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Psychosocial Stimulation Interventions to Optimise The Developmental Growth Process of Stunted Toddlers in The First 1000 Days of Life: A Systematic Review

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Abstract

This systematic review investigates the efficacy of psychosocial stimulation interventions in improving the developmental outcomes of stunted toddlers during their first 1000 days of life. We used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to analyse 13 articles that met strict inclusion criteria from various scientific disciplines. Our findings reveal that interventions emphasising family empowerment, enhanced hygiene, and strategic health education significantly impact child growth and cognitive development. Community-based approaches, including cash transfers and educational programs, support sustainable development in resource-limited settings. This review also identifies the importance of cultural adaptation in intervention strategies, ensuring community acceptance and effective implementation. Despite the promising outcomes, the variability in research methodologies and the focus on specific socio-economic contexts limit the generalizability of the results. Future research should expand the studies' geographical and cultural scope to validate these findings comprehensively. The implications of this review support the integration of psychosocial stimulation into public health policies, highlighting its potential to improve developmental trajectories and reduce stunting in affected populations substantially.

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Introduction

Stunting remains a formidable global health challenge, characterised by impaired growth and development in children due to chronic malnutrition. With a worldwide prevalence of approximately 21.9%, it affects around 149 million children under five, highlighting a significant public health concern (UNICEF, 2019). In Southeast Asia alone, an estimated 14.4 million children are affected by stunting (RI, 2018). The consequences extend beyond physical stature, impacting cognitive and psychosocial development and affecting educational outcomes and future economic productivity (Akseer et al., 2022; Wijekumar et al., 2023). Addressing stunting is, therefore, crucial for global health and socioeconomic development.

The etiology of stunting is complex and influenced by many factors, including inadequate nutritional intake, recurrent infections, and various socioeconomic conditions (Fatima et al., 2020; Soliman et al., 2021). Environmental and household variables such as access to health services and maternal education also significantly contribute to this condition (Sarma et al., 2017). Despite a comprehensive understanding of these factors, the persistently high prevalence of stunting underscores the urgent need for practical, comprehensive interventions (Nurliyana et al., 2020; Pangaribuan et al., 2020). These interventions must tackle the multifaceted causes of stunting to reduce its prevalence effectively. This comprehensive approach is crucial to breaking the cycle of malnutrition and poor health outcomes associated with stunting (Handryastuti et al., 2022).

The first 1000 days of life represent a critical window for implementing interventions due to the rapid physiological and neurological development during this period (Isnaini et al., 2022). Targeting this timeframe is pivotal, as interventions can significantly influence long-term developmental trajectories (Stein et al., 2023). Although nutritional support forms the cornerstone of stunting interventions, emerging evidence suggests that incorporating psychosocial stimulation could enhance developmental outcomes, providing a more holistic approach to tackling stunting (Putri et al., 2023). This integration of psychosocial elements is vital to support child development's cognitive and emotional aspects. Therefore, a multidimensional intervention strategy during this critical period can substantially improve stunted children's overall health and development (Mahfuz et al., 2020).

Psychosocial stimulation interventions aim to enhance cognitive, motor, and emotional development through targeted activities. These interventions have shown promise, but research addressing stunted populations is relatively scarce (Agustin & Rahmawati, 2022). The generalisation of findings from broader child populations to stunted children may not address the specific needs and circumstances unique to stunted growth, indicating a significant gap in the research and a need for tailored intervention strategies (Galasso et al., 2019; Leroy et al., 2020). Furthermore, psychosocial stimulation can offset some cognitive deficits associated with early nutritional deficiencies (Alam et al., 2020). A focused approach to understanding these interventions' impact is crucial for developing effective therapeutic strategies (Bhavnani et al., 2021).

The evidence supporting the benefits of psychosocial stimulation for stunted children suggests that significant improvements in cognitive function and physical health can be achieved when appropriate stimulation is provided (Wang et al., 2017). These interventions are particularly effective when combined with nutritional support, suggesting a synergistic effect that could be pivotal in reversing the adverse outcomes associated with stunting (Prado et al., 2019). However, details on the optimal types, timing, and intensity of stimulation still need to be explored, underscoring the necessity for focused research in this area (Hossain et al., 2024). Identifying these parameters will help formulate specific guidelines for intervention practices. It is imperative to address these research gaps to fully leverage the potential of psychosocial stimulation in combating stunting (Frongillo et al., 2019).

Current literature reveals significant disparities in intervention approaches and outcomes, reflecting a fragmented understanding of how best to implement psychosocial stimulation for stunted children (Agustin & Rahmawati, 2022; Putri et al., 2023). These discrepancies, arising from variations in study designs, population characteristics, and intervention modalities, highlight the need for more rigorous research to establish clear, standardised intervention protocols that can be universally applied (Sarma et al., 2017). The inconsistency in findings impedes the ability to draw definitive conclusions about the effectiveness of psychosocial interventions (Rezaeizadeh et al., 2024). Establishing a coherent framework for these interventions is essential for ensuring their efficacy and scalability. A systematic and structured approach to researching and implementing these strategies is crucial for advancing the field.

This study aims to delve into the effects of psychosocial stimulation interventions on the developmental growth of stunted toddlers during the crucial first 1000 days of life. By focusing on this specific population, the research seeks to identify particular intervention effects, refine strategies, and contribute comprehensively to understanding developmental supports for stunted children. This investigation will help delineate the precise benefits and mechanisms of psychosocial interventions tailored for stunted growth. Ultimately, the findings are expected to inform and transform policy and practical approaches to early childhood development in regions with high stunting rates. The potential contributions of this study could influence a broad spectrum of health and educational practices, offering significant implications for public health strategies.

Methods

This research aims to see how psychosocial stimulation influences the development process of toddlers who experience stunting. The method used is a systematic review using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist. Identify keywords using PICO (Problem, Intervention, Comparison Outcome) as follows: Problem: Stunted Toddlers, Intervention: Stimulation Psychosocial, Comparison: Intervention besides stimulation psychosocial, and Outcomes: Development status stunted toddlers.

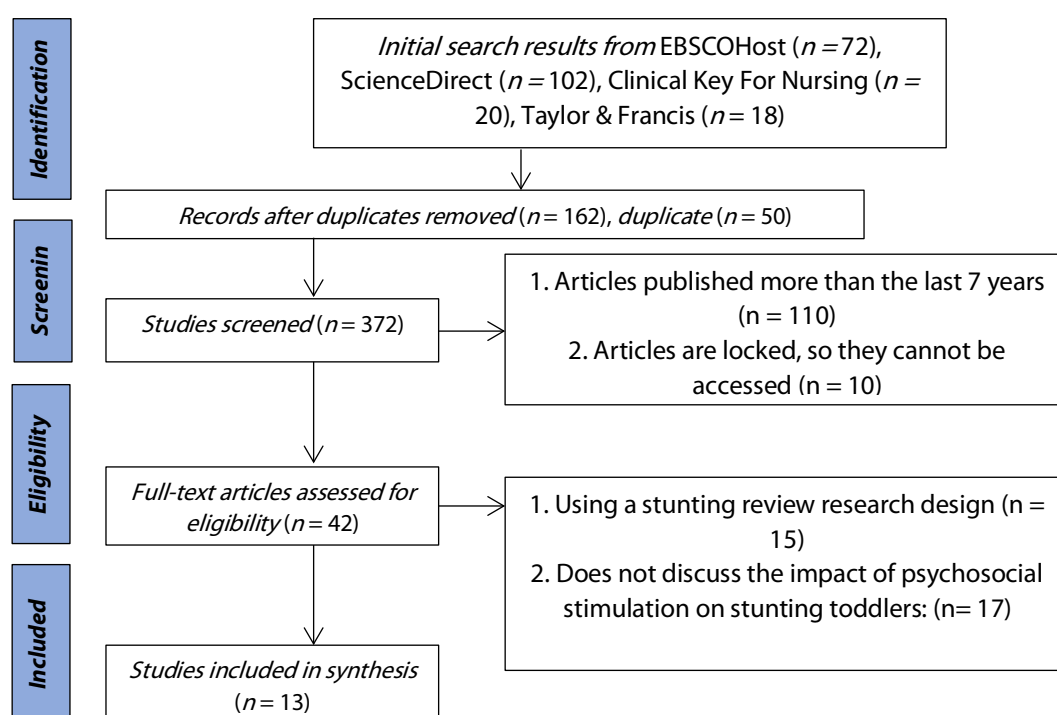
Article searches were carried out on the open access database search engine subscribed to by the University of Indonesia, namely Science Direct, Ebsco host, clinical key for nursing, and Taylor and Francis using the keywords :

P	I	C	O
Stunting	Psychology Stimulation	Intervention Besides Stimulation, Psychosocial	Development Status Stunted Toddlers
SINONIM			
Growth Disorder	Psychology Stimulus	-	Stunting Development
Stunting	Counselling	-	Stunted Development

In this research, the hand-searching technique was not utilised. The literature search was conducted with specific inclusion criteria: articles published within the last seven years (2017-2024), those that explain the influence of psychological stimulation on the development process of stunting in toddlers, and articles written in English. The exclusion criteria were also clearly defined, including the inability to access the complete article and the exclusion of review articles.

Several steps were carried out in the literature search process. First, a search was carried out using keywords and filtered through inclusion criteria until articles by the research objectives were found. Article selection was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram, with identification, screening, eligibility, and included stages. The articles found were then subjected to a feasibility test using JBI Critical Appraisal to assess their suitability.

Figure 1. Prism Flow Chart



Result

This study collected thirteen articles from the systematic review process to identify article characteristics through data mapping. The study emphasises the importance of psychosocial stimulation interventions for toddlers to optimise their growth and development in the first 1000 days of life. It also compared the results of the article analysis and reached a consensus through several discussions. Thirteen articles met the inclusion and exclusion criteria. These articles provide a comprehensive overview of the current research on this topic.

The articles came from several scientific journals using various methods, namely qualitative, quantitative, and mixed. The types of journals used include child health science journals, medical journals, education and pedagogy journals, child nutrition journals, child sociology journals, and public health journals. These results can be seen from the articles whose data have been extracted in Table 2. This diversity in journal sources ensures a broad perspective on the topic. The methodologies employed also reflect the complexity and multi-faceted nature of psychosocial interventions.

From the data extraction that has been carried out, we found several critical conclusions in psychosocial stimulation interventions for stunting toddlers, including the successful implementation of psychosocial stimulation, fully supported by empowered families (Suaib, 2021). Hygiene and sanitation practices (Jacob et al., 2023) support the successful implementation of the intervention. Health promotion media supports the intervention (Sharma et al., 2023). Parents and teachers are important supporting elements in the intervention implementation process (Riyadi et al., 2019).

The findings suggest that the success of psychosocial stimulation interventions depends on the intervention methods and the support from the surrounding environment. Hygiene and sanitation practices play a crucial role in the success of these interventions. Health promotion media also play a significant role in supporting the intervention process. Moreover, the active involvement of parents and teachers is essential. This holistic approach ensures a better implementation and outcome of psychosocial interventions.

This study highlights the importance of comprehensive and sustained psychosocial stimulation interventions for stunting toddlers. Full support from families, a clean and healthy environment, and the active role of parents and teachers are crucial. The findings reaffirm the need for a multidisciplinary approach to addressing stunting issues in toddlers. This approach ensures that all aspects influencing a child's development are addressed. Consequently, it paves the way for more effective interventions and better developmental outcomes for stunted children.

The extraction results article is depicted in the following table :

Table 2. Data extraction

Author Year	Country	Journal Name	Objective	Method	Conclusion
Sukmawati & Suaib, (2021)	Indonesia	Indian Journal of Forensic Medicine & Toxicology	analyse the influence empowerment of family through psychosocial help stimulation and giving Eat child to intake nutrition and child weight _ 2-3 years old to prevent stunting.	Quasi experiment with Pre-Post Test Control Group Design.	Empowerment family through help stimulation psychosocial and giving Eat child influential actual to enhancement intake substance nutrition (carbohydrates, protein, fat, calcium, zinc, and vitamin A) and child's weight 2-3 years old
Jacob et al. (2023)	Nigeria	European Journal of Education and Pedagogy	Analyse the influence Intervention Integrated Stimulation Psychosocial, Support Nutrition, and Hygiene Water Sanitation for Patients Nutrition Bad	Quasi experiment	development status of a child's nutrition through psychosocial stimulation, support nutrition, water sanitation, and cleanliness, which can be used to overcome malnutrition and increase the growth of the expected child. Along with emotional, social, physical, and intellectual child (brain) development, nutrition can develop with good when caught in psychosocial stimulation, play, comfort, and communication.
Sharma et al. (2023)	Nepal	PLOS ONE	identify influencing factors in cognitive development in children preschool 3–5 years old	Cross-sectional survey	Nutritional status and psychosocial stimulation become the main factors influencing preschool children's cognitive skills development. Promotion strategies, nutrition, and techniques for optimal psychosocial stimulation may play essential roles in increasing this development.
Hossain et al. (2022)	Bangladesh	Social Science & Medicine	measure impact integrated PAUD activities to aid programs cash without condition development children	Randomised Controlled Trial	Stimulation Integrated psychology in the assistance program benefits developing nerve children and increases the UCT price for self-mother. Assistance program cash can become an essential platform for stimulation programs for children in rural areas with poor populations.

Ramírez-Luzuriaga et al. (2021)	Guatemala	Social Science & Medicine	Analyse the role of supplementation food and stimulation of psychosocial with psychological well-being.	Cohorts	Intervention in nutrition in childhood has a long-term effect on cognitive abilities and results in psychological well-being.
Nataningtyas et al. (2024)	Indonesia	STRADA Journal Health Sciences	analyse the impact of stunting and stimulation on growing flower children between age from ages 2 and 6 years	observational analytical research with a case-control	stimulation psychosocial has a significant influence _ on growing flowers in a child between ages 2-6 years.
Helmizar et al. (2017)	Indonesia	Asia Pacific Journal of Clinical Nutrition	evaluate influence supplementation food and stimulation relevant psychosocial _ with culture to growth and development baby	Randomised controlled trial	Combination intervention with supplementation food and stimulation psychosocially increases the growth and development of the cognitive and motor baby.
Abessa et al. (2019)	Ethiopia	BMC Pediatrics	the test is stimulation psychomotor. I am running a few minutes late; my previous meeting is over. psychosocial family in the neighbourhood income increase development, linear growth, and yield nutrition in children	Randomised controlled trial	Stimulation psychomotor: Can you please give me access to this document? Psychosocial factors in children's nutrition can enhance motor rough work when combined with a standard nutrient-rich diet; however, they can even increase motor function when standard dietary care is unavailable.
Riyadi et al. (2019)	Indonesia	Journal of Food and Nutrition Research	Know the influence of nutrition and psychosocial stimulation on growing flower children in rural preschool areas.	quasi-experimental design	The study concludes that education, nutrition, and psychosocial stimulation increase nutrition Mother knowledge and practice, psychosocial mother and teacher knowledge and training, and child development.
Tessema et al. (2019)	Ethiopia	BMC Public health	test influence intervention stimulation psychosocial provided with maintenance take care stay routine and for six months after out on development, growth and results in treatment children with Malnutrition I Heavy aged 6–59 years month in Southern Ethiopia.	A parallel-group cluster-randomized controlled trial	Study This will contribute to proof of the influence of intervention stimulation on the development and growth of a child with malnutrition I heavy.

Emmers et al. (2024)	China	Child Development	evaluating a community-based psychosocial stimulation program in 3571 rural Chinese children aged 6-24 months from 2014 to 2017.	A cluster-randomized trial	Psychosocial stimulation interventions can significantly improve children's cognitive development and, in particular, positively impact the cognition of premature infants with low birth weight (LBW), helping them catch up developmentally.
Ruswiyani et al. (2021)	Indonesia	CABI Database	Testing the effect of psychosocial stimulation intervention and daily egg consumption on the nutritional status of stunted children aged 6-23 months	quacky-experiment study with cluster sampling	Both psychosocial stimulation and egg interventions significantly improved chronic malnutrition. However, combining these interventions resulted in even more significant improvements.
Li et al. (2024)	China	Chines Sociological Review	examine how primary caregiver education and family income may moderate the effects of CNPSI on children's growth environment and risk of developmental delay	randomised controlled trial	Combined nutrition and psychosocial stimulation interventions on home growth environment and developmental delay were weaker for parents with higher education levels.

The systematic review encompassed 13 articles from various scientific journals that fulfilled stringent inclusion and exclusion criteria. These articles implemented a range of research methodologies, including qualitative, quantitative, and mixed approaches. The fields contributing to these journals varied, covering child health science, medical research, education and pedagogy, child nutrition, child sociology, and public health. This diversity underscores the interdisciplinary nature of research concerning psychosocial stimulation for toddlers. Such a broad scope highlights the multifaceted aspects of studying and addressing early childhood development.

Successful implementation of psychosocial stimulation interventions was a common theme across the studies, with family empowerment frequently cited as critical. Enhanced hygiene and sanitation practices and strategic use of health promotion media were also identified as pivotal elements. For example, family empowerment significantly influences nutritional intake and child weight management, crucial in stunting prevention (Sukmawati & Fatmawati, 2021). These factors collectively contribute to effectively deploying interventions to reduce stunting and enhance early development. The studies suggest that empowered, well-informed families are essential to the success of these interventions.

Community-based programs, particularly cash transfers and educational outreach, were significant in promoting child development in impoverished rural settings (Hossain et al., 2022). Education and involvement of parents and teachers were highlighted as vital supports in effectively implementing intervention strategies (Riyadi et al., 2019a). These components ensure that interventions are delivered, sustainable, and integrated into the community lifestyle. Such approaches help to foster an environment where child development interventions can have long-lasting impacts. This is especially important in resource-limited settings where community involvement can make a substantial difference.

Several studies highlighted the long-term cognitive and psychological benefits of early childhood nutritional and psychosocial interventions (Ramírez-Luzuriaga et al., 2021). Long-term follow-ups in these studies indicate that early interventions can have lasting effects on cognitive abilities and psychological well-being. For instance, interventions combining nutritional support with psychosocial stimulation addressed immediate developmental needs and promoted sustained growth and mental development (Helmizar et al., 2017). Such findings underscore the importance of early intervention in setting a foundation for future educational and health outcomes. Early, comprehensive interventions are crucial for holistic child development.

Adapting interventions to local cultural contexts significantly enhances the effectiveness of programs, particularly those involving food supplementation and psychosocial support tailored to community norms (Helmizar et al., 2017). Cultural adaptation ensures that interventions are acceptable and resonate well with the target community's values and practices. This approach facilitates greater community buy-in and participation, which are crucial for the success of any public health initiative. Studies have shown that culturally sensitive implementations can lead to better health outcomes and more effective public health strategies. Therefore, understanding and integrating cultural dynamics into program design is vital for the success of psychosocial stimulation interventions.

The effectiveness of psychosocial and nutritional interventions can be influenced by socioeconomic factors such as the educational level of caregivers and family income (Li et al., 2024). These factors can moderate the impact of interventions on home growth environments and developmental outcomes. For example, higher educational levels of caregivers often correlate with better implementation and responsiveness to interventions. Understanding these moderating effects can help tailor interventions more effectively across different socioeconomic strata. This aspect of research highlights the need for tailored approaches that consider families' socioeconomic backgrounds to optimise intervention outcomes.

Discussion

The primary objective of this study was to evaluate the effectiveness of psychosocial stimulation interventions on the developmental growth of stunted toddlers during the crucial first 1000 days of life. Stunting, characterised by low height-for-age, has profound implications for physical and cognitive development, necessitating multifaceted interventions (Black et al., 2020; Fatima et al., 2020). Previous literature underscores the critical need for interventions that address nutritional deficiencies and the psychosocial environment to foster optimal child development (UNICEF, 2019). This systematic review integrates diverse research findings, highlighting the importance of combined nutritional and psychosocial strategies to mitigate the adverse effects of stunting (Jacob et al., 2023; Sharma et al., 2023).

Our results indicate that psychosocial stimulation interventions significantly enhance stunted toddlers' cognitive, motor, and emotional development (Abessa et al., 2019). These interventions also positively impact maternal self-esteem, possibly leading to a more supportive caregiving environment (Hossain et al., 2022). The synergistic effect of combining psychosocial and nutritional interventions suggests that such an integrated approach is more beneficial than isolated interventions (Sharma et al., 2023; Sukmawati & Suaib, 2021). These findings are particularly salient as they underscore both the direct benefits to child development and the secondary benefits to caregivers, which are crucial for the sustainability of developmental gains.

Comparing our results with existing literature, we find consistent support for the efficacy of psychosocial interventions in improving nutritional and developmental outcomes in stunted children (Tessema et al., 2019; Walker et al., 2015). The observed improvement in maternal self-esteem aligns with recent dimensions of psychosocial stimulation literature, highlighting an expansive influence beyond immediate child development benefits. This dual benefit is less emphasised in earlier studies but is critical for comprehensive child development programs. Such comparisons reinforce the necessity for integrated approaches considering broader family dynamics affecting child development (Galasso et al., 2019; Rezaeizadeh et al., 2024).

In line with previous findings, interventions that integrate nutritional supplementation with psychosocial stimulation significantly improve developmental outcomes. Studies in Bangladesh have demonstrated that daily supplementation with eggs, cow's milk, and multiple micronutrients significantly enhances linear growth in children who are stunted or at risk of stunting (Mahfuz et al., 2020). Similarly, educational programs for caregivers, focusing on nutrition and early child development, have positively affected cognitive, language, and motor development, although physical growth may not always reflect these gains (Hossain et al., 2024; Prado et al., 2019). These findings underscore the importance of a dual approach that addresses immediate nutritional needs and long-term developmental stimulation.

Furthermore, our review highlights that early life stature is associated with adult IQ and educational achievement, emphasising the need for interventions targeting early cognitive abilities to ensure long-term cognitive outcomes (Stein et al., 2023). Even with intervention, the persistence of stunting-related developmental deficits points to the complexity of addressing early malnutrition's long-term effects (Leroy et al., 2020). Studies have shown that socioeconomic status, maternal education, and environmental factors significantly correlate with growth and development outcomes, indicating the multifactorial nature of stunting and the need for comprehensive intervention strategies (Pangaribuan et al., 2020; Rezaeizadeh et al., 2024).

The impact of stunting on cognitive scores is well-documented, with stunted children exhibiting lower cognitive scores than their non-stunted peers (Nurliyana et al., 2020). This cognitive disadvantage is compounded by poor home environments, further impairing developmental outcomes. Integrating psychosocial stimulation with nutritional support addresses both these factors, providing a comprehensive solution to stunting (Bhavnani et al., 2021). Moreover, interventions focusing on the first 1000 days are critical as they coincide with a period of rapid brain development, making early intervention particularly effective (Prado et al., 2019).

The significant role of combined psychosocial and nutritional interventions can be explained by their ability to address both the immediate and long-term needs of stunted children. The dual focus on nutritional support and cognitive stimulation ensures comprehensive care, addressing multiple developmental aspects simultaneously. This integrative approach is vital for breaking the cycle of malnutrition and poor developmental outcomes in stunted populations. However, diverse methodologies across studies necessitate careful interpretation, considering methodological limitations and potential biases. Future research should aim to standardise intervention protocols to assess efficacy across different settings better.

These findings have profound implications, advocating for integrating psychosocial stimulation into public health policies addressing stunting. Demonstrating the effectiveness of these interventions supports the adoption of holistic child development strategies on a larger scale. These strategies should focus on both the child and elements that empower and educate caregivers, creating a supportive environment for optimal development. Policymakers and practitioners should consider these findings in intervention program designs and implementations. Comprehensive approaches have the potential to significantly reduce stunting prevalence and improve developmental outcomes in affected populations.

Conclusion

This systematic review was conducted to explore the effects of psychosocial stimulation interventions on the growth and development of stunted toddlers during the critical first 1000 days of life. Our analysis included 13 studies employing diverse methodologies across various scientific disciplines, highlighting the multifaceted nature of addressing early childhood development. The review demonstrated that successful interventions are strongly associated with family empowerment, improved sanitation, and effective use of health promotion media, with community-based programs further enhancing sustainable child development, especially in resource-limited settings. The findings emphasise the importance of integrating psychosocial stimulation into public health strategies to significantly improve developmental outcomes and reduce stunting. However, the variation in research methodologies and the focus on specific geographic and socio-economic settings may limit the generalizability of these findings. Future research should, therefore, focus on diverse cultural and economic environments to verify these results and refine intervention strategies. Overall, the study supports the adoption of comprehensive public health interventions that prioritise psychosocial stimulation to foster optimal growth in children at risk of stunting.

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