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Educational Outcomes of Speech Therapy Interventions for Children with Speech Delay: A Systematic Review

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Abstract
Speech delay in children may hinder communication development, classroom participation, early literacy readiness, and social interaction, making effective educational intervention essential for supporting learning. This systematic review aimed to synthesize the effectiveness of educationally oriented speech and language interventions in improving children's communication abilities and related learning outcomes. The review followed the PRISMA 2020 guidelines. Searches were conducted in Scopus, Web of Science, PubMed/MEDLINE, and ScienceDirect for studies published between 2021 and June 2026. Studies involving children with speech delay or speech and language disorders who received speech and language interventions with educationally relevant outcomes were included. Five primary studies involving 320 children met the eligibility criteria, comprising three randomized controlled trials and two non-randomized studies. Risk of bias was assessed using RoB 2 and ROBINS-I, while certainty of evidence was evaluated using GRADE. Owing to substantial heterogeneity in participants, interventions, outcome measures, and follow-up periods, a narrative synthesis was conducted. Overall, the evidence indicates that educationally oriented speech and language interventions improve articulation accuracy, speech intelligibility, phonological skills, and functional communication, with family-supported interventions showing additional benefits in reinforcing targeted communication skills. However, evidence for the transfer of these gains to broader communication, sustained classroom participation, and long-term outcomes remains limited. These findings suggest that interventions tailored to children's communication needs can support communication development and educational participation, particularly by enhancing classroom engagement and early literacy readiness.

Keywords: speech delay, speech therapy, educational intervention, inclusive preschool, family involvement

INTRODUCTION

Communication delay in children is a multidimensional condition that affects not only speech production but also language comprehension, vocabulary development, speech intelligibility, and the ability to communicate effectively in everyday situations. Within educational settings, these difficulties extend beyond clinical concerns by influencing classroom participation, peer interaction, early literacy development, and school readiness (Jullien, 2021). Since communication competence underpins children's academic achievement, social participation, and learning engagement, early intervention has become an important component of inclusive education (Riad et al., 2023). This educational perspective is supported by evidence showing that communication skills develop most effectively through meaningful learning interactions, supportive classroom environments, and active participation in communicative activities (Farhan et al., 2025). Furthermore, teachers play an essential role in facilitating communication development by implementing interactive teaching strategies and visual learning media that encourage children with speech delay to participate actively in classroom communication (Anriyani & Vitaloka, 2025).

The term speech delay is frequently used as a general term for describing various communication disorders in children. Intervention literature shows that the population studied can include children with developmental language disorder, late language emergence, speech sound disorder, and severe speech motor delay (Nouraey et al., 2021). Although these conditions differ in their underlying characteristics and intervention needs (Liang et al., 2023; Sansavini et al., 2021). They share common educational consequences, including reduced opportunities to participate in classroom learning, interact with peers, and develop early literacy skills. Consequently, speech and language interventions should be evaluated not only for their therapeutic effectiveness but also for their contribution to children's educational participation and learning outcomes.

Speech and language interventions encompass diverse approaches, including speech motor therapy, phonological intervention, language stimulation, dialogic reading, play-based intervention, technology-assisted learning, and family-mediated programs. Evidence from preschool language enrichment programs suggests that educationally embedded interventions can enhance children's communication skills while supporting classroom engagement and early literacy development (West et al., 2024). Therefore, evaluating intervention effectiveness from an educational perspective requires consideration of how communication gains are transferred into meaningful participation in learning activities rather than focusing solely on improvements in speech accuracy.

From an educational perspective, intervention success extends beyond improvements in articulation or vocabulary. More meaningful outcomes include children's ability to understand classroom instructions, participate in discussions, communicate with peers and teachers, express their needs, and engage in literacy-related activities, influenced by collaboration among speech-language therapists, teachers, and families, as well as by supportive learning environments (Fitri et al., 2025). The change rates, effect size, and confidence intervals presented in this study are derived from the primary studies or meta-analyses reviewed. Claims regarding effectiveness need to be formulated proportionally by considering research design, evidence quality, population characteristics, intervention type, therapy dose, measurement instrument, follow-up duration, and their usefulness in the learning process (Moges et al., 2024).

Some of the previous studies have not adequately explained the database, search strategy, selection criteria, quality assessment process, study heterogeneity, and the

relationship between therapeutic dose and outcomes. Children with language disorders need sustained support at school, so their academic, social, and participation needs can be met in an inclusive community (Chahboun et al., 2024). Discussion is also often descriptive in nature because studies are summarized separately without comparing interventions mechanism, implementation intensity, family involvement, teacher support, and the rate of transfer of results. This approach makes it difficult for readers to determine the intervention type that is most appropriate for a particular disorder profile and to assess whether the improvements found can be applied in everyday communication and learning activities.

Research gaps in this field can be identified at three levels. First, previous studies have generally focused on one diagnostic group or one ability domain, such as vocabulary, developmental language disorder, speech sound disorder, or speech motor delays. This separate focus limits understanding of differences in mechanism and effectiveness between intervention types. Second, proximal outcomes, such as articulation accuracy, word count, and the ability to repeat sounds, are often equated with distal outcomes, such as conversational intelligibility, functional communication, social participation, and readiness to participate in learning activities. Improvements in skills that are directly trained do not necessarily transfer automatically to more complex communication situations. Third, Therapy dose, treatment fidelity, implementer competence, family involvement, teacher collaboration, classroom activity integration, and school support have not been widely analyzed in an integrated manner as factors that can strengthen or limit intervention effectiveness. Partnership between teacher and parents can strengthen the implementation of language strategies across home and school through ongoing communication, parent training, and collaborative problem solving (Hampton et al., 2023). Consequently, educational research increasingly emphasizes participation-based outcomes that reflect children's functional communication within authentic learning contexts.

Despite growing evidence regarding speech and language interventions, several limitations remain in the existing literature. Previous reviews have frequently focused on specific diagnostic groups or isolated intervention approaches, making comparisons across intervention mechanisms difficult. Furthermore, many studies have primarily evaluated proximal outcomes, such as articulation accuracy or vocabulary acquisition, while providing limited evidence regarding broader educational outcomes, including classroom participation, functional communication, and early literacy readiness. Factors that may influence intervention effectiveness, such as intervention dosage, family involvement, teacher collaboration, and implementation within educational settings, have also received relatively limited attention.

These limitations indicate the need for a more comprehensive synthesis that connects intervention characteristics with educational outcomes. Rather than examining therapeutic effectiveness alone, an educational perspective requires understanding how different intervention approaches support children's communication development in ways that facilitate participation in learning, inclusion, and literacy development. Such evidence is essential for informing educators, speech-language therapists, and families about intervention practices that are most likely to benefit children within school environments.

Accordingly, this systematic review advances previous reviews by synthesizing speech and language interventions through an educational lens. Specifically, it compares intervention approaches according to their underlying mechanisms, examines outcomes

across communication and educational domains, evaluates the influence of intervention dosage and family involvement, and critically appraises the methodological quality and certainty of the available evidence. By integrating clinical evidence with educational outcomes, this review provides a broader understanding of how speech and language interventions can support children's communication development, classroom participation, and early learning.

Therefore, this study aims to synthesize the effectiveness of educationally oriented speech and language interventions for children with speech delay and related communication disorders, examine their implications for communication and learning outcomes, evaluate the influence of intervention characteristics and contextual factors, and assess the methodological quality and certainty of the available evidence.

METHOD

This study employed a systematic narrative review to synthesize evidence on speech and language interventions for children with communication delays. A narrative approach was selected because the included studies differed in diagnosis, participant characteristics, intervention type and dose, comparison groups, outcome measures, and reporting methods. The review followed the PRISMA 2020 guidelines and applied the PICOS framework to define the research question and eligibility criteria (Page et al., 2021). Although the protocol was not prospectively registered, a predefined protocol guided the search, study selection, data extraction, and quality assessment to ensure methodological transparency. Owing to substantial clinical and methodological heterogeneity, no meta-analysis was conducted; therefore, all quantitative findings reported are those presented in the original studies.

Table 1. Research Eligibility Criteria

Component	Inclusion criteria	Exclusion criteria
Population	Children with speech or language delays, developmental language disorders, late talkers, speech sound disorders, or speech motor delays.	Adult populations or studies that do not provide separate child data.
Intervention	Speech, language, articulation, vocabulary, speech motor, family-based, caregiver-based, digital, or play interventions.	Diagnostic, prevalence, or screening studies without intervention outcome data.
Comparator	Routine care, waiting list, no intervention, therapist treatment only, condition before intervention, or comparison between strategies.	There is no comparable data or assessable change in results.
Outcome	Vocabulary, expressive or receptive language, articulation, PCC, intelligibility, functional communication, and participation.	Only reports satisfaction or acceptance of the program without communication outputs.
Design	RCTs, quasi-experiments, intervention studies, cohorts, systematic reviews, meta-analyses, scoping reviews, and umbrella reviews.	Editorials, opinions, conference abstracts, and protocols without results.

As presented in Table 1, literature searches were performed in Scopus, Web of Science Core Collection, PubMed/MEDLINE, and ScienceDirect for English-language articles published between 2021 and 2026 involving pediatric populations. The search strategy combined terms related to children, communication disorders, and speech-language interventions, with syntax adapted to each database. Retrieved records were merged, and duplicates were removed using DOI, title, author, and publication year. Study eligibility was determined according to the inclusion and exclusion criteria.

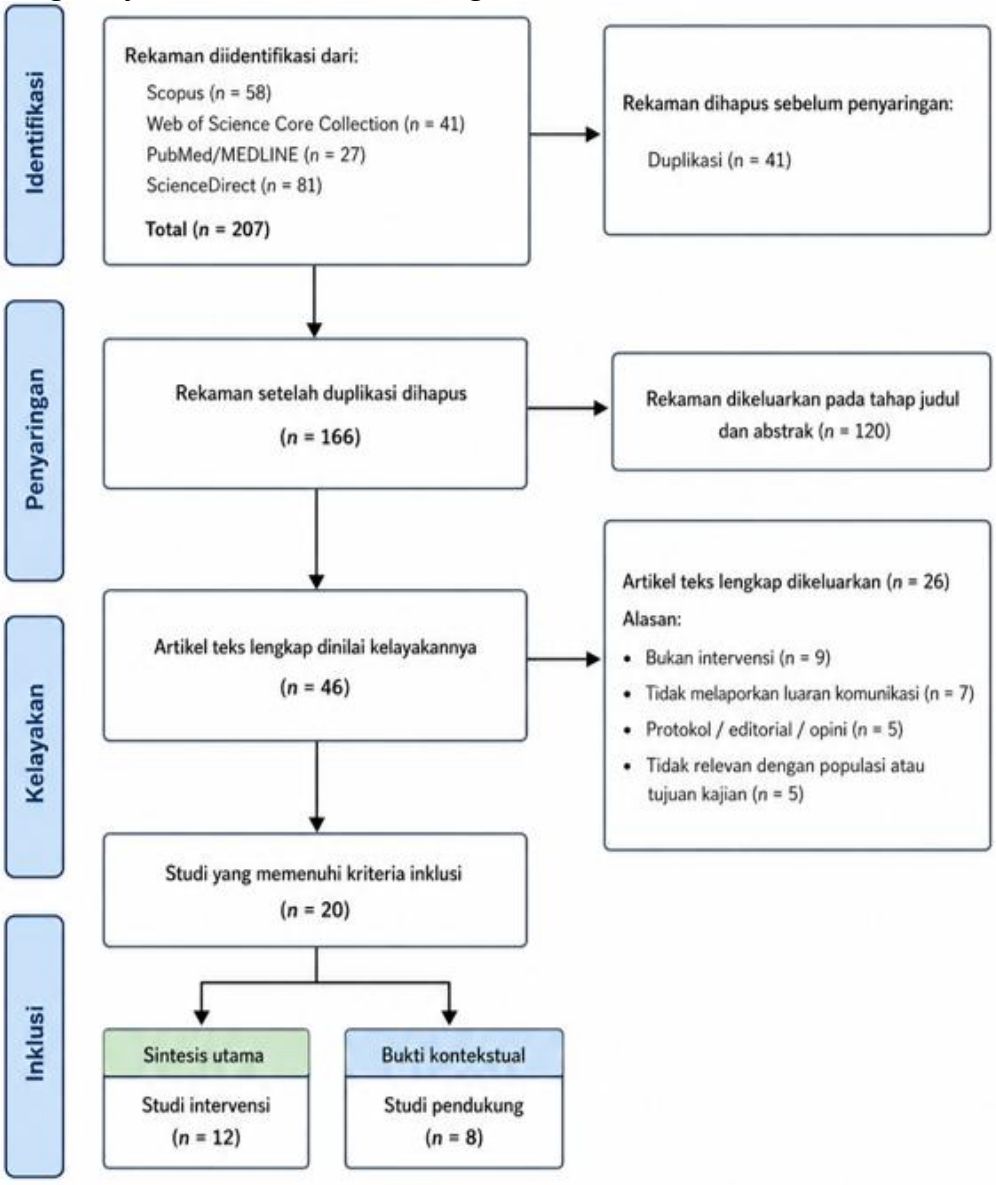


Figure 1. PRISMA 2020 Flow Diagram of the Process of Identification, Screening, Eligibility Assessment, and Article Selection

Selection was conducted through title and abstract screening followed by full-text review by two independent reviewers, with disagreements resolved through discussion or consultation with a third reviewer. The search identified 207 records (Scopus = 58, Web of Science = 41, PubMed = 27, ScienceDirect = 81). After removing 41 duplicates and

excluding 120 records during screening, 46 full-text articles were assessed. Of these, 26 were excluded because they did not evaluate interventions, report communication outcomes, or meet the eligibility criteria, resulting in 20 included studies (12 for the primary synthesis and 8 as contextual evidence).

Data extraction was independently performed by two reviewers using a standardized form, with discrepancies resolved by consensus. Extracted information included study design, participant characteristics, diagnosis, intervention type and dose, comparison group, outcome measures, numerical findings, family involvement, follow-up, and study limitations. Studies were categorized into speech motor and articulation, language and vocabulary, family or caregiver-based, and digital, media, or play-based interventions.

Methodological quality was evaluated independently by two reviewers using the JBI critical appraisal tools and the Mixed Methods Appraisal Tool (MMAT) for mixed-methods studies. Assessments covered study design, measurement validity, group comparability, confounding control, follow-up, intervention fidelity, analytical rigor, and reporting transparency. Studies were classified as high, moderate, or low quality, and the appraisal findings informed the interpretation of the evidence and the study conclusions.

The synthesis was conducted in a structured narrative manner by comparing populations, intervention mechanisms, therapy doses, family involvement, evidence quality, and outcome domains. Measures such as standardized mean difference, score change, and percentage change were maintained as per the original publication. Outcomes were mapped into proximal speech outcomes, language development outcomes, and functional-participatory outcomes to assess the level of maintenance and generalization of outcomes.

FINDINGS AND DISCUSSION

Findings

Evidence Characteristics

Twenty studies met the eligibility criteria, including 12 providing primary evidence on intervention effectiveness and 8 contributing contextual evidence on diagnosis, risk factors, outcome measurement, screen time, and early identification of communication delays. The evidence comprised randomized controlled trials, non-randomized comparative studies, systematic reviews, meta-analyses, scoping reviews, and umbrella reviews. Given the substantial clinical and methodological heterogeneity across study populations, interventions, treatment dosage, and outcome measures, findings were synthesized narratively rather than quantitatively, with detailed numerical results presented in Tables 2–5.

Table 2. Main Studies Synthesis

Study	Design/ sample	Intervention type	Dose	Outcome	Main result	Limitation	Quality
Namasivayam et al. (2021)	RCT; 49 SMD children	PROMPT motor-speech	45 minutes; 2x / week; 10 weeks	Motor control, articulation, PCC, intelligibility, function	+5.15 articulation score; +10.85% PCC; +8.59% word intelligibility; weak sentence/ function transfer	Small sample; highly experienced therapist; no long maintenance	High
Fan et al. (2022)	DLD meta-analysis	Language therapy	Varies	Vocabulary, complexity of phrases, and different words	SMD 0.43 vocabulary; 1.24 phrase complexity; 0.62 different words; long-	Interventions heterogeneity and size	High

					term effects inconsistent		
Fan et al. (2024)	Comparative; n=134	Therapist + family-centered therapy vs therapist alone	3 months	Gesell language and personal-social	Language gain 18.45±5.72 vs 13.00±6.16; personal-social 4.73±4.07 vs 2.20±3.68	Not random; potential confounding of family implementation	Medium
Finestack et al. (2022)	Scoping review; ages 0-48 months	Caregiver-implemented communication	Varies	Language and communication	The majority of studies show a positive trend; reporting fidelity and dose are not uniform.	Does not take into account the pooled effect	Medium-high
Pentimonti et al. (2022)	Parental intervention in home visiting	Parent-implemented language	Integrated home visits	Language development	Supporting literature reports effect sizes of 0.15–0.95; benefits depend on parental implementation.	Study-specific effects and generalizations require caution.	Medium
Suttora et al. (2021)	Late talkers intervention	Dialogic reading and parental responsiveness	Structured program	Expressive language	Changes are influenced by the contingency of parental speech and dialogic reading ability.	Mediator mechanisms; limited sample/ context	Medium-high
Siemons-Lühring et al. (2021)	RCT speech sound disorder	Integrated treatment	Structured	Articulation/ phonology	Improvement in target speech sounds; generalization depends on the target and intensity	Not identical to general speech delay	High
Rinaldi et al. (2021)	Systematic review DLD	Various language therapies	Varies	Phonology, vocabulary, morphosyntax	Positive effects in some domains, but heterogeneous in size and duration of follow-up	Not all interventions are comparable	High
Ansari et al. (2025)	Systematic review DLD	Vocabulary intervention	Varies	Word learning and retention	Explicit intervention, retrieval, and repetition are potentially effective; dose reporting is not yet uniform.	Dominant school-age children; a variety of tasks	High
Zhou et al. (2025)	Systematic review	Digital intervention	Varies	Language and engagement	Potential benefits, especially as a complement; heterogeneous digital quality and formats	Direct evidence on speech delay is limited.	Medium
Harding et al. (2024)	Umbrella review	Outcome measures SSD	Not applicable	Outcome validity	Demonstrates a wide variety of measurement tools and the need for core outcome sets.	Not an effectiveness test	High
Cairney et al. (2026)	Systematic review protocol	Non-SLT interventions	No results yet	Speech sound outcomes	Emphasizes the need for synthesis of interventions implemented by non-therapists	Protocol; should not be used as evidence of effects	Not rated for effectiveness

Synthesis Based on Intervention Type

Motor-Speech and Articulation

Randomized controlled trials consistently show that motor-speech interventions, particularly PROMPT, improve articulation accuracy, motor speech control, and speech intelligibility in children with severe speech motor delays. As summarized in Table 2, the greatest improvements were observed in skills directly targeted during intervention, whereas gains in broader functional communication were more limited.

These findings support the principle of intervention specificity, indicating that motor-based therapies primarily enhance trained speech production skills but do not necessarily translate into improved spontaneous communication, classroom participation, or conversational competence. Therefore, speech intervention should be considered one component of comprehensive educational support that incorporates meaningful communication opportunities in natural learning environments.

Language and Vocabulary Intervention

Language therapy meta-analysis showed improvements in several expressive indicators. The largest effect was reported for phrase complexity based on parent report (SMD 1.24), followed by the number of distinct words in the language sample (SMD 0.62) and overall expressive vocabulary (SMD 0.43). Parent-reported measures frequently demonstrated larger improvements than standardized assessments, suggesting that children's communication gains may become more apparent during natural interactions than under structured testing conditions. Recent evidence also indicates that vocabulary learning is facilitated through repeated retrieval, semantic and phonological cueing, distributed practice, and meaningful contextual use. From an educational perspective, these findings support classroom practices such as dialogic reading, interactive storytelling, shared book reading, and teacher-guided language activities that encourage children to use newly acquired vocabulary during meaningful learning experiences.

Bias Risk

Risk-of-bias assessment demonstrated considerable variation in methodological quality across the included studies (Table 3). Randomized controlled trials generally showed lower risks of bias than non-randomized comparative studies. Namasivayam et al. (2021) demonstrated the lowest overall risk of bias because external randomization, allocation concealment, blinded outcome assessment, intention-to-treat analysis, and intervention fidelity were clearly reported. Siemons-Lühring et al. (2021) also reported randomization and independent outcome assessment; however, details regarding sequence generation, allocation concealment, and blinding were less comprehensively described. Pentimonti et al. (2022) employed cluster randomization but experienced substantial participant attrition and limited statistical power.

The two nonrandomized studies had greater limitations. In Suttora et al. (2021) parents choose to accept intervention or enter control. Groups differed on birth status, maternal age, and child participation in care centers. Attrition also occurs before analysis. Likewise, Fan et al. (2024), used a retrospective comparative design in which family participation was voluntary, increasing the possibility of confounding, selection bias, and recall bias despite statistical adjustment. Consequently, findings related to family-mediated interventions should be interpreted as promising rather than conclusive until confirmed by additional high-quality randomized studies.

Table 3. Bias Risk Assessment

Study	Randomization/ confounding	Intervention deviation	Data lost	Measurement/ reporting	Overall
Namasivayam et al.	Low	Low	Low	Low	RoB 2: low
Siemons-Lühring et al.	Some concerns	Low	Low	Some concerns	RoB 2: some concerns
Pentimonti et al.	Some concerns	Some concerns	High	Some concerns	RoB 2: high
Suttora et al.	Serious	Moderate	Serious	Moderate	ROBINS-I: serious
Fan et al.	Serious	Moderate	Moderate	Moderate	ROBINS-I: serious

Family-Based Intervention

Family-centered interventions provided greater improvements than therapist-only interventions. After three months, the combined intervention group showed larger gains in language and personal-social outcomes, suggesting that caregiver involvement enhances communication opportunities during daily routines. However, family participation alone does not guarantee better outcomes; its effectiveness depends on appropriate guidance and consistent implementation. As much of the evidence is derived from studies with moderate to serious risk of bias, these findings should be interpreted with caution.

From an educational perspective, these findings reinforce the importance of home-school partnerships promoted within inclusive early childhood education. Collaboration between teachers, speech-language therapists, and families may provide children with more frequent opportunities to practice communication skills across multiple learning contexts, thereby increasing the likelihood that communication gains transfer to classroom participation and early literacy activities.

Digital Interventions, Media, and Play Activities

Digital media, picture books, songs, games, and play activities can increase engagement and provide repetition. The available evidence supports its use as delivery support rather than a replacement for human interaction. Media is effective when it stimulates conversation, turn-taking, naming, elaboration, and feedback. Passive exposure does not have the same mechanisms as responsive interaction (Karani et al., 2022). The digital evidence quality still varies. Platforms, features, duration, and adult assistance are not uniform. Therefore, it is not appropriate to conclude that technology is generally effective. More appropriate questions are which features facilitate language practice, who provides support, and whether skills transfer to non-digital communication.

Table 4. Outcomes Quantitative Synthesis

Outcome domain	Available measure	Reported values	Interpretation	Certainty
Vocabulary improvement	SMD	0.43 (95% CI 0.17-0.69)	Small-moderate effects on expressive vocabulary	Medium-high
Expressive phrase complexity	SMD	1.24 (95% CI 0.78-1.70)	Large effect, but based on specific measures/parental reports	Medium

Different words used	SMD	0,62 (95% CI 0.35-0.88)	Moderating effect on word diversity	Medium-high
Articulation	Changes in standard scores	5.15 points	Specific improvements after PROMPT 10 weeks	High for the SMD population
Percentage consonants correct	Percentage change	10.85	Clinical changes from severe to moderate-severe	High for the SMD population
Word intelligibility	Percentage change	8.59%	Improvements at the word level do not guarantee conversation	High for the SMD population
Language development	Gesell score changes	18.45±5,72 vs 13.00±6.16	Additional family-centered benefits for 3 months	Medium
Personal-social participation	Score changes	4.73±4.07 vs 2.20±3.68	Family involvement can strengthen social outcomes	Medium

Does Therapy Duration Affect Results?

Duration influences results, but not linearly and cannot be separated from frequency, intensity per session, targets, and home practice. PROMPT totaling approximately 15 hours of direct therapy over 10 weeks produced marked proximal changes, but distal outcomes remained weak. A three-month family intervention showed gains in language and personal-social outcomes as practice expanded into daily routines. This evidence points to the dose-transfer hypothesis: a structured clinical dose is sufficient to develop the target skill, whereas generalization requires more time, practice in natural contexts, and reinforcement across communication partners. Some previous related articles did not report the number of trials, total minutes, quality of implementation, or adherence to home exercises. Duration in weeks should not be used alone as an indicator of dosage.

Table 5. Quality Assessment Results

Evidence group	Strong design	Valid measurement	Fidelity / dose	Follow-up	Overall rating
Motor-Speech / articulation	Yes, RCTs are available	Yes	Good on PROMPT	Limited	High for proximal outcomes; moderate for function
Language / vocabulary	Review and meta-analysis	Varies	Often not uniform	Inconsistent	Medium-high
Family-centered	Comparative and review	Enough	Home fidelity is often under-measured	Short	Medium
Digital / media	Heterogeneous majority	Varies	Often not uniform	Limited	Low-medium
Outcome measures SSD	Umbrella review	Shows great variation	Not applicable	Not applicable	High as evidence of the need for standardization

Discussion

From Description to Critical Synthesis

Intervention effectiveness varies according to children's diagnostic profiles, intervention type, therapy dosage, family involvement, and educational context. Consistent with previous reviews, motor-speech interventions most effectively improve articulation and speech intelligibility, whereas language interventions primarily enhance expressive vocabulary and language development (Namasivayam et al., 2021; Fan et al., 2022; Rinaldi et al., 2021). Family-centered interventions further enhanced language development by increasing children's communication opportunities during everyday interactions (Fan et al., 2024; Finestack et al., 2022; Pentimonti et al., 2022).

A key finding of this review is that proximal outcomes improved earlier than distal outcomes. Gains in articulation, vocabulary, and speech production preceded improvements in functional communication, classroom participation, and social interaction. This pattern is consistent with vocabulary intervention research showing that children often acquire directly trained words before demonstrating generalized communication skills across unfamiliar contexts (Ansari et al., 2025). Similarly, PROMPT intervention substantially improved speech motor control and articulation but demonstrated only limited transfer to conversational intelligibility and functional communication following ten weeks of intervention (Namasivayam et al., 2021).

From an educational perspective, these findings indicate that communication gains do not automatically transfer into successful learning participation without sufficient opportunities for practice in authentic educational settings. Preschool language enrichment programs have demonstrated that integrating language-supportive activities into everyday classroom instruction significantly improves children's language development (West et al., 2024). Likewise, inclusive preschool practices emphasize that teachers' communication strategies, visual learning media, and collaboration with parents strengthen children's communication abilities beyond individual therapy sessions (Fitri et al., 2025; Anriyani & Vitaloka, 2025). These findings reinforce the view that intervention effectiveness should be evaluated not only through speech accuracy but also through children's participation in classroom interaction, collaborative learning, and early literacy activities (Riad et al., 2023).

The Influence of Bias Risk on Interpretation

The methodological quality of the included studies substantially influenced confidence in the synthesized findings. Randomized controlled trials, particularly those evaluating PROMPT intervention and integrated speech-sound interventions, provided stronger evidence because they implemented rigorous randomization procedures, standardized intervention protocols, blinded outcome assessment, and treatment fidelity monitoring (Namasivayam et al., 2021; Siemons-Lühring et al., 2021). In contrast, much of the evidence supporting family-centered interventions originated from comparative or observational studies with greater risks of confounding and self-selection bias (Fan et al., 2024; Pentimonti et al., 2022).

Recommendations should be interpreted according to the certainty of the available evidence. Strong evidence supports structured motor-speech interventions for articulation, whereas family-mediated and digital interventions remain promising but less conclusive because of heterogeneous protocols and moderate-to-serious risks of bias (Finestack et al., 2022; Zhou et al., 2025). Educational practices should therefore be considered evidence-informed rather than universally established, as their effectiveness

depends on implementation quality, teacher–parent collaboration, and intervention fidelity (Hampton et al., 2023; Chahboun et al., 2024).

Comparison with Previous Reviews

The present findings are generally consistent with previous systematic reviews demonstrating positive effects of speech and language intervention on articulation, vocabulary development, and expressive language (Fan et al., 2022; Rinaldi et al., 2021; Ansari et al., 2025). However, previous reviews have primarily synthesized intervention outcomes according to diagnostic categories or therapeutic techniques without explicitly examining how communication improvements contribute to children's educational participation.

The present review extends previous evidence by integrating intervention effectiveness with educational outcomes, including classroom participation, functional communication, and readiness for early literacy. This perspective complements recent educational research demonstrating that communication competence contributes directly to children's academic engagement, social participation, and inclusive educational experiences (Riad et al., 2023; Chahboun et al., 2024).

Furthermore, unlike previous intervention reviews that focused predominantly on therapist-delivered interventions, this review synthesizes evidence concerning teacher support, family involvement, classroom communication, and naturalistic learning opportunities. Such integration reflects current educational perspectives emphasizing that communication development is distributed across home and school environments rather than occurring exclusively during clinical therapy (West et al., 2024; Hampton et al., 2023; Fitri et al., 2025).

New Conceptual Framework

The proposed Target–Mechanism–Dosage–Transfer Framework conceptualizes speech and language intervention as a multilevel educational process linking clinical intervention with children's participation in authentic learning environments. Unlike previous intervention models that primarily classify interventions according to therapeutic techniques or diagnostic categories (Liang et al., 2023; Rinaldi et al., 2021), the proposed framework explicitly explains how proximal improvements in speech production gradually transfer into language development, functional communication, classroom participation, and early literacy through repeated opportunities for practice across home and school contexts.

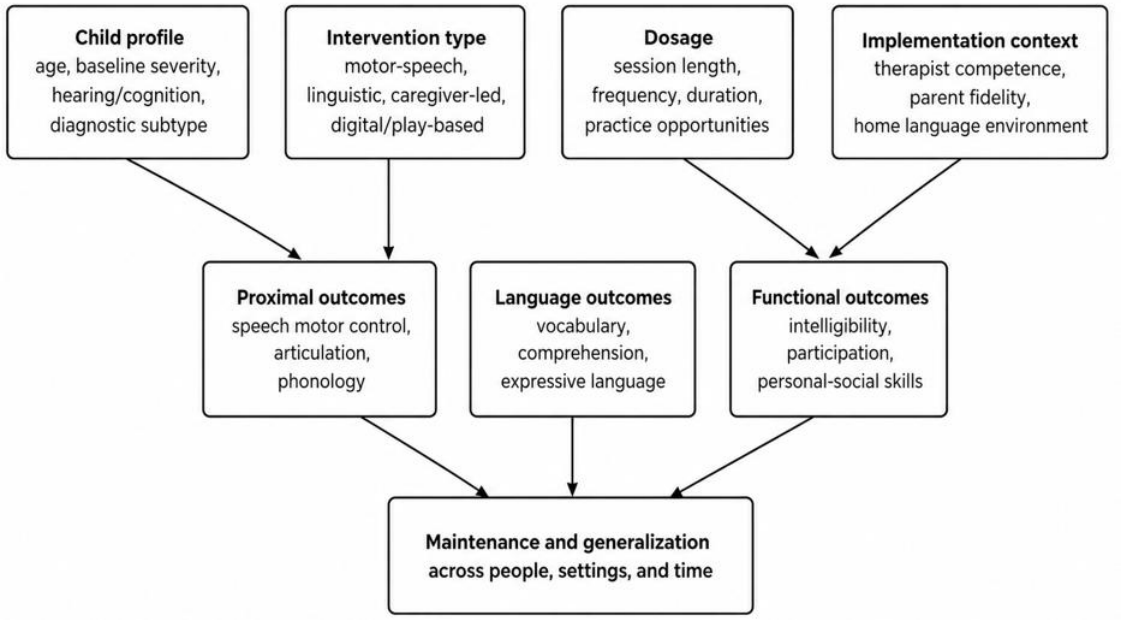


Figure 2. Target Mechanism Dosage Transfer Framework for Speech and Language Intervention

This educational perspective is supported by some previous research. Family participation, teacher support, dialogic reading, and classroom language enrichment facilitate communication generalization beyond therapy sessions (West et al., 2024; Hampton et al., 2023; Fan et al., 2024). Therefore, the framework extends previous systematic reviews by integrating intervention mechanisms with educational implementation and participation-based learning rather than focusing exclusively on clinical outcomes.

Theoretical Implications

The findings support the principle of intervention specificity, whereby the greatest improvements occur in communication skills that are directly targeted during intervention. However, generalization to functional communication requires repeated learning opportunities across multiple communication partners and educational contexts (Ansari et al., 2025; Namasivayam et al., 2021). This interpretation aligns with contemporary educational theories emphasizing participation, social interaction, and contextualized learning as central mechanisms underlying children's communication development (Riad et al., 2023; Chahboun et al., 2024). Accordingly, speech and language intervention should be viewed as a collaborative educational process involving therapists, teachers, families, and peers. Teacher-parent partnerships provide continuity between therapy and everyday learning experiences, thereby increasing opportunities for communication practice and supporting children's participation in inclusive educational environments (Hampton et al., 2023; Fitri et al., 2025).

Educational and Practical Implications

The findings have important implications for early childhood and inclusive education. Initial assessment should distinguish among motor-speech, phonological, vocabulary, language comprehension, and social communication difficulties because intervention effectiveness depends on matching intervention approaches to children's

communication profiles (Liang et al., 2023). Educational support should complement therapist-delivered intervention by integrating dialogic reading, interactive storytelling, collaborative play, visual learning media, vocabulary-rich classroom interaction, and responsive teacher-child communication into everyday instruction (West et al., 2024; Anriyani & Vitaloka, 2025; Fitri et al., 2025).

Furthermore, sustained partnerships between teachers and parents are essential for extending communication practice beyond therapy sessions and facilitating the generalization of communication skills into authentic educational contexts (Hampton et al., 2023). Strong evidence supports structured interventions targeting articulation and speech production (Namasivayam et al., 2021; Siemons-Lühring et al., 2021), whereas evidence supporting family-mediated interventions, classroom implementation, and digital learning remains of low-to-moderate certainty because of study heterogeneity and methodological limitations (Finestack et al., 2022; Zhou et al., 2025). Consequently, these educational strategies should be regarded as evidence-informed approaches requiring continued evaluation rather than universally applicable interventions.

Study Limitations

This review has several limitations that should be considered when interpreting the findings. First, only a limited number of primary intervention studies met the eligibility criteria, which reduced the breadth of evidence available for synthesis across different diagnostic groups and intervention approaches. Second, a meta-analysis was not conducted because of substantial clinical and methodological heterogeneity among the included studies. Third, several included studies had moderate to serious risks of bias, particularly among non-randomized and family-centered intervention studies. Finally, differences in intervention dosage, treatment fidelity, follow-up duration, and outcome measurement limited the generalizability of the findings. Therefore, the conclusions should not be interpreted as supporting a universal intervention model or dosage but rather as evidence-informed guidance that should be adapted to children's communication profiles and educational contexts.

CONCLUSION

This systematic review suggests that speech and language interventions may improve communication outcomes in children with speech delay, particularly articulation, phonology, vocabulary, and word intelligibility. However, improvements in directly trained skills do not consistently generalize to functional communication, classroom participation, social interaction, or long-term maintenance. The findings indicate that intervention outcomes are influenced by children's communication profiles, intervention mechanisms, therapy dosage, family involvement, implementation fidelity, and educational support. From an educational perspective, this review highlights that speech and language intervention should be integrated with classroom learning, teacher support, and family involvement to promote children's communication, participation, and early literacy development within inclusive educational settings. Future research should prioritize high-quality randomized controlled trials using standardized outcome measures and longer follow-up periods, while educational studies should further investigate collaborative intervention models involving therapists, teachers, and families.

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