: (1) persistent deficits in social communication and social interaction across multiple contexts, either currently or in the past, and (2) restricted, repetitive patterns of behaviour, interests, or activities, either presently or historically (The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition [DSM-5]; the American Psychiatric Association [APA], 2013). Though social communication is a core deficit among the ASD population, the operationalising term has been defined interchangeably in ASD research.

For example, the DSM-5 does not define social communication specifically because it focuses on diagnosing disorders that can impact social communication rather than defining the concept itself. However, the DSM-5 does have a category for Social (Pragmatic) Communication Disorder (SCD). This diagnosis highlights the importance of the pragmatic aspects of communication, which refers to the use of language effectively in social situations. Hence, DSM-5 describes social communication disorder according to these two dimensions: (1) persistent difficulties in the social use of verbal and nonverbal communication, and (2) difficulties in adapting communication to different contexts (i.e., who is the listener and social situation). Even though DSM-5 did not have a direct definition, this diagnostic criteria for SCD offered a framework for understanding the core aspects of social communication.

Meanwhile, the International Speech Communication Association (ISCA) defines social communication as using communication processes to create, share, and manage information within and between social systems. Additionally, the American Speech-Language-Hearing Association (ASHA) defines social communication as encompassing social interaction, social cognition, pragmatics, and language processing. These skills enable individuals to engage and interact within a societal framework, sharing experiences, thoughts, and emotions through various modalities, including nonverbal, spoken, written, and visual-gestural (sign language) communication.

Social communication skills are often identified as a primary focus for intervention in children with ASD, highlighting the importance of early intervention in this area (Brian et al., 2022; Fuller & Kaiser, 2020; Wattanawongwan et al., 2020). Addressing children's pragmatic skills and social challenges during their early years is essential to providing them with equal development opportunities, enabling them to reach their full academic and social potential (Zaidman-Zait et al., 2020).

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Definition of Parent-Implemented Intervention

Many researchers have developed interventions that parents can implement at home, allowing for earlier intervention and support for children with ASD (Brian et al., 2022). An early intervention program that involves parents actively as implementers or mediators to deliver skill-focused early intervention goals at home, whereby the child benefits directly through parents, is known as "parent training" (Bearss et al. 2013b; Ingersoll & Dvortcsak, 2006; Oosterling et al., 2010; Solomon et al., 2007), "parent education'' (Schultz et al., 2011; Steiner et al., 2012), "parent-implemented'' (Bearss & Stewart, 2015; Brown & Woods, 2016; Ingersoll & Gergans, 2007; Reagon & Higbee, 2009; Tarbox et al., 2010), "parent-mediated'' (Green et al., 2010; Ingersoll & Wainer, 2013; Oono et al., 2013; Siller et al., 2013), or ''caregiver-mediated'' (Kasari et al., 2010, 2014).

Parent-mediated intervention is delivered by individuals closest to the child, which naturally increases learning opportunities across various contexts and interactions, supporting the child's development over time (O'Toole et al., 2021; Pacia et al., 2021). Research has shown that parent-implemented interventions can significantly enhance social communication in children with ASD (Green et al., 2017; Schertz et al., 2017). For example, studies have reported notable improvements in joint attention (Schertz et al., 2013; Schertz et al., 2017), interactive play, gaze shifting, and shared positive affect. Additionally, children with ASD have demonstrated gains in verbal communication as a result of these interventions (Green et al., 2015; Kasari et al., 2014).

Parent-implemented intervention engaged parents in a therapist role, guiding parents to make their own decisions (Jurek et al., 2022), with a range of strategies introduced in a tailored manner, from changing parents' communication skills to teaching comprehensive skills such as social skills, joint attention, or communication skills (Yosep et al., 2022). By acquiring this, parents can promote the social, language, and communication skills of children with ASD (Klatte & Roulstone, 2016; Schertz & Horn, 2017). This review emphasises the importance of identifying elements in parent-implemented intervention practices that focus on social communication, which may benefit parents and their children in early intervention programs.

Methodology

This review utilised the five-stage methodological framework proposed by Arksey and O'Malley (2005) and was reported following the Preferred Reporting Items for Systematic Review and Meta-Analysis Extension for Scoping Reviews (PRISMA-ScR; Waid & Uhrich, 2020). Scoping reviews are beneficial for mapping specific research areas that have not been extensively reviewed, such as parent-implemented intervention practices. They also help examine what and how research has been conducted within a given field (Arksey & O'Malley, 2005). This systematic approach comprises five distinct stages, as outlined below.

Stage 1: Specify The Research Questions

This scoping review is guided by the main research question, which was aimed at identifying "What are critical components or elements embedded in the parent-implemented intervention that contribute to the program's success in educating, training, and coaching parents of children with ASD to improve their child's social communication skills?.

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Stage 2: Identify Relevant Studies

The relevant studies related to research questions were identified through IIUM Databases: Scopus, PubMed, Cochrane Library, and ProQuest Health and Medical Complete. A comprehensive key term in search queries results in a thorough coverage of the literature (Arksey & O'Malley, 2005). The search strategy was designed to include all relevant studies comprehensively.

The search string strategies relevant to parent-implemented intervention studies were determined in a discussion with a second co-author, corresponding author, and a librarian specialising in health sciences at the International Islamic University Malaysia. The keywords used were a combination of primary keywords' synonyms compiled using the Population, Concept, and Context framework (PCC), as recommended by Pollock et al. (2023) and Medical Subject Headings (MeSH). The search strategies also adopted Boolean operators to refine and focus on specific keywords designed.

The search results, including abstracts, were uploaded into reference management software and saved in Excel format. To ensure accuracy and consistency, two reviewers compared the data to identify and resolve any discrepancies. Table 1 presents the key search terms used, while Table 2 outlines the inclusion and exclusion criteria applied in the review.

Table 1: Key Search Terms

Search Terms
("parent-implemented intervention" OR "parent training" OR "parent-mediated intervention" OR "parent coaching" OR "parent education") AND ("social communication" OR pragmatic*) AND (autis* OR ASD OR PDD) AND (child* OR preschool* OR kindergarten* OR toddler*)

Table 2: Inclusion and Exclusion Criteria

Criterion	Inclusion	Exclusion
Year	2012 to 2023	Studies published outside the specified date range
Language	Full text in English	Studies not reported in English
Type of article	Peer-reviewed	Other than peer-reviewed articles (e.g. grey literature, books, letters)
Population	Parents of children diagnosed with ASD aged 0 to 6;11	Studies included other than parents and children not diagnosed with ASD or have other diagnoses, aged more than 7 years old
Concept/Context	Parent-implemented intervention focuses on the social communication skills of children with ASD	Interventions not related to parent-implemented intervention and outcomes other than social communication

Stage 3: Study Selection

The literature search process concluded in January 2024 and yielded 244 relevant studies. After removing 100 duplicates found in the records using the sorting feature, 144 studies were then screened independently by two reviewers. Following title and abstract screening based on inclusion-exclusion criteria, 53 studies were excluded. Of 91 studies, 24 failed to retrieve full

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articles despite the researcher contacting the author or finding them through the university library. Before full-text review, reviewer discrepancies were resolved through consensus in a few meetings.

The full review of 67 studies resulted in 37 rejected for multiple reasons. Finally, once both reviewers achieved the same consensus for all included studies, 30 were retained for data analysis. The searching and screening process lasted three weeks. Figure 1 illustrates the study's selection process.

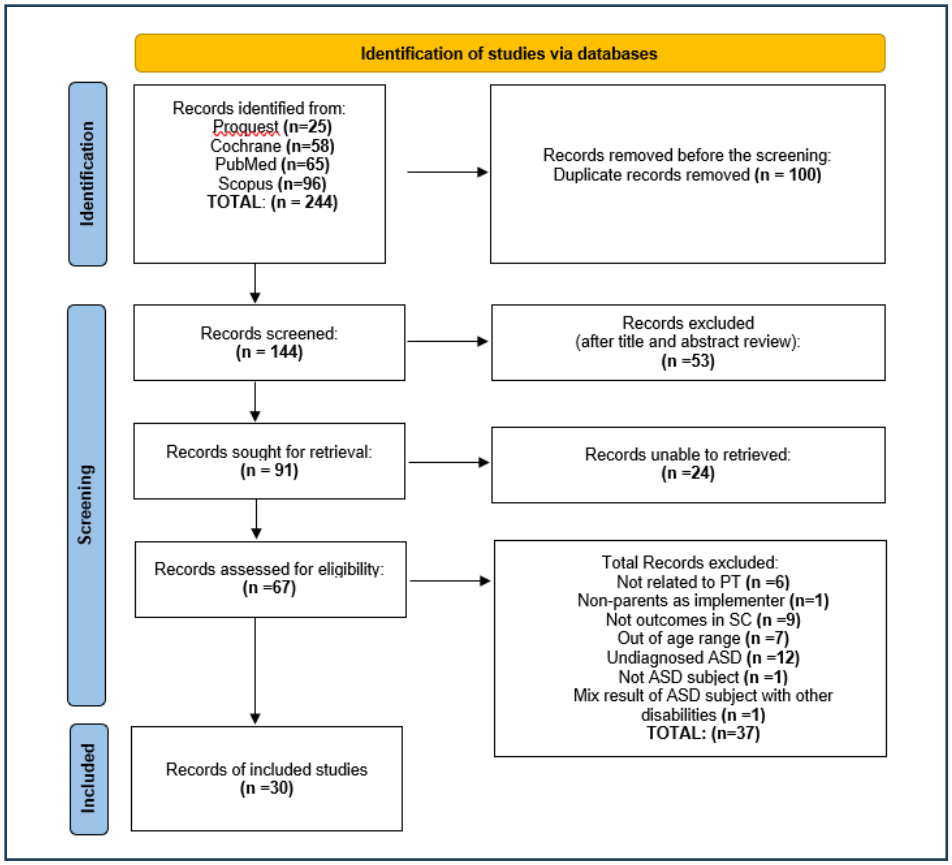

Figure 1: PRISMA Flow Diagram for Selecting Studies

Stages 4 and 5: Data Extraction, Synthesis and Summarise

A specific data charting form was created using the Microsoft Excel software (Microsoft Corporation, n.d.), piloted by the first reviewer and further refined and verified by the second reviewer. Data were extracted from 30 studies that met the inclusion criteria. The data was charted and summarised in Table 3 and Table 4, categorised based on studies' characteristics that addressed critical elements in parent-implemented intervention practices.

After data extraction and charting, the analysis was conducted using frequency analysis and basic qualitative methods, specifically thematic analysis (Mays, 2005). A reviewer synthesised and summarised the findings under thematic headings, and other co-authors subsequently cross-checked the results to ensure accuracy and consistency.

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Table 3: Matrix of Summarised Studies

No.	Author	Year	Study Location	Sample	Study Design
1	Garnett et al.	2022a	Australia	11 children, 11 mothers	Convergent mixed methods
2	Garnett et al.	2022b	Australia	11 children, 11 mothers	Case experimental, multiple-baseline-across-groups (SSD)
3	Valeri et al.	2019	Italy	34 children, 17 fathers, 17 mothers	Randomised Controlled Trial
4	Frolli et al.	2021	Italy	84 children, 64 males, 20 females	NA
5	Ferguson et al.	2023	United Kingdom	2 children, 2 mothers	Single-subject research design (SSD)
6	Ferguson et al.	2022	United Kingdom	5 children, 5 females	Concurrent multiple probe design (SSD)
7	Gengoux et al.	2019	United States	48 children, 10 males, 38 females	Randomised Controlled Trial
8	Hardan et al.	2014	United States	53 children, 4 males, 49 females	Randomised Controlled Trial
9	Liu et al.	2023	United States	4 children, 4 mothers	Single-subject, multiple baseline (SSD)
10	Schertz et al.	2013	United States	23 children	Randomised Controlled Trial
11	Ibañez et al.	2018	United States	104 children, 10 fathers, 94 mothers	Randomised Controlled Trial
12	Flippin	2019	United States	1 child, 1 father/mother	Single-subject, multiple baselines (SSD)
13	Thomeer et al.	2020	United States	12 children	Non-randomised controlled trial
14	Klein et al.	2021	United States	15 children, 1 male, 14 females	Randomised Controlled Trial
15	Hernandez Ruiz & Braden	2021	United States	4 children, 1 father, 3 mothers	Single case, alternating treatment design (SSD)
16	Meadan et al.	2016	United States	3 children, 3 mothers	Multiple-baseline design, two-phased intervention (SSD)
17	Gulsrud et al.	2016	United States	86 children	NA
18	Schertz et al.	2017	United States	144 children	Randomised Controlled Trial
19	Yllades et al.	2021	United States	3 children	Single case, multiple probe design (SSD)
20	Erturk et al.	2020	United States	2 children, 2 mothers	Multiple baseline design (SSD)
21	Wetherby et al.	2014	United States	82 children	Randomised Controlled Trial
22	Shire et al.	2014	United States	61 children, 10 fathers, 51 mothers	Randomised Controlled Trial
23	Gengoux et al.	2015	United States	23 children	Randomised Controlled Trial
24	Heffler et al.	2023	United States	9 children	NA
25	Rollins	2018	United States	34 children, 34 mothers	Randomised Controlled Trial
26	Vismara et al.	2016	United States	24 children,5 fathers, 19 mothers	Randomised Controlled Trial
27	Guthrie et al.	2023	United States	82 children	Randomised Controlled Trial
28	Zhou et al.	2018	China	43 children	Non-randomised controlled trial

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29	Sengupta et al.	2023	India	12 children, 12 mothers	Quasi-experimental pre-post with mix-method
30	Sengupta et al.	2020	India	57 children, 57 mothers	Quasi-experimental pre-post

NA, not available, SSD, single subject research design

(continuation) Table 3: Matrix of Summarised Studies

Intervention	Trainer/Facilitator	Findings
Telepractice HMTW	SLP	Child: Improved social interaction and play post-intervention Parent: Higher learning and confidence, but no significant stress reduction
Telepractice HMTW	SLP	Child: Increased social communication behaviour Parent: Higher responsiveness and maintained behaviour change post-intervention
TEACCH-CPMT and LPI	Therapist, Clinical Psychologist	Child: Significant improvement in socio-communication skills ($p < 0.05$), reduction in ASD symptom severity Parent: Stress scores significantly decreased post-intervention
ABA Training and Parental Reflexive Functions (RF)	Psychologist	Child: Significant increase in joint attention and early social skills ($p < 0.05$) Parent: The RF group showed greater mentalisation skills than the ABA group
Telehealth ABA-based Parent Training	Psychologist and teacher background	Child: Demonstrated increased use of verbal operant Parent: High fidelity in applying ABA-based strategies via telehealth
Telehealth ABA-based in Social Communication	Psychologist	Child: Variable improvements in social communication Parent: High fidelity and viewed telehealth training favourably
PRT Package (PRT-P)	Bachelor-master level	Child: Significant increase in functional utterances ($p = 0.026$, $d = 0.61$), social communication scores improved Parent: 91% of parents implemented PRT with fidelity within 24 weeks
PRT Group (PRTG)	Clinician, Psychologist,	Child: Significant increase in frequency of utterances ($p = 0.038$, $d = 0.42$), improvement in

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	Clinical psychology graduate student	adaptive communication Parent: 84% of parents met fidelity criteria after 12 weeks
Telehealth Music-RIT	SLP	Child: No consistent increase in imitation skills, though qualitative reports suggested engagement improvements Parent: Met fidelity criteria by the end of treatment, increased use of musical elements in play
JAML intervention	Childhood education and counselling background	Child: Large effect sizes for improvements in Focusing on Faces ($d > 1.0$), Responding to Joint Attention ($d > 1.0$), and Receptive Language ($p < 0.05$) Parent: Increased responsiveness and interaction quality with children
The Enhancing Interactions Tutorial Web-based	Self-directed, web-based learning	Child: Engagement during routines increased significantly ($p < 0.01$), higher ratings in social communication at T2 and T3 Parent: Stress decreased significantly ($p < 0.01$), and parenting efficacy increased at T3
FCC Intervention	SLP	Child: Single-word utterances increased by 40%, multi-word utterances newly emerged Parent: Reduction stress level post-intervention, though statistical significance was not tested
SummerMAXyc	Clinician	Child: 10 out of 12 children were treatment responders ($d = 1.76$), with a significant reduction in ASD symptoms ($p < 0.05$) Parent: High satisfaction levels, no attrition observed
Video feedback Parent-Mediated NDBI	SLP, Psychologist	Child: Children improved social communication and adaptive behaviours Parent: High parental engagement and satisfaction with video feedback
Music Intervention-ESDM	Therapist	Child: Improved child responses and synchrony in music-based condition Parent: Better engagement and learning in music-based sessions
Internet-Based Parent-Implemented Communication	Special education background	Child: Improved in communication skills after parent training ($p < 0.05$) Parent: Implemented naturalistic teaching strategies with high fidelity

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Strategies (i-PiCS)		
JASPER Parent-Mediated	Interventionist	Child: Significant improvement in joint engagement in the JASPER group ($p < 0.01$) Parent: Effectively implemented strategies, with mirrored pacing as a key mediator
JAML intervention	Interventionist	Child: Post-intervention improvements in joint attention ($p < 0.05$), sustaining at 6 months Parent: Increased engagement and mediated learning
Telepractice Parent Coaching	Special education and education psychology background	Child: Bilingual children improved communication via multimodal approaches Parent: Successfully adapted culturally responsive communication strategies
Parent Implemented Early Social Communication Intervention	Special education background	Child: Significant gains in child social communication ($p < 0.05$) Parent: Improved fidelity in intervention strategies
ESI Parent-Implemented Intervention	Interventionist	Child: Individual-ESI group improved significantly in social communication and receptive language ($p < 0.05$) Parent: Better coaching efficacy in individual ESI compared to group ESI
JASPER and EMT	Speech clinician, Child psychologist, Special education	Child: Improvements in joint engagement and social communication ($p < 0.05$) Parent: Mastered 70% of the strategies, with the highest gains after active coaching
PRT Parent Training	Psychologist	Child: Significant improvement in functional utterances ($p = .009$), gains in cognitive abilities Parent: Parents maintained high fidelity in PRT strategies over 3-month follow-up
Parent Training and Support Program	Researcher	Child: Significant reduction in screen time (5.6 hours/day to 5 min/day), improved social communication ($p < 0.05$) Parent: Decreased stress and high intervention acceptability

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Pathways Early Autism Intervention	SLP, Interventionist	Child: The Pathways group had greater gains in social eye gaze and verbal reciprocity (p = .002) Parent: Increased engagement and improved interaction quality
ESDM-Telehealth Parent Training (P-ESDM)	Therapist, self-learning mode	Child: Significant improvements in social communication across telehealth and in-person groups Parent: The telehealth group reported higher fidelity and satisfaction
ESI model	Interventionist-master level	Child: Children starting ESI at 18 months had greater gains than those starting at 27 months Parent: Higher engagement in earlier intervention groups
Parent-implemented ESDM (P-ESDM)	Therapist	Child: Significant improvement in language development ($p < 0.05$), increased social affect scores, no significant change in ASD severity Parent: Stress decreased in the P-ESDM group ($p < 0.05$), increase in the community group
UPPA	OT with special education	Child: Significant improvement in social-communication skills ($p < 0.01$) as rated by parents Parent: Achieved fidelity in intervention implementation with high completion rates
Project ImPACT	SLP, Psychologist, Special education, OT	Child: Increased social engagement ($p < 0.05$) Parent: Lower stress and improved implementation fidelity

SLP, Speech-language pathologist, OT, Occupational therapist, ABA, Applied Behaviour Analysis, CPMT, Cooperative Parent-Mediated Therapy, EMT, Enhanced Milieu Teaching, ESDM, Early Start Denver Model, ESI, Early Social Interaction, FCC, Father Communication Coaching, ImPACT, Improving Parents As Communication Teachers, LPI, Low-Intensity Psychosocial Intervention, HMTW, Hanen More Than Words, JAML, Joint Attention Mediated Learning, JASPER, Joint Attention, Symbolic Play, Engagement, and Regulation, NDBI, Naturalistic Developmental Behavioural Interventions, SummerMAXyc, cognitive-behavioural summer treatment, PRT, Pivotal Response Treatment, RIT, Reciprocal Imitation Training, TEACCH, Treatment and Education of Autistic and Related Communication Handicapped Children, UPPA, Ummeed Parent Training Programme

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Table 4: Critical Elements in Parent-Implemented Intervention Practises

Elements	Studies
Naturalistic Strategies	Meadan et al. (2016), Heffler et al. (2023), Gengoux et al. (2015)
Use of Video	Garnett et al. (2022a, 2022b), Klein et al. (2021), Ferguson et al. (2022)
Early Intervention	Guthrie et al. (2023)
Evidence-Based Strategies or Program	Gulsrud et al. (2016), Hernandez Ruiz & Braden (2021), Sengupta et al. (2020), Valeri et al. (2019)
Cultural Adaptation	Sengupta et al. (2020)
Intervention Reliability	Schertz et al. (2013), Wetherby et al. (2014), Meadan et al. (2016), Ibañez et al. (2018)
Parental Psychological Well-being	Frolli et al. (2021)
Pivotal Skills Development	Liu et al. (2023), Rollins (2018), Erturk et al. (2021)
Online Parent Training	Garnett et al. (2022a, 2022b), Sengupta et al. (2023), Yllades et al. (2021)
Self-Directed learning	Ibañez et al. (2018), Vismara et al. (2016)
Hybrid Parent Training and Clinician-delivered	Gengoux et al. (2019), Hardan et al. (2014)
Group Training	Gengoux et al. (2015), Garnett et al. (2022a)
Individual Training or Coaching	Ferguson et al. (2022, 2023), Flippin (2019), Guthrie et al. (2023), Schertz et al. (2013,2017), Sengupta et al. (2023), Shire et al. (2014), Zhou et al. (2018), Garnett et al. (2022a)

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Findings

This review (refer to Table 3) presents a synthesis of studies published between 2012 and 2023 across multiple countries, with a majority (n=21) in the United States, followed by Australia (n=2), Italy (n=2), the United Kingdom (n=2), India (n=2), and China (n=1). The studies were published the most in 2023 and 2021, the rise of which began in 2013, with no relevant publications found in 2012. Sample sizes ranged widely, from single-case studies (Flippin, 2019: n=1 child) to over 100 participants (Ibañez et al., 2018: n=104 children). Parental involvement was frequently documented, with mothers comprising most participating caregivers (e.g., 94 mothers in Ibañez et al., 2018; 34 mothers in Rollins, 2018).

Randomised controlled trials (RCTs) were the most common study design, accounting for 43% (n=13) of the published research. These studies often involved larger sample sizes, such as Schertz et al. (2017) with 144 participants and Guthrie et al. (2023) with 82 participants. Single-subject research designs (SSD) were utilised in nine studies, typically with small cohorts of children (e.g., Ferguson et al., 2023: n=2; Liu et al., 2023: n=4). Other study designs utilised in parent-implemented interventions include quasi-experimental designs, non-randomised controlled trials, and a mixed-method approach. Three studies (Frolli et al., 2021; Gulsrud et al., 2019; Heffler et al., 2023) have not reported their study design.

Various intervention programs are used in parent-implemented intervention practices to support children's development through parental involvement. Of the 30 studies, 25 (83%; n=25) integrated established programs or evidence-based strategies in their parent-implemented intervention approach. Well-supported evidence-based programs included Pivotal Response Treatment (PRT) (n=3), the Early Start Denver Model (ESDM) (n=3), the Applied Behaviour Analysis-based approach (n=3), and the Joint Attention, Symbolic Play, Engagement, and Regulation (JASPER) parent-mediated intervention (n=2). However, five studies (17%) did not provide specific details about the programs used in their parent-implemented intervention.

Most studies employed a single professional as the trainer in parent-implemented intervention programs, though individuals from diverse professional and educational backgrounds were involved. Many studies (93%; n=28) utilised highly trained professionals, including speech-language pathologists (SLPs), psychologists, special educators, and child psychologists, to train parents in implementing intervention strategies. Among these, 79% (n=22) relied solely on a professional trainer, while others engaged two trainers (n=3), three trainers (n=2), and a maximum of four trainers (n=1). In contrast, two studies adopted alternative approaches to parent training—one combined therapist involvement with self-directed learning, while the other implemented a fully self-guided online learning format.

Notably, all 1076 children in the review had a formal diagnosis of ASD in all treatment programs. The outcomes of various intervention programs, focussing on both child and parent improvements, demonstrate the efficacy of each intervention in enhancing developmental, social, and communication skills in children while also evaluating parental engagement, stress levels, and fidelity in implementing intervention strategies. The child-specific findings indicate that most interventions contributed to improved social communication skills, such as increased verbal utterances, enhanced joint attention, and reduced ASD symptom severity.

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Nearly half of the studies (47%, n=14) demonstrated improvements in children's social communication skills following the intervention (Gengoux et al., 2019; Sengupta et al., 2023, 2020; Thomeer et al., 2020). Meanwhile, nine studies (30%) reported mixed results (Guthrie et al., 2023; Klein et al., 2021), and two studies (7%) found no significant effects on social communication skills post-intervention (Heffler et al., 2022; Vismara et al., 2018). Additionally, five studies (17%) relied on parents' assessments to evaluate their child's improvement in social communication (Garnett et al., 2022; Meadan et al., 2016; Sengupta et al., 2023, 2020; Zhou et al., 2018).

Parental engagement and confidence in implementing interventions were key focal points in many studies. The findings indicate that parents who received structured coaching or self-directed training achieved high fidelity in implementing intervention strategies, with several interventions reporting over 90% of parents successfully applying techniques within 12 to 24 weeks. Overall, almost two-thirds of the studies (80%, n=24) showed improvement in measurement for parents (Ferguson et al., 2022; Flippin, 2019; Hernandez Ruiz & Braden, 2021), while six studies (20%) had mixed results (Garnett et al., 2022a, 2022b, Liu et al., 2023) following the intervention.

Besides, thirteen critical elements in parent-implemented intervention practice were highlighted in Table 4, which provided insights into potential factors influencing the successes of parent-implemented intervention practices. Articles from the same area will be discussed together.

Discussions

This review aimed to identify essential elements in the parent-implemented intervention practices, focusing on improving the development of social communication skills in children with ASD, which ultimately benefits both parents and their children. From data analysis of 30 studies, several knowledge gaps in parent-implemented interventions need further exploration. The increase in research publications on parent-implemented interventions after 2013 aligns with the global rise in ASD awareness. This growth has been partly influenced by changes in diagnostic criteria and well-established research infrastructures and funding sources (Autism Spectrum Disorder Research Portfolio Analysis Report 2013 - Funders | IACC, n.d.), particularly in western regions.

Although numerous studies have explored parent-implemented interventions, a significant geographic bias remains, with 90% of the research conducted in western countries. In contrast, only three studies have been conducted in eastern regions (Sengupta et al., 2020, 2023; Zhou et al., 2018). Interestingly, despite the rising prevalence of ASD in eastern countries such as China and India, research on parent-implemented interventions only began in 2018 (Zhao et al., 2021), indicating a delay in research development. This lag may be attributed to differences in healthcare systems, research funding, and awareness of the importance of early intervention (e.g., Zakirova-Engstrand & Yakubova, 2023).

While most studies reported the gender and number of parent participants, 10 studies (33%) lacked this information, indicating a gap in transparency. Furthermore, a review of 20 studies revealed a significant imbalance in parental representation, with none focusing exclusively on fathers. This finding highlights a gender disparity in parental engagement, underscoring the need for future research to adopt more inclusive study designs. Ensuring balanced

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representation of both parents in early intervention studies can provide a more comprehensive understanding of their roles and contributions.

While randomised controlled trials (RCTs) remain the predominant study design, the growing use of single-subject designs (SSDs) reflects a shift towards more individualised and precision-based approaches. Compared to large-scale RCTs, SSDs are more cost-effective and feasible (Byiers et al., 2012), enabling the examination of intervention effects at the individual level. This approach provides valuable insights into how interventions work for specific children and families. The increasing adoption of SSDs aligns with a broader trend in healthcare and education toward personalised and precision-based methodologies (Byiers et al., 2012).

Despite variation programs used in the parent-implemented intervention, nine studies used telehealth-based approaches, and two studies used a hybrid of online-offline mode, possibly potential to reduce the cost compared to traditional training models (Ferguson et al., 2022) and expand the participants (Zorzi & Marzano, 2020), particularly for those residing in rural areas. The 2019 pandemic also promoted a shift towards the use of remote parent-implemented intervention delivery models, hence reflecting a broader trend in healthcare research (Smith et al., 2019) and offering alternatives to delivering intervention other than offline mode. Besides, the terminology employed for describing the trainer (e.g., therapist, clinician, interventionist) in parent-implemented intervention differed between studies; thus, this inconsistency may lead to inconclusive findings. Most of the studies (79%) assigned a professional as the trainer, addressing the varying demands of the parents and children with ASD.

While study findings on children's social communication outcomes remain inconsistent, the results regarding parental fidelity and acceptability are promising. Most studies indicate a significant improvement in parent fidelity when interventions include parent training and coaching, compared to programs without a coaching component (Meadan et al., 2016). This aligns with research showing high treatment fidelity among participants who received remotely delivered parent-implemented intervention programs (Ferguson et al., 2019; Parsons et al., 2017).

The critical elements of parent-implemented interventions emphasise evidence-based, adaptable, and culturally relevant approaches that enhance parental competence and child development. Effective strategies include naturalistic learning, early intervention, structured training, and self-directed learning, supported by video-based and online resources. Integrating hybrid models, group training, and individualised coaching ensures flexibility and accessibility, catering to diverse needs. Additionally, parental psychological well-being plays a crucial role in sustaining intervention effectiveness. By incorporating these key elements, interventions become more reliable, inclusive, and impactful, ultimately improving long-term developmental outcomes for children while empowering parents as active participants in the process.

Conclusions

This review effectively identified and outlined the key elements of parent-implemented intervention practices globally while highlighting several gaps in the existing literature. The increasing diversity of research methodologies in recent years indicates a growing openness among researchers to employ various study designs to address different research questions. Additionally, the findings emphasise the effectiveness of parent-implemented interventions in

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enhancing children's social communication skills and strengthening parental engagement and confidence in delivering interventions.

Key elements contributing to successful interventions include early intervention, evidence-based strategies, naturalistic learning, and a combination of structured training with self-directed learning. Telehealth and hybrid models have emerged as effective and accessible methods for overcoming geographical barriers. Furthermore, parental psychological well-being and coaching are essential to sustaining intervention fidelity and effectiveness. With the rising prevalence of ASD diagnoses worldwide and the limited resources available in many countries, there is a critical need to explore accessible and scalable service delivery models. Research should focus on various approaches, such as peer-based, group, classroom, and remote interventions, within real-world community settings to enhance their feasibility and effectiveness.

The involvement of trained professionals, structured methodologies, and evidence-based approaches further supports the efficacy of these interventions in addressing ASD-related challenges. Future research could explore the long-term sustainability of these improvements and the role of culturally responsive adaptations in enhancing intervention effectiveness. Future research should address the gender disparity in parental involvement, enhance cultural adaptations of interventions, and expand studies to under-represented regions. Strengthening these areas will contribute to the development of more inclusive, sustainable, and impactful parent-implemented intervention programs, ultimately benefiting both parents and children with ASD.

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