

DETERMINANTS ASSOCIATED WITH FINE MOTOR DEVELOPMENT IN CHILDREN AGED 3–6 YEARS

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Abstract

Children aged 0–6 years are recognized as being in the golden period, a critical stage for growth and development encompassing physical, cognitive, emotional, and social aspects. Delays in fine motor skill acquisition during the preschool years may negatively affect a child's readiness to enter the next developmental stage in the school-age period. This study aimed to analyze the determinants associated with fine motor development in children aged 3–6 years at Muslimat NU 15 Kindergarten, Malang. The research employed an analytic observational design with a cross-sectional approach. A total sampling technique was applied, involving 52 respondents. Research instruments included a questionnaire, the Denver II test, and supporting examination tools. Data analysis was performed using Odds Ratio (OR), and multivariate logistic regression. The results showed that three of the five independent variables – exclusive breastfeeding, immunization, and parental stimulation – were significantly associated with fine motor development ($p < 0.05$). In contrast, the child's sex was not significantly associated ($p = 0.571$). Immunization emerged as the most dominant factor influencing fine motor development ($p = 0.002$; OR = 12.4; 95% CI). These findings highlight the importance of parental attention to factors affecting child growth and development to ensure fine motor skills progress in accordance with age and to prevent developmental delays.

Keywords: Preschool; development; motor skills

INTRODUCTION

Children aged 0–6 years are in what is often referred to as the golden period, a critical stage for overall development encompassing physical, cognitive, emotional, and social aspects. Key developmental milestones assessed during this stage include gross motor skills, fine motor skills, language, and social interaction. Developmental screening is essential to detect any deviations or delays in a child's growth and progress. Fine motor development delays can be identified by a child's inability to perform tasks that require finger movements, such as folding fingers, grasping, sticking, cutting, or transferring objects (Soetjiningsih, 2015).

A child's inability to achieve fine motor skills during the preschool years can have a significant impact on their ability to progress to the next stage of development during the school-age period (Luh et al., 2019). Developmental areas that may be disrupted when fine motor delays occur in preschool children include reading, writing, attention span, and cognitive learning abilities, as well as self-care and independence. Such delays can hinder a child's ability to achieve essential cognitive milestones and may negatively affect their readiness for formal learning and their capacity to interact effectively with peers.

The Indonesian Basic Health Research (Riset Kesehatan Dasar) reports that the prevalence of stunting – a condition caused by nutritional problems – reaches

37.2%. This high rate of stunting is closely associated with an increased risk of developmental disorders in children (IDAI, 2017). As a result of the COVID-19 pandemic, the coverage of health services for infants, toddlers, and preschool-aged children tended to decline compared to 2021. Key essential services for infants and young children include the provision of exclusive breastfeeding, Vitamin A supplementation, and growth and developmental monitoring. According to data from the Kementrian Kesehatan (2021), the proportion of toddlers in Indonesia whose growth and development were monitored in 2021 was 69.6%. Meanwhile, the 2021 Strategic Plan (Renstra) set a target of 70% for child growth and development monitoring. During the COVID-19 pandemic, growth and development monitoring activities, which were typically carried out at Posyandu (community health posts), were largely disrupted depending on the situation in each district or city. Despite these challenges, the national achievement for East Java Province reached 77.8% of children being monitored for growth and development. According to the 2018 Basic Health Research (RISKESDAS) report for East Java, the prevalence of gross motor developmental disorders among children was 12.4%, while fine motor developmental disorders accounted for 9.8%. These figures indicate that cases of motor development disorders among preschool-aged children in Indonesia remain a significant public health concern (RISKESDAS, 2018). According to preliminary data collected in November 2022 from students at Muslimat NU 15 Kindergarten, Malang, 6 out of 54 students were suspected of experiencing fine motor development delays. These delays were indicated by the children's inability to perform activities such as cutting with scissors or participating in play activities like stacking blocks.

During the period of fine motor development, several factors can influence a child's progress, one of the most important being the stimulation provided by parents. Children who lack opportunities to explore—such as those who are frequently carried or not given chances to grasp and manipulate objects—may experience delays in achieving fine motor milestones. According to a study conducted by (Fitriyanti & Rosidah, 2017) There is a possibility that factors such as nutrition, parenting style, and the environment also play significant roles in the development of children's fine motor skills. In addition, environmental conditions and the child's personality can influence the pace and quality of fine motor development. According to Munawaroh dkk (2019) the fine motor development of preschool children progresses after the development of gross motor skills. During the early years, particularly at the ages of one to two years, gross motor abilities develop rapidly and serve as the foundation for subsequent fine motor skill development. In her study Luh (2019) reported that the formation of early cognitive abilities in school-age children is influenced by factors such as family stimulation, breastfeeding duration, and the sibling effect, all of which play important roles in shaping a child's development during the early stages of life.

Children's fine motor skills can be enhanced through appropriate stimulation. Training these abilities can be achieved not only by providing direct

stimulation but also through engaging activities such as playing with lego, stacking blocks, or assembling puzzles. Such activities help strengthen the small muscles of the hands and fingers while fostering creativity, thereby supporting the optimal development of fine motor skills.

Based on the description above and findings from previous studies, several factors have been identified as being associated with fine motor development in children aged 3–6 years. Therefore, the researcher was motivated to conduct a study analyzing the factors related to fine motor development among children aged 3–6 years at Muslimat NU 15 Kindergarten, Malang City.

METHODS

The research design employed in this study was a quantitative research design. Multivariate analysis was performed using logistic regression to identify variables independently associated with fine motor development. The study population comprised all students of Muslimat NU 15 Kindergarten, Malang City, during the 2022–2023 academic year, totaling 54 children. The sample size was determined using a total sampling technique, resulting in 54 respondents.

Inclusion criteria included: (1) children aged 3–6 years, (2) parents willing to participate as research respondents, and (3) children present during the data collection period. The study was conducted at Muslimat NU 15 Kindergarten, Malang City, and data were collected in June 2023.

Child development was assessed using the Denver Developmental Screening Test (DDST/Denver II), while additional data were obtained through a structured questionnaire covering demographic information (parent's name, child's name, age, address, sex, body weight, and height), a parenting style questionnaire, and a child stimulation questionnaire. Measurement tools included a weighing scale and a stadiometer for weight and height assessment.

Ethical approval for this study was granted by the Health Research Ethics Committee of Poltekkes Kemenkes Malang, Certificate No. 573/VI/KEPK-Polkesma/2023, dated June 22, 2023.

RESULTS AND DISCUSSION

Table 1
Demographics of Students at Muslimat NU 15 Kindergarten, Malang
Academic Year 2022–2023

Student Characteristics	Frequency (f)	Percentage (%)
Sex		
Male	28	53,8 %
Female	24	46,2 %
Breastfeeding		
Exclusive	31	59,6 %
Predominant	0	0 %
Partial	21	40,4 %

Nutritional Status		
Underweight	8	15,4 %
Normal	26	50 %
Overweight	18	34,6 %
Immunization		
Incomplete	18	34,6 %
Complete	34	65,4 %
Parenting style		
Democratic	26	50 %
Authoritarian	18	34,6 %
Permissive	8	15,4 %
Stimulation		
Low	0	0 %
Adequat	19	36,5 %
Good	33	63,5 %
Motor development		
Normal	37	71,2 %
Suspect	15	28,8 %
Unstable	0	0 %

Source: Processed Data 2023

Based on Table 1, it is shown that 53.8% of the students are male, 59.6% received exclusive breastfeeding, 50% have normal nutritional status, 65.4% received complete immunization, 50% were raised with a democratic parenting style, 63.5% received adequate stimulation from their parents, and 71.2% demonstrated normal fine motor development.

Table 2
Results of Logistic Regression Analysis of Determinants Associated with Fine Motor Development in Children Aged 3–6 Years at Muslimat NU 15 Kindergarten, Malang Academic Year 2022–2023

Variable	B	S.E.	Wald	d f	Sg.	Exp (B)	95% C.I.for EXP(B)	
							Lower	Upper
Breastfeeding	-.795	.552	2.075	1	.150	.452	.153	1.332
Nutritional Status	-.350	1.177	.088	1	.766	.705	.070	7.072
Immunization	2.523	1.029	6.013	1	.014	12.472	1.660	93.730
Parenting style	-.497	1.536	.105	1	.746	.608	.030	12.335
Stimulation	1.326	.958	1.916	1	.166	3.766	.576	24.631

Omnibus Test: p value = 0,000

Nagerkerke R square = 0,623

The results of the logistic regression analysis showed that the variables significantly associated with fine motor development were breastfeeding, immunization, and parental stimulation. In contrast, nutritional status and parenting style were not significantly associated with fine motor development. Based on the Nagelkerke R square, a value of 0.623 was obtained, indicating that

the independent variables explained 62.3% of the variance in fine motor development. The most dominant factor was immunization, with an odds ratio (OR) of 12.4 (95% CI: 1.660–93.730), meaning that children with incomplete immunization were 12.4 times more likely to experience delayed fine motor development compared to those who received complete immunization.

The results of the study showed a significant association between fine motor development and exclusive breastfeeding, immunization, and stimulation. This finding is consistent with the research of (Hastuti., 2019) which states that there is a relationship between exclusive breastfeeding and the fine motor development of children. Exclusive breastfeeding is critically important for a child's growth and development because breast milk provides nutrients that are precisely suited to the infant's needs and supports optimal development. Infants who do not receive sufficient breast milk may experience inadequate nutritional intake, which can lead to malnutrition, stunting, and delayed growth and development. This is in line with the theory explained by (Soenarwo, 2012), which explains that the nutritional components contained in breast milk, such as taurine and long-chain polyunsaturated fatty acids (LCPUFAs), are highly beneficial for an infant's vision and psychomotor development. These nutrients are exclusively present in breast milk, whereas formula milk contains only minimal amounts of lactose and long-chain fatty acids, making it less optimal for supporting these critical developmental processes.

Research conducted by (Riyantini, 2016) stated that there is a relationship between the administration of complete basic immunization and the fine motor development of children. Immunization increases a child's immunity against certain diseases so that when exposed to those diseases, the child will either not become ill or only experience mild symptoms. Illness in children can hinder their learning process, thereby preventing optimal growth and development. Soetjningsih (2015) stated that growth and development can be influenced by susceptibility to disease, which is partly determined by the status of complete basic immunization. Providing complete basic immunization can prevent toddlers from contracting infectious diseases, especially during the critical age period when children are vulnerable to nutritional deficiencies. If such conditions persist, the child may experience disruptions in both growth and developmental progress.

Research conducted by (Yunita, 2020) stated that there is a relationship between the provision of stimulation and fine motor development. This is in accordance with the theory Nursalam (2015), stimulation is a crucial factor in a child's growth and development. Children who receive frequent and targeted stimulation tend to develop more rapidly than those who receive little or no stimulation. Providing stimulation during the golden period, aligned with the child's developmental needs, optimizes overall development. Parental involvement in stimulation positively influences preschool-aged children's development. A lack of adequate stimulation can result in stiff movements, reduced activity, and limited exploration of new experiences. This aligns with

the view of Thorndike (Hastuti, 2019) in the law of exercise theory, which states that the connection between a stimulus and its response becomes stronger the more frequently the response is performed in reaction to the stimulus.

According to the researchers, exclusive breastfeeding, complete basic immunization, and adequate stimulation are key factors that make a significant contribution to supporting fine motor development in preschool-aged children. Exclusive breastfeeding not only provides essential nutrients such as taurine and long-chain polyunsaturated fatty acids (LCPUFAs) but also delivers immunological protection that cannot be fully replaced by formula milk. These bioactive components play a crucial role in the formation of neural networks and psychomotor functions, which form the foundation for fine motor development. Complete basic immunization is also a critical determinant, as it reduces a child's vulnerability to infectious diseases. Children who are protected from illness have a greater opportunity to grow healthily, engage in learning activities, and explore their environment optimally, ensuring that their motor development is not hindered. This finding highlights that immunization is beneficial not only for disease prevention but also for supporting the attainment of developmental milestones. In addition, appropriate stimulation during the golden period plays a central role in strengthening stimulus-response connections and promoting the maturation of the nervous system. Consistent and well-directed stimulation from parents or caregivers has been shown to accelerate the acquisition of fine motor skills, aligning with Thorndike's law of exercise, which emphasizes the importance of repeated practice in reinforcing developmental responses.

CONCLUSSION

The most dominant factor associated with fine motor development in children was immunization. Therefore, parents are encouraged to pay closer attention to their child's immunization schedule to prevent illness and to ensure that the child's growth and development progress optimally according to age, thereby reducing the risk of developmental delays.

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