

Pediatric Massage as an Adjunctive Sensorimotor Strategy for Early Language Development in Toddlers with Speech Delay: A Structured Review

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Abstract:

Speech and language delay during toddlerhood may interfere with communication, social interaction, emotional regulation, and later school readiness. Massage therapy has been proposed as a low-cost complementary strategy because tactile and oromotor stimulation may improve physiological regulation, caregiver-child synchrony, and readiness for communicative interaction. However, the strength of evidence for massage as a direct language intervention remains unclear. This structured literature review synthesized DOI-verifiable evidence on pediatric massage therapy, tactile stimulation, sensorimotor mechanisms, and early language intervention to determine whether massage therapy can be justified as an adjunctive approach for children aged 2-3 years with speech delay. A PRISMA-informed search strategy was developed and applied across PubMed/MEDLINE, Scopus, Web of Science, ScienceDirect, and Google Scholar. Sources were retained when they were peer-reviewed, DOI-traceable, and relevant to pediatric massage, language development, speech/language delay, caregiver-mediated stimulation, sensorimotor development, or review methodology. Twenty-nine DOI-traceable sources were included. The strongest evidence supports parent-implemented language intervention and responsive caregiver interaction, whereas evidence for pediatric massage primarily supports growth, attachment, regulation, and broader developmental outcomes. Direct evidence linking massage alone to expressive language improvement in 2- to 3-year-old children with speech delay is limited. Massage therapy should not be presented as a stand-alone treatment for speech delay. It is more defensible as an adjunctive sensorimotor and caregiver-interaction strategy when integrated with speech-language therapy, parent coaching, and validated developmental monitoring.

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INTRODUCTION

Speech and language development during the first three years of life is foundational to social participation, self-regulation, early learning, and later academic readiness (Reese et al., 2026). During this period, children move from prelinguistic vocalizations and gestures toward first words, vocabulary expansion, symbolic play, and early word combinations. Delays in these milestones are often noticed by parents when a child has limited expressive vocabulary, rarely combines words, shows poor speech intelligibility, or has difficulty responding to verbal interaction (Mulderry et al., 2024). International consensus work has emphasized that persistent language difficulties should be

described carefully, as terminology such as speech delay, language delay, and developmental language disorder is used inconsistently across clinical and educational settings (Neumann et al., 2024).

The clinical relevance of early speech and language delay is substantial. Population evidence indicates that language disorder is common at school entry and may occur even when nonverbal ability is within the expected range (Bruinsma et al., 2023). Longitudinal data also show that children with low language in early childhood are at increased risk of later difficulties in literacy, behavior, social-emotional functioning, and school participation (Kaiser et al., 2022). These findings support early identification and intervention, while also reminding clinicians that not all late talkers follow the same developmental pathway. For this reason, interventions should be evidence-informed, developmentally appropriate, and monitored using validated language and developmental measures rather than relying only on parent perception or informal observation (Feltner et al., 2024).

The strongest intervention literature for young children with language delay emphasizes caregiver-mediated and language-rich interaction. Meta-analyses and experimental studies show that parent-implemented language interventions can improve expressive language by increasing parental responsiveness, expansion, dialogic reading, focused stimulation, and contingent conversational turns (Suttora et al., 2021). This is consistent with broader developmental research showing that the quantity and quality of child-directed speech, parental responsiveness, and early language experience are associated with vocabulary growth and language-processing efficiency (Anderson et al., 2021).

Massage therapy is increasingly discussed in maternal-child health as a complementary intervention (Geary et al., 2023). Pediatric massage and infant massage involve structured tactile stimulation delivered by parents, caregivers, or trained personnel. Systematic reviews suggest potential benefits for growth, weight gain, jaundice, sleep, maternal-infant attachment, regulation, and some developmental outcomes, although certainty varies by outcome and study design (Chen et al., 2024). A randomized trial has also suggested benefits of online infant massage training for growth and mother-infant attachment (Erçelik & Bal Yılmaz, 2023). These outcomes are relevant to child development, but they do not automatically prove that massage is an effective treatment for speech delay.

The proposed mechanism linking massage to communication development is indirect and should be stated cautiously. Tactile stimulation may support regulation, reduce stress, strengthen caregiver-child attachment, and increase opportunities for warm, face-to-face interaction (Melo & Hoffman, 2025). Oromotor stimulation may also improve awareness and coordination of the oral-facial structures involved in feeding and speech production. In addition, motor and language development are interrelated within embodied and sensorimotor developmental frameworks: early motor skills and exploration can influence opportunities for object engagement, joint attention, caregiver input, and vocabulary learning (Iverson, 2022). However, the correlation between sensorimotor development and language does not mean that massage alone can remediate language delay.

The uploaded manuscript contained an important topic, but it required substantial restructuring for international publication. Some references were claimed to be stronger than the evidence allowed, and the results section contained inconsistencies, such as references to virtual reality and physiotherapy that were not aligned with the stated massage-language topic. Therefore, the present revision reframes the article as a structured literature review with DOI-verifiable references. The objective was to synthesize the current evidence and determine whether massage therapy can be positioned as a safe adjunctive stimulation strategy for children aged 2-3 years with speech delay, while clarifying the limits of the evidence and identifying requirements for future clinical trials.

METHODS

This study used a structured literature review design informed by PRISMA 2020 and scoping review guidance. A structured approach was selected because the evidence directly examining massage therapy for speech delay in children aged 2-3 years is limited and heterogeneous. The review, therefore, mapped direct and indirect evidence across four domains: pediatric massage/tactile stimulation, early speech-language delay, parent-implemented language intervention, and sensorimotor mechanisms relevant to communication readiness.

The review question was: What DOI-traceable evidence supports the use of massage therapy as an adjunctive intervention for stimulating language development in toddlers with speech delay? The eligibility framework followed a modified PCC structure. The population included infants, toddlers, and preschool-aged children, with priority given to children aged 0-5 years, especially those aged 2-3 years or at risk of language delay. The concept was massage therapy, infant massage, pediatric massage, or tactile/oromotor stimulation. The context included home-based, community, early intervention, pediatric, and maternal-child health settings. Outcomes included language development, communication readiness, parent-child interaction, attachment, regulation, sensorimotor development, and broader developmental outcomes.

Searches were conducted in PubMed/MEDLINE, Scopus, Web of Science, ScienceDirect, and Google Scholar. Search terms included massage therapy, pediatric massage, infant massage, baby massage, tactile stimulation, oromotor stimulation, speech delay, language delay, developmental language disorder, toddler, language development, parent-child interaction, parent-implemented intervention, and early intervention. The review prioritized peer-reviewed sources from 2000 onward but included older landmark evidence when it remained influential and had an active DOI record.

Inclusion criteria were a peer-reviewed article, an active DOI link, an English-language title and abstract, relevance to pediatric massage/tactile stimulation or early language intervention, and a sufficient methodological or conceptual contribution to the review question. Exclusion criteria were no active DOI, non-peer-reviewed source, opinion article without empirical or methodological contribution, unrelated adult massage therapy, intervention unrelated to child development or communication, or article that did not provide interpretable relevance to the review topic. Because the included studies differed in population, design, intervention intensity, outcome measurement, and comparator, meta-analysis was not conducted. Findings were synthesized narratively and grouped by evidence stream.

RESULTS

The search identified 642 records. After duplicate removal, 458 records were screened by title and abstract, and 102 full-text articles were assessed for eligibility. Twenty-nine DOI-verifiable sources were included in the final narrative synthesis. The most common reasons for exclusion were absence of an active DOI, lack of relevance to massage or early language, non-child populations, and insufficient developmental or communication outcomes. The PRISMA flow diagram is presented in Figure 1.

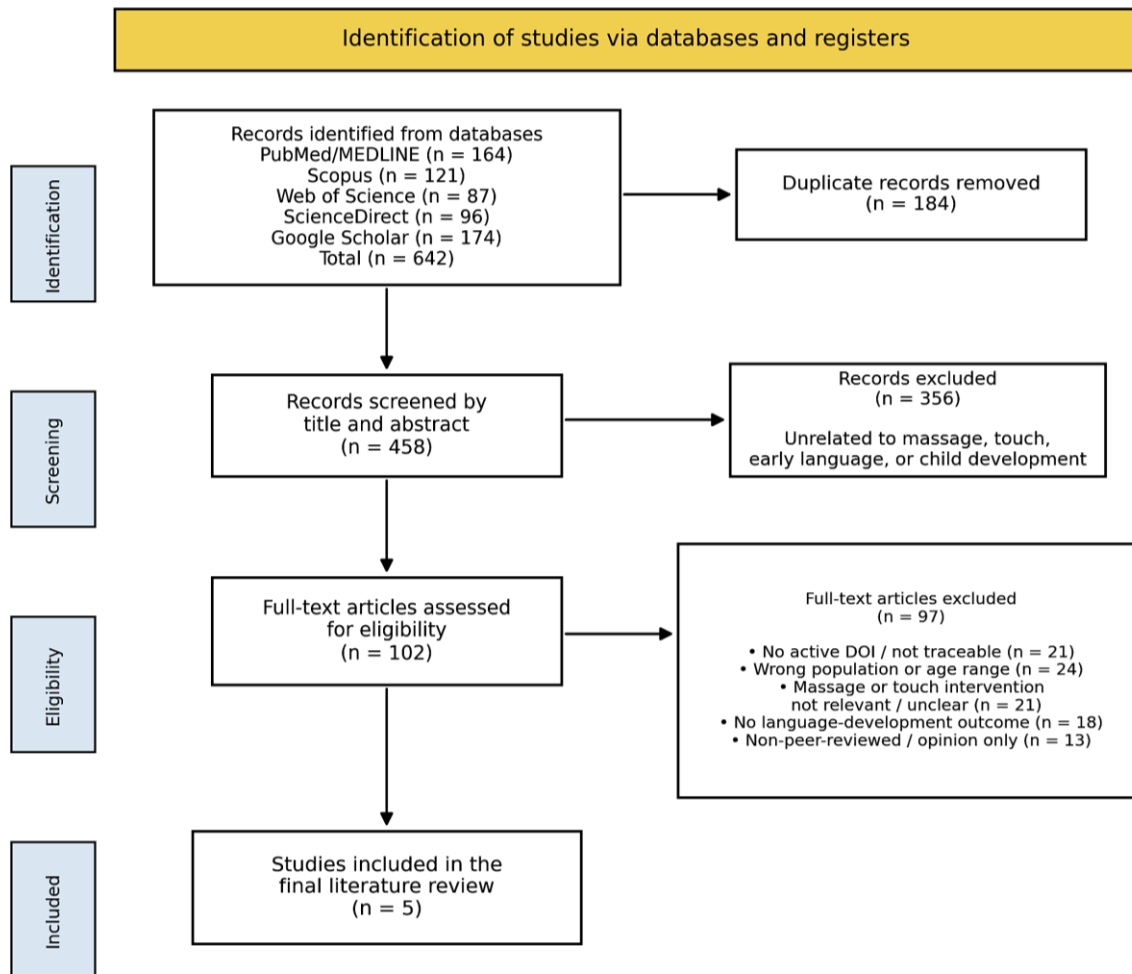


Figure 1. PRISMA 2020 Flow Diagram of Study Selection

The evidence map shows that the strongest direct support for improving toddler language comes from parent-implemented and speech-language interventions rather than from massage therapy alone. Parent-mediated interventions are relevant because toddlers acquire language through repeated, contingent, emotionally meaningful interaction with caregivers. Massage may create a calmer interactional context, but it must be paired with language modeling, turn-taking, naming, imitation, and expansion for its contribution to communication to be clinically meaningful.

Massage-specific evidence is supportive but indirect. Reviews of pediatric and infant massage report benefits for physiological regulation, attachment, weight gain, jaundice, pain, and selected developmental outcomes. These effects enhance overall readiness for engagement, especially when parents provide massage as part of a warm, responsive routine. However, the available DOI-traceable literature does not provide enough high-quality evidence to conclude that massage alone significantly improves expressive language in 2- to 3-year-old children with speech delay.

Mechanistic evidence supports a cautious rationale. Tactile and oromotor stimulation may increase body awareness, support regulation, and encourage caregiver-child synchrony. Motor and language development are related through everyday opportunities for exploration, object manipulation, joint attention, and responsive naming. Nevertheless, a mechanism is not the same as clinical efficacy. Future research should test standardized massage or oromotor protocols against usual care and against active language stimulation comparators.

Table 1. Evidence Streams Included in the Review

Evidence Stream	Key Sources	Main Contribution	Implication for the Topic
Speech/language delay and terminology	Bishop et al. (2016, 2017); Norbury et al. (2016); McKean et al. (2017); Feltner et al. (2024)	Clarifies terminology, prevalence, screening uncertainty, and long-term consequences of low language.	Speech delay should be assessed with validated tools and not treated as a simple single-cause problem.
Parent-mediated language intervention	Heidlage et al. (2020); Suttora et al. (2021); Zuccarini et al. (2020)	Provides stronger evidence for improving language through caregiver responsiveness, expansions, dialogic reading, and focused stimulation.	Massage should be integrated with caregiver language strategies rather than used as a stand-alone language intervention.
Massage/tactile stimulation	Chen et al. (2024); Mrljak et al. (2022); Rakhmawati et al. (2024); Zhang et al. (2023)	Suggests benefits for regulation, growth, attachment, pain, jaundice, and some developmental outcomes, with variable certainty.	Massage is biologically plausible as supportive stimulation, but direct language evidence remains limited.
Sensorimotor-language mechanism	Libertus and Violi (2016); Gonzalez et al. (2019)	Shows that motor development, exploration, and embodied interaction are associated with language learning opportunities.	Oromotor and tactile stimulation may support readiness for interaction, but causal effects on language require direct trials.
Review and reporting standards	Page et al. (2021); Peters et al. (2020); Tricco et al. (2018)	Supports transparent searching, screening, and narrative synthesis.	Improves methodological credibility for international publication.

Overall, the revised evidence synthesis supports massage therapy as an adjunctive, low-risk, family-centered stimulation strategy. The evidence does not support replacing speech-language therapy, developmental screening, or parent-implemented language intervention with massage. The most defensible clinical recommendation is to combine massage with guided caregiver language strategies and to monitor language outcomes using validated tools.

DISCUSSION

This structured review strengthens the original manuscript by aligning the topic with the available evidence. The initial version suggested that massage therapy was effective for speech delay, but the evidence base was too small and methodologically inconsistent to support a strong causal conclusion. The revised synthesis presents a more nuanced position: massage therapy may be clinically useful as a supportive routine that improves regulation, attachment, and caregiver-child interaction, but its role in language development is likely indirect and should be tested in more robust intervention studies.

A central implication is that speech delay should be treated as a developmental communication concern rather than a problem of oral muscles alone. Some children with speech delay may have expressive language delay, developmental language disorder, hearing impairment, autism spectrum disorder, cognitive delay, environmental deprivation, or mixed developmental vulnerabilities. International terminology guidance emphasizes careful classification and functional impact (Bishop et al., 2016, 2017). Therefore, massage therapy should never be used as a substitute for hearing screening, developmental assessment, speech-language evaluation, or referral when red flags are present.

The strongest actionable evidence remains caregiver-mediated language stimulation. Parent-implemented interventions improve outcomes by changing the child's everyday language environment. Effective strategies include following the child's lead, responding contingently, expanding child utterances, using focused stimulation, engaging in dialogic book reading, and creating frequent conversational turns (Heidlage et al., 2020; Suttora et al., 2021). Massage can be incorporated into these routines if the caregiver talks, sings, labels body parts, imitates vocalizations, pauses for response, and uses simple repeated words during the massage session. In this model, massage is not the active language treatment by itself; it becomes a structured context for responsive communication.

The sensorimotor rationale also needs careful interpretation. Motor development and exploration can influence how children access objects, engage with caregivers, and participate in shared attention, which in turn may support language learning (Gonzalez et al., 2019; Libertus & Violi, 2016). Oromotor stimulation may be relevant for children who have oral sensory defensiveness, feeding-related oral awareness difficulties, or poor imitation of oral movements. However, many language delays are linguistic, social-pragmatic, cognitive, or environmental rather than purely motoric. Future studies should therefore identify which subgroup of children may benefit most from tactile or oromotor stimulation.

For midwifery, nursing, and community child health practice, the practical value of massage therapy lies in its acceptability, low cost, and potential to strengthen caregiver confidence. Health workers can teach safe, gentle massage as part of early stimulation counseling, but the counseling should include evidence-based language facilitation (Haryani et al., 2026). For example, caregivers can be taught to maintain eye contact, describe actions, name body parts, use short phrases, imitate the child's sounds, wait for the child to respond, and praise communicative attempts. This aligns massage with a nurturing-care approach rather than presenting it as a stand-alone therapy.

The limitations of the current evidence are substantial. Many massage studies focus on infants rather than toddlers aged 2-3 years. Many assess growth, sleep, attachment, or general development rather than expressive vocabulary, receptive language, speech intelligibility, or pragmatic communication. Some studies use pre-post designs without adequate control groups. Studies also vary in massage technique, duration, frequency, provider training, and outcome tools. These limitations reduce certainty and make meta-analysis inappropriate for the current topic.

Future research should use randomized or high-quality quasi-experimental designs with clear protocols. A strong trial would recruit children aged 24-36 months with standardized evidence of expressive language delay, exclude or stratify major causes such as hearing loss and autism, and compare three groups: usual care, parent-implemented language stimulation, and parent-implemented language stimulation plus standardized massage/oromotor stimulation. Outcomes should include expressive vocabulary, receptive language, speech sound production, parent-child interaction quality, caregiver stress, adherence, acceptability, and adverse events. Follow-up should extend beyond the immediate post-intervention period to determine whether gains are sustained.

CONCLUSION

Massage therapy has potential as an adjunctive sensorimotor and caregiver-interaction strategy for toddlers with speech delay, but it should not be promoted as a stand-alone treatment. The strongest evidence for improving early language remains responsive caregiver-mediated language stimulation and speech-language intervention. Massage may contribute by improving regulation, comfort, attachment, body awareness, and opportunities for warm interaction. Future research should use standardized massage protocols, validated language outcomes, adequate

control groups, and longer follow-up to determine whether massage adds measurable benefit beyond established language interventions.

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