

Factors affecting delays in motor development in children aged 3-6 years: a literature review

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ABSTRACT

Background: The age range of 3–6 years represents a critical period of rapid motor and cognitive development. However, some children experience motor developmental delays due to multiple interacting factors.

Methods: This literature review was conducted using the PubMed, Google Scholar, and ScienceDirect databases with the keywords developmental delay, motor skills, and preschool children. From an initial 50 articles, five studies that met the inclusion criteria (children aged 3–6 years, observational design, and assessment of motor delay factors) were selected for in-depth review.

Results: The analysis identified four main categories of factors associated with motor developmental delays in early childhood: biological, social, psychological, and environmental. Among these, authoritarian parenting style and poor nutritional status were the most dominant determinants.

Conclusion: Motor developmental delays in preschool children are multifactorial and strongly influenced by biological and psychosocial conditions. Early identification of risk factors, especially parenting style and nutritional status, is essential for effective prevention and intervention strategies.

Keywords: developmental delay, motor skills, preschool children, risk factors

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Introduction

Child development is a gradual and multidimensional process encompassing physical, cognitive, motor, social, and emotional aspects. During early childhood—particularly between ages 3 and 6—rapid maturation of the nervous system occurs, a period often referred to as the brain growth spurt.¹ This stage is critical for establishing fundamental abilities, including motor functions. Motor development, which reflects the maturation of neuromuscular coordination, consists of two major domains: gross motor skills, involving large muscle activities such as walking, running, and jumping; and fine motor skills, which require precision and control of small muscles for tasks like writing, buttoning, or manipulating small objects. These motor abilities are essential for children's daily activities, learning processes, and social participation.²

In both developed and developing countries, motor developmental delays remain a prevalent issue affecting functional independence and quality of life. In Indonesia, the World Health Organization (WHO) reported that the country ranks third highest in Southeast Asia in the prevalence of developmental disorders among children.³ The 2017 WHO report also indicated that children with motor delays are at greater risk of coordination impairments and challenges in performing daily activities independently. Similarly, data from the Indonesian Ministry of Health (2020) revealed that approximately 13–18% of toddlers experience growth and developmental abnormalities.⁴ A study conducted at the Growth and Development Clinic of Prof. dr. I.G.N.G. Ngoerah Central General Hospital, Denpasar, found that 41.5% of children exhibited developmental delays, with the 36–72-month age group being the most at-risk population.⁵ These

contributing factors can be broadly categorized into biological, psychological, social, and environmental domains.

Although numerous studies have explored motor developmental delays, most remain descriptive or are based on limited populations, offering insufficient insight into causal mechanisms or effective intervention strategies. Moreover, many do not adopt an interprofessional perspective in addressing detection and management. Importantly, there is a lack of systematic literature reviews that classify contributing factors using a multidimensional framework encompassing biological, social, psychological, and environmental domains. Therefore, this literature review aims to identify and categorize the factors influencing motor developmental delays in children aged 3–6 years, providing both theoretical understanding and practical direction for future research and interventions in pediatric developmental health.

Methods

This study employed a literature review design aimed at identifying factors associated with motor developmental delays among children aged 3–6 years. The search strategy and reporting process followed the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) guidelines, although some formal components, such as risk of bias assessment, were not fully applied due to the descriptive nature of this review.

The literature search was conducted systematically through the PubMed, Google Scholar, and ScienceDirect databases. The following keywords and Boolean operators were used: motor delay, preschool children (3–6 years), motor development delay, motor delay risk factors, relationship, and association. The search was limited to articles published between 2018 and 2025 in English or Indonesian.

A total of 50 articles were initially identified. After screening titles and abstracts for relevance, 17 studies met the inclusion criteria, while 33 were excluded. Following full-text review, five studies that met all eligibility criteria were included in the final analysis.

The inclusion criteria consisted of: studies involving children aged 3–6 years, research examining gross or fine motor developmental delays, observational study designs (cross-sectional, case-control, or cohort), and publications available in full text in English or Indonesian. The exclusion criteria included: studies involving children with disabilities, opinion papers, case reports, or narrative reviews without primary data, and studies focusing solely on prevalence without exploring causal factors.

Article screening was performed independently by two reviewers to minimize selection bias. Discrepancies were resolved through discussion and consensus. However, a formal quality appraisal of the included studies was not conducted, which represents a limitation of this review.

Results

A total of five studies met the inclusion criteria and were analyzed to identify factors associated with motor developmental delays among children aged 3–6 years (Table 1). Yanti et al.¹ reported that maternal stimulation had a significant relationship with both gross and fine motor development. Among 32 preschool children, 53.1% exhibited gross motor delays and 59.4% showed fine motor delays. Inadequate stimulation was reported in 92.9% of children with gross motor delays and 86.7% with fine motor delays, whereas those receiving sufficient stimulation demonstrated normal motor development ($p < 0.05$). The duration of mother–child interaction was significantly associated with fine motor outcomes but not with gross motor skills.

Shatla et al.⁶ found that early complementary feeding before six months ($p = 0.001$), short birth spacing ($p = 0.018$), premature birth ($p = 0.004$), a large number of children in the household ($p = 0.037$), and low maternal education ($p = 0.016$) were significantly associated with developmental delays. These findings suggest that biological and environmental factors collectively influence motor development in young children.

Strooband et al.⁷ identified several determinants of fine motor delay, including male gender, low self-regulation, and poor language ability. Family-related and socioeconomic factors—such as single-parent households, low income, and indigenous background—were also associated with increased risk due to limited stimulation and restricted access to educational resources.

Masita et al.⁸ reported that close birth spacing ($p = 0.001$), birth order ($p = 0.002$), parental perception ($p = 0.039$), and religious values ($p = 0.020$) were significantly associated with fine motor development. Firstborn children tended to receive greater parental attention and stimulation, while those born with shorter birth intervals were more likely to experience fine motor delays. In contrast, parental education level and child maltreatment were not significantly related to motor development.

Dina et al.⁹ identified authoritarian parenting style and poor nutritional status as the main predictors of gross motor delay. Children exposed to authoritarian parenting were more likely to show gross motor delays than those raised with supportive parenting ($p < 0.05$). Nutritional inadequacy was also associated with borderline gross motor performance, whereas motivation did not have a significant influence.

Collectively, these studies indicate that motor developmental delays in preschool-aged children are multifactorial, with maternal stimulation, parenting style, nutritional status, and birth spacing emerging as the most consistent determinants.^{1,6–9}

Discussion

Based on the five studies reviewed, motor developmental delays among children aged 3–6 years are influenced by multiple interrelated factors, including biological, social, psychological, and environmental aspects. Among these, authoritarian parenting style and poor

Table 1. Results summary of the factors affecting delays in motor development in children.

Authors	Title	Methods	Results
Yanti et al., (2020) ¹	Factors affecting pre-school age motoric development	Study design: cross-sectional Participants: 32 children aged 4-5 years Measuring instrument: a questionnaires and tables DDST	The factors that influence gross and fine motor development are stimulation from the mother. Age, education, length of interaction with the mother, and the mother's occupation have no significant relationship with the child's motor development.
Shatla et al., (2020) ⁶	Prevalence and factors associated with developmental delays among preschool children in Saudi Arabia	Study design: cross-sectional Participants: 984 reschoolers aged 36, 48, and 60 months Measuring instrument: a modified Arabic version of the ages and stages questionnaires, third edition (ASQ-3) questionnaires.	Significant factors associated with delayed motor development in children are complementary feeding before the age of 6 months, birth spacing between children (< 3 years), premature birth, number of children in the household, and low maternal education level.
Strooband et al., (2020) ⁷	Prevalence and risk factors of preschoolers' fine motor delay within vulnerable Australian communities	Study design: cross-sectional Participants: 700 children aged 3-5 years Measuring instrument: a third edition (ASQ-3) questionnaire, SDQ, and YET questionnaires.	Significant factors in motor development delays are gender, ethnicity, children with low self-regulation, low speech and vocabulary skills, and children living with single parents.
Masita et al., (2021) ⁸	Fine motor developmental delay and associated factors among children aged 3-5 years in Surabaya.	Study design: cross-sectional Participants: 70 children aged 3-5 years Measuring instrument: a fine motor skills assessment questionnaire.	Significant factors include birth spacing, birth order, religious values, and parental perceptions. Parental education and child abuse are not significant factors.
Dina et al., (2024) ⁹	Faktor yang mempengaruhi perkembangan motorik kasar anak 3-5 tahun di Desa Lasarasawo Kecamatan Sawo Kabupaten Nias.	Study design: cross-sectional Participants: 35 children aged 3-5 years Measuring instrument: a KPSP, parenting questionnaire, and Motivation questionnaire.	The most dominant result in the bivariate and multivariate analyses was authoritarian parenting. In the bivariate analysis, nutritional factors were found to be significant.

nutritional status were identified as the most dominant contributors, particularly affecting gross motor development. Early identification and management of these risk factors are therefore essential to prevent long-term developmental consequences and to promote optimal growth during the preschool years.

Although several studies have examined the association between these variables, gaps remain in understanding their causal mechanisms and in developing contextually and culturally relevant intervention strategies. Future research should adopt longitudinal and cross-cultural designs to strengthen causal inference and improve the generalizability of findings. The present review underscores the importance of a collaborative approach involving parents, healthcare providers, and policymakers in promoting child motor development through effective parental education, early screening programs, and inclusive, evidence-based public health policies.

Conclusions

Based on the five studies reviewed, motor developmental delays among children aged 3–6 years are influenced by multiple interrelated factors, including biological, social, psychological, and environmental aspects. Among these, authoritarian parenting style and poor nutritional status were identified as the most dominant contributors, particularly affecting gross motor development. Early identification and management of these risk factors are therefore essential to prevent long-term developmental consequences and to promote optimal growth during the preschool years.

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Ethical clearance

This review study utilized publicly available published articles, so informed consent and ethical approval were unnecessary.

Conflict of interest

The authors declare no conflicts of interest, financial or otherwise, that could have influenced the research, manuscript preparation, or publication. All authors confirm that this study and manuscript were conducted with full scientific integrity and without external or personal influences that could affect the objectivity or validity of the findings.

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Author contributions

CISM developed the study design, conducted data collection, and prepared the initial manuscript; IP and AAGAPN were responsible for data collection and provided revisions to the manuscript.

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