INVITED COMMENTARY

# Sensory Stimulation and Structured Play Therapy in Children With Severe Acute Malnutrition

**Praveen Kumar**
*Director Professor, Department of Pediatrics,*
*Lady Hardinge Medical College and Associated Kalawati Saran Children's Hospital, New Delhi, India*
*pkpaed@gmail.com*

Early identification and management of acute malnutrition is a global priority for achieving the Sustainable Development Goals (SDGs) [1]. Despite this, progress in reducing the prevalence of acute malnutrition among children under five years old has been limited. According to the Joint Child Malnutrition Estimates from the United Nations International Children's Emergency Fund (UNICEF), World Health Organization (WHO), and the World Bank, 45 million under-five children experienced wasting in 2022. Of these, an estimated 13.7 million had severe wasting, while the remainder had moderate wasting [2]. Delayed diagnosis and treatment predispose these children to short-term risks such as increased susceptibility to infections and higher mortality rates, as well as long-term risks like poor motor and cognitive development, reduced economic productivity, and a heightened risk of non-communicable diseases in adulthood [3].

Adequate nutrition, particularly during pregnancy, infancy, and early childhood, is crucial for the development of the brain. These early periods lay the foundation for the development of cognitive, motor, and socio-emotional skills that influence both childhood and adulthood. Research from animal models and human studies indicates that nutrient deficiencies during these critical periods adversely affect five key neuro-developmental processes: neuron proliferation, axon and dendrite growth, synapse formation and pruning, myelination, and neuronal apoptosis (programmed cell death) [4]. Additionally, an environment with inadequate sensory and social stimulation can impair similar neurodevelopmental processes, such as dendritic branching and synaptic density, similar to the effects of nutrient deprivation during early development [5]. A meta-analysis has provided strong evidence that childhood malnutrition negatively impacts neurodevelopment, as demonstrated by high-quality studies utilizing validated neurodevelopmental assessment tools. Malnutrition is also linked to impairments in academic achievement and cognitive function [6].

While all forms of undernutrition can negatively impact neurodevelopmental outcomes, children with severe acute malnutrition (SAM) are at the highest risk for poor outcomes. SAM is characterized by weight-for-length z-scores (WLZ) or weight-for-height z-scores (WHZ) at least three standard deviations below the median and/or a mid-upper arm circumference (MUAC) less than 115 mm, and/or bilateral pitting edema of nutritional origin [3]. Children with SAM often exhibit weakness and lethargy, which impairs their interaction with their environment. Additionally, many of these children come from socio-economically disadvantaged backgrounds, which can exacerbate the situation due to adverse psychosocial factors, such as limited financial resources leading to stimulation-deprived home environments.

While nutritional deficiencies during critical periods of neurodevelopment can significantly impact neurocognitive functions, a key question is whether these effects can be reversed with nutritional rehabilitation. Evidence suggests that the brain has the potential for recovery from early damage if risk factors are removed. Recovery can occur in three main ways, depending on the timing of the injury and subsequent environmental experiences:

1. Reorganization of intact circuits: The brain can reorganize remaining intact circuits and generate new synapses in existing pathways.
2. Development of new circuitry: New neural circuitry may develop to compensate for the injury.
3. Generation of new neurons and glia: The brain can generate new neurons and glial cells to replace those that were injured.

Thus, recovery from brain alterations caused by nutrient deficiencies is plausible, if nutrients are provided while the affected growth processes are still ongoing. In addition to nutrient replenishment, sensory stimulation, enhanced linguistic interactions, and social engagement can also facilitate better recovery [4].

Based on these principles, the WHO has recommended structured play therapy and sensory stimulation as part of routine care for children with severe acute malnutrition (SAM) admitted to health facilities [7]. Sensory stimulation, along with emotional support, should begin during the stabilization phase, while psychosocial stimulation tailored to the child's developmental level should be introduced during the rehabilitation phase [8]. Structured play therapy, recommended for 15-30 minutes per day, includes interactive play between the caregiver and child using simple, inexpensive toys to develop motor and language skills. Activities should be age-appropriate and based on the child's developmental status. Mothers of admitted children should be encouraged to participate in structured play therapy and sensory stimulation under supervision. However, a systematic review conducted in 2017 found that evidence supporting the recommendation of psychosocial stimulation for children with SAM is sparse and of very low quality across important outcomes [9]. Subsequently, a randomized controlled study from Ethiopia in 2019 reported that integrating psychosocial stimulation with medical management and nutritional rehabilitation effectively improved children's growth and development. This study found that stimulation significantly enhanced gross motor skills during hospitalization and fine motor skills during home follow-up visits [10].

In the current issue of *Indian Pediatrics*, Upadhyay et al. [11] report on the effects of nutritional rehabilitation on the neurodevelopmental status of 110 children with SAM. Neurodevelopmental assessments were conducted using the Developmental Assessment Scale of Indian Infants (DASII) at admission, at discharge following nutritional rehabilitation, and at 2-month and 4-month follow-ups. Significant improvements were observed in both the Motor Developmental Quotient (MoDQ) and Mental Developmental Quotient (MeDQ) at discharge, as well as at the 2-month and 4-month follow-ups. Notably, these improvements were more pronounced in children who achieved adequate weight gain. The study also found that poor weight gain, older age at presentation, and lower MeDQ and MoDQ at admission were associated with persistent developmental delays at the 4-month follow-up. This publication in *Indian Pediatrics* will be highly valuable for health workers and program managers involved in managing SAM as it demonstrates significant neurocognitive recovery when therapeutic feeding and structured play therapy are provided together. This study also emphasises the need to conduct studies with longer follow-up durations. Given the new national protocol for managing SAM children, which emphasizes community-based treatment for those who are not medically complicated [12], incorporating these practices into community management is crucial.

Funding: *None*; Competing interests: *None stated.*

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