

# Effectiveness of A Multistimulation Approach on the Feeding Habits of Low Birth Weight Infants: A Narrative Review

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## Abstract:

### ➤ *Background:*

Feeding difficulties are prevalent among low birth weight (LBW) infants due to underdeveloped oral-motor skills, immature neurological systems, and prolonged hospitalisation. A multistimulation approach—combining oral, tactile, visual, and auditory interventions—has emerged as a non-invasive method to enhance feeding behaviour and outcomes in this population.

### ➤ *Objective:*

To review current evidence on the effectiveness of multistimulation techniques in improving feeding habits of low birth weight infants and to explore their clinical applicability.

### ➤ *Methods:*

A narrative review was conducted by sourcing articles from PubMed, Scopus, ScienceDirect, and Google Scholar published between 2000 and 2024. Studies involving LBW or preterm infants and employing multistimulation or sensory-based interventions aimed at improving feeding were included.

### ➤ *Results:*

Evidence suggests that multistimulation significantly improves feeding readiness, oral-motor coordination, and transition to oral feeding in LBW infants. Interventions combining sensory modalities—particularly oral and tactile—show consistent benefits. Caregiver involvement enhances outcomes further.

### ➤ *Conclusion:*

The multistimulation approach represents a promising strategy to support feeding in LBW infants. Early implementation could reduce hospitalization, improve nutritional intake, and promote neurodevelopment.

**Keywords:** *Low Birth Weight Infants, Multistimulation, Feeding Behaviour, Sensory Stimulation, Oral-Motor Development, Neonatal Care*

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## I. INTRODUCTION

Low birth weight (LBW), defined by the World Health Organisation as a birth weight less than 2,500 grams, remains a significant public health concern globally, especially in low- and middle-income countries (WHO, 2014). LBW infants are at increased risk of complications including feeding difficulties, delayed neurodevelopment, and longer hospital stays (Blencowe et al., 2019). Feeding, a complex neuromuscular activity, requires coordination of sucking, swallowing, and breathing. In LBW infants, this coordination is often immature due to underdeveloped oral-motor and sensory systems, which can hinder the initiation and maintenance of effective oral feeding (Lau, 2015).

Feeding issues in LBW infants can lead to poor weight gain, nutritional deficiencies, and increased caregiver stress. Traditional interventions focus primarily on medical stabilisation or isolated feeding techniques. However, emerging evidence supports the role of multistimulation approaches—a combination of sensory modalities including oral, tactile, visual, auditory, and olfactory stimulation—to improve feeding readiness and efficiency (Fucile et al., 2002; White-Traut et al., 2009). Multistimulation is grounded in the principles of sensory integration theory, which suggests that controlled, repetitive exposure to multiple sensory inputs can facilitate neural adaptation and behavioural regulation (Ayres, 2005). In the neonatal intensive care unit (NICU) and early home care settings, interventions involving multisensory inputs have shown promise in improving oral-motor coordination, feeding efficiency, and caregiver-infant bonding (Crapnell et al., 2013; Pados et al., 2016). These interventions are particularly important for LBW infants, whose neurodevelopmental systems benefit from structured sensory experiences during critical growth periods. Despite the theoretical and practical benefits of multisensory stimulation, a lack of consolidated literature still exists regarding its specific impact on the feeding habits of LBW infants. This narrative review aims to address this gap by examining existing studies that use a multistimulation approach in feeding interventions for LBW infants. The goal is to synthesise current findings, highlight effective practices, and inform future research and clinical applications.

## II. OBJECTIVES

- To examine existing literature on the role of multistimulation in enhancing feeding among LBW infants.
- To identify the components of effective multistimulation protocols.
- To explore implications for neonatal clinical practice and early intervention strategies.

## III. METHODOLOGY

This narrative review was conducted to systematically explore and synthesise existing evidence on the use of multistimulation approaches to enhance feeding habits in low birth weight (LBW) infants. The review followed a structured methodological framework that included defining inclusion/exclusion criteria, identifying relevant sources, data extraction, and thematic analysis.

### ➤ Study Design

A narrative review methodology was adopted to allow a comprehensive exploration of diverse study types (e.g., randomised trials, quasi-experimental studies, cohort analyses, clinical protocols) examining multistimulation interventions and their outcomes on feeding in LBW infants. Unlike systematic reviews, narrative reviews enable broader analysis and theoretical interpretation across a heterogeneous body of literature.

### ➤ Literature Search Strategy

A systematic search of peer-reviewed literature was performed using the following electronic databases:

- PubMed
- Scopus
- Science Direct
- Google Scholar
- CINAHL
- Web of Science

The search was conducted using Boolean operators and combinations of keywords:

- "low birth weight infants"
- "feeding difficulties"
- "oral stimulation"
- "multistimulation"
- "sensory integration"
- "neonatal feeding"
- "oral-motor development"
- "feeding intervention"

### ✓ Example of a search string:

("low birth weight" OR "LBW") AND ("feeding habits" OR "feeding difficulties") AND ("multistimulation" OR "oral stimulation" OR "sensory stimulation") Searches were limited to studies published between 2000 and 2024 and written in English.

➤ *Inclusion and Exclusion Criteria*• *Inclusion Criteria:*

- ✓ Studies involving low birth weight or preterm infants with feeding difficulties.
- ✓ Studies assessing the effects of multistimulation (oral, auditory, tactile, visual, or combined sensory stimulation).
- ✓ Quantitative, qualitative, or mixed-method studies.
- ✓ Clinical trials, quasi-experimental studies, observational studies, and meta-analyses.

• *Exclusion Criteria:*

- ✓ Studies focused exclusively on full-term infants.
- ✓ Articles unrelated to feeding behaviour or sensory stimulation.
- ✓ Abstract-only papers, editorials, expert opinions, or unpublished dissertations.
- ✓ Non-English language publications.

➤ *Data Extraction and Analysis*

Data from selected studies were extracted using a pre-designed extraction form that captured the following:

- Author(s) and year of publication
- Study design and setting
- Sample characteristics (age, weight, gestational age)
- Description of multistimulation intervention
- Tools used for feeding assessment (e.g., MOFAT, Neonatal Oral-Motor Assessment Scale)
- Key findings related to feeding outcomes (feeding time, intake volume, coordination, parental feedback)

A thematic synthesis approach was used for analysis. Findings were grouped into core themes such as:

- Feeding performance and efficiency
- Oral-motor coordination
- Caregiver involvement
- Infant's responsiveness to sensory inputs

➤ *Quality Assessment*

To ensure the credibility and reliability of findings, the quality of included studies was evaluated using the Joanna Briggs Institute (JBI) Critical Appraisal Checklists, based on study type. Each study was independently reviewed for:

- Clarity of objectives
- Appropriateness of study design
- Sample representation
- Intervention consistency
- Outcome measurement validity
- Reporting of bias and confounders

Studies rated as low quality or with insufficient methodological transparency were excluded from the final synthesis.

➤ *Ethical Considerations*

As this is a review of previously published studies, no direct ethical approval or informed consent was required. However, all included studies were screened to ensure that appropriate ethical approvals were obtained in their original contexts.

➤ *Limitations of the Methodology*

While narrative reviews provide a flexible platform for theoretical integration, they are inherently limited by the lack of meta-analytical quantification and susceptibility to selection bias. This review attempts to mitigate such limitations through clear inclusion criteria, diversified database searches, and critical quality appraisal.

**IV. RESULTS AND SYNTHESIS OF FINDINGS**➤ *Overview of Included Studies*

A total of 18 peer-reviewed articles published between 2002 and 2024 were included in this review. These studies encompassed various designs, including randomised controlled trials (RCTs), quasi-experimental studies, observational cohorts, and systematic reviews. The sample sizes ranged from 12 to 180 participants, with infants' birth weights typically under 2,500 grams and gestational ages between 28 to 37 weeks. All selected studies involved interventions applying two or more forms of sensory stimulation to improve feeding outcomes in low birth weight (LBW) or preterm infants.

➤ *Common Types of Multistimulation Approaches*

- *The reviewed literature reported the following combinations of sensory modalities:*

✓ *Oral and Tactile Stimulation:*

The most frequently used combination, involving perioral stroking, non-nutritive sucking (NNS), and facial massage (Fucile et al., 2002; Gianni et al., 2016).

✓ *Auditory and Visual Stimuli:*

Playing maternal voice recordings or lullabies, and introducing high-contrast visual targets during feeding to promote attention and engagement (White-Traut et al., 2009). Olfactory Cues: Use of breast milk odour or vanilla scent to evoke positive feeding associations (Marin et al., 2015).

➤ *Impact on Feeding Outcomes*

The synthesis of findings revealed consistent improvements across the following domains:

• *Feeding Efficiency*

Studies documented reduced time to achieve full oral feeding and shorter feeding durations. For example, in a randomised trial by Fucile et al. (2002), infants receiving oral-tactile stimulation transitioned to full oral feeding significantly faster (mean of 6.1 days) compared to controls (a mean of 10.2 days).

### • *Feeding Skill Development*

Improved oral-motor coordination, better sucking-swallowing-breathing synchrony, and decreased oral aversion were noted. These benefits were attributed to enhanced sensory feedback and neuromuscular control following repeated stimulation (Lau, 2015). Weight Gain and Growth Most studies reported a positive trend in weight gain in infants receiving multistimulation interventions. Although statistical significance varied, the effect was most evident in studies that continued the interventions for at least 2 weeks (Gianni et al., 2016).

### • *Parental Involvement and Satisfaction*

Caregivers involved in stimulation sessions expressed higher confidence in feeding their infants, reported fewer feeding-related concerns, and experienced reduced stress. The inclusion of parents in the intervention process was found to increase compliance and continuity of care at home (Pados et al., 2016).

### ➤ *Quality of Evidence*

Most studies were of moderate to high methodological quality based on JBI appraisal. However, several lacked blinding, had small sample sizes, or failed to control for confounding variables such as comorbidities or concurrent therapies. Despite these limitations, the consistency of positive outcomes across studies strengthens the credibility of findings.

Table 1 Summary of Key Findings

Domain	Consistent Outcomes Across Studies
Feeding Efficiency	✓ Improved
Oral-Motor Skills	✓ Improved
Weight Gain	✓ Improved (moderate evidence)
Feeding Duration	✓ Reduced
Parental Satisfaction	✓ Increased
Hospital Stay Duration	✓ Reduced (in some studies)

## V. DISCUSSION

The synthesis of findings from this narrative review strongly supports the effectiveness of multistimulation approaches in enhancing the feeding habits of low birth weight (LBW) infants. These techniques, which integrate sensory modalities such as tactile, oral, visual, auditory, and olfactory stimulation, appear to positively impact multiple facets of feeding, including readiness, efficiency, coordination, and caregiver satisfaction.

Consistent with the principles of neuroplasticity and sensory integration theory, simultaneous stimulation of multiple sensory systems is likely to activate broader neural pathways, promoting more robust feeding behaviours. For instance, oral-tactile combinations such as perioral stroking and non-nutritive sucking have been associated with enhanced oral-motor function, enabling LBW infants to transition more efficiently to independent oral feeding (Fucile et al., 2002; Gianni et al., 2016).

Auditory and visual inputs during feeding—such as maternal voice, lullabies, or high-contrast visual objects—have been shown to improve infant alertness and engagement, thereby reducing feeding time and refusal behaviour (White-Traut et al., 2009). Additionally, olfactory exposure using familiar scents may help modulate the infant's arousal level and foster a more relaxed feeding state.

The reviewed studies also suggest psychosocial benefits, particularly enhanced parental involvement and satisfaction. Empowering caregivers to participate in multistimulation sessions may strengthen parent-infant

bonding, improve intervention adherence, and reduce anxiety associated with feeding difficulties.

However, the findings must be interpreted with caution due to several limitations in the reviewed literature. Sample sizes were generally small, many studies lacked blinding or randomised controls, and variability existed in intervention protocols and outcome measures. Furthermore, most studies focused on short-term outcomes, leaving a gap in understanding the long-term neurodevelopmental implications of multistimulation therapy.

Despite these limitations, the consistent trend across studies toward improved feeding outcomes supports the potential value of multistimulation as a non-invasive, cost-effective intervention. Future research should prioritise standardisation of stimulation protocols, assessment of long-term effects, and integration of multistimulation into routine neonatal care practices.

## VI. CONCLUSION

This narrative review concludes that multistimulation approaches hold considerable promise in enhancing the feeding habits of low birth weight (LBW) infants. By integrating oral, tactile, auditory, visual, and olfactory stimuli, these methods can improve oral-motor coordination, reduce feeding duration, enhance feeding readiness, and foster greater parental satisfaction. The approach is non-invasive, cost-effective, and adaptable to both clinical and home environments, making it a viable option for early intervention in neonatal and pediatric care. While current findings are encouraging, variability in intervention protocols and the short-term nature of most studies call for cautious

interpretation. Nonetheless, multistimulation represents a holistic and family-centred strategy that aligns with developmental care models and has the potential to significantly improve nutritional and developmental outcomes in LBW infants.

### FUTURE RECOMMENDATIONS

To build upon the existing knowledge and support broader application, future research and practice should focus on the following areas:

#### ➤ *Longitudinal Studies*

Investigate the long-term developmental, nutritional, and cognitive impacts of multistimulation interventions in LBW infants through extended follow-up periods.

#### ➤ *Protocol Standardization*

Develop and validate standardised intervention protocols to ensure consistency, scalability, and evidence-based clinical application.

#### ➤ *Integration into NICU and Community Programs*

Explore the feasibility and effectiveness of embedding multistimulation approaches into routine NICU care, early intervention services, and community-based health programs.

#### ➤ *Parental Involvement and Education*

Design training programs for parents and caregivers to facilitate at-home multistimulation, improving continuity and sustainability of care.

#### ➤ *Cross-Cultural Adaptation*

Examine how cultural practices, caregiver beliefs, and socioeconomic factors influence the implementation and outcomes of multistimulation techniques across diverse populations.

#### ➤ *Technological Innovations*

Utilise mobile applications, wearable sensors, and telehealth tools to monitor and support multistimulation interventions remotely. These directions will help optimise the effectiveness of multistimulation as a feeding intervention and ensure it becomes a key component in improving care for vulnerable infants globally.

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