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The Association of Stimulation and Food Intake with Motor Development among Toddlers in Puskesmas Belimbing

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ABSTRACT

Background: Children's brain development up to 3 years old reaches 80%. At this age, delays in motor development can be detected so that further intervention can be carried out.
Objectives: To determine the factors which have an association with motor development among toddlers.
Methods: A cross-sectional research design was undertaken in which the sample was a 78 of mothers of toddlers 6-36 months in Puskesmas Belimbing. The sample was chosen by proportional random sampling technique. Data analysis was carried out in the form of univariate, bivariate and multivariate with the IBM SPSS Statistics for Windows Software.
Results: This research found the majority of toddlers' fine motor (80.8%) and gross motor development (84.6%) were in the normal category. The bivariate analysis results indicated an association between iron intake and the fine motor (p value=0.008) and gross motor development (p value =0.045). There was an association between stimulation and fine motor (p value =0.001) and gross motor development (p value =0.009), as well as nutritional status according to weight-for-height which had an association with the fine motor (p value =0.034) and gross motor development (p value =0.047). Meanwhile, nutritional status according to height-for-age had only an association with fine motor development (p value =0.016). The factor most related to fine and gross motor development was stimulation (p value = 0.006; OR=6.559; 95%CI=1.704-25.249 and p value=0.007; OR=6.333; 95%CI=1.671-23.999).
Conclusion: It was discovered that the factor most related to fine and gross motor development in toddlers aged 6-36 months was stimulation provided by parents.

INTRODUCTION

Each child's development process has a different speed, so parents with the help of health workers are encouraged to monitor their child's development regularly according to the Regulation No. 66 of 2014 of the Republic of Indonesia's Health Minister about the surveillance of growth, development and growth and development disorders[1]. One of the delays that often occurs at an early age is delayed motor development. The development of a growing child's brain goes through three phases, firstly is the primitive brain (action brain), the limbic brain (feeling brain), and at the end is the neocortex (thinking brain). Motor movements are regulated by the primitive brain, where from birth to 3 years of age brain development

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approaches perfection, reaching 80%. This causes providing stimulus at this age to influence motor development in children[2].

The United Nations International Children's Emergency Fund (UNICEF) in 2019 report the problem of growth and development disorder in children throughout the world reached 27.5% or the equivalent of 3 million children experiencing growth and development disorders[3]. According to the Indonesian Pediatrician Association (IDAI), 5-10% of children experience developmental delays. The incidence of children suffering from general development is not yet clear. However, it is anticipated that 1-3% of children under the age of five face general developmental delays[4]. The Early Growth and Development Stimulation, Detection and Intervention (SDIDTK) program addresses developmental delays by focusing on infants from 0 to 11 months, toddlers from 12 to 59 months, and preschoolers aged 60 to 72 months.

Based on a report from the Padang City Health Service in 2023, the SDIDTK program has been implemented for 8,909 babies, 36,633 toddlers and 14,352 preschool children in Padang. The implementation of this program revealed that 5% of children in Padang were affected by developmental disorders. The SDIDTK results showed that 80 children had gross motor disorders, 41 children had fine motor skills, 122 children had language and communication disorders, and 56 children had social and independence disorders.

Among the 24 community health centers implementing the SDIDTK program in 2023, Puskesmas Belimbing stands out as having the highest prevalence of developmental disorders in children[5].

Children who experience delays in motor development at an early age will affect other aspects of development later in life. Delays in motor development affect the body's coordination system, where if immediate follow-up is not taken it will cause children to have difficulty carrying out physical activities such as sitting, crawling and walking. Children who experience delays in motor development will potentially experience delays in cognitive and social aspects[6]. The book "Guidelines for Implementing Stimulation, Detection and Early Intervention of Growth and Development" states that several internal and external factors affect children's growth and development. Internal factors that influence children's development are as follow: race, family, age, gender and genetics. The external factors are grouped based on the prenatal phase, labor phase, and postpartum or birth phase[7]. Motor delays in the postnatal phase are a phase of child development that can be detected. Factors that influence the postpartum phase include nutritional intake, stimulation, and nutritional status.

In various studies, the intake of micronutrients greatly influences brain development, such as iron, vitamin A, vitamin B, vitamin D, calcium, zinc, phosphorus and iodine. These micronutrients have their respective functions and roles in the process of children's growth and development. Based on the annual report of Puskesmas Belimbing in 2023, it shows that the incidence of anemia is the second highest in the city of Padang, reaching 20.4%[8]. In toddlers, iron intake helps the body develop optimally. Iron deficiency in children will have an impact on cognitive function, physical growth, and delays in motor function in children[9].

Many studies have linked nutritional status with motor development in children. Children's development of gross and fine motor skills is disrupted by the prevalence of nutritional status disorders like stunting. This can be related to a delay in the maturity of nerve cells in the cerebellum that is responsible for coordinating motor movements. Stunted children with delay in maturation of brain function caused by low triceps surae muscle mechanical ability, which impairs their motor skills [10].

Moreover, providing stimulation to children from an early age has an influence on children's motor development. Stimulation is recommended to be given from an early age, even in the womb. Stimulation and the role of parents have an influence on children's development in the golden age. Providing systematic and coherent stimuli according to age can help children develop optimally. Providing stimulation to

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children can provide benefits in being able to grow, develop and mature children's basic abilities in motor and sensory development [11].

A preliminary survey in Puskesmas Belimbing revealed that 33 children suffered from motor disorders. The study was conducted in comprehensive to study fine and gross motor development spesifically among children aged 6 to 36 months. Given the issues raised, the author would like to investigate the association of iron consumption, nutritional status, and stimulation and motor development in children aged 6 to 36 months in Puskesmas Belimbing.

METHOD

Cross-sectional research using a quantitative approach was conducted in Puskesmas Belimbing in Padang City. Mothers of toddlers aged 6 to 36 months who reside in Puskesmas Belimbing made up the research population,were 3.365 mothers. Sample was obtained from the Lemeshow formula calculation, namely 78 respondents taken using proportional random sampling techniques, in three sub-districts in Puskesmas Belimbing. The variables analyzed included motor development as the dependent variable and sample characteristic variables, such as age and gender, then iron intake, nutritional status, and stimulation as independent variables.

Both primary and secondary data are included in the collected data. Researchers used standardized instruments to directly collect primary data, such as nutritional status data, including height or body length and body weight. Height or body length is measured with a microtoice for toddlers who can stand calmly and straight, while a body length tool is used for toddlers who cannot yet stand calmly and straight. Each tool used has an accuracy of 0.1 cm. Digital scales were used to measure the toddler's weight with an accuracy of 0.1 kg. For toddlers who cannot yet be weighed on a digital scale, they are weighed with their mother. Data on toddler characteristics, iron intake and stimulation were collected through filling out questionnaires with interviews. Specifically, data on toddlers' motor development is collected by data collectors with a psychology background. Meanwhile, secondary research data was collected according to the annual reports of the Padang City Health Service (DKK) and Puskesmas Belimbing, such as data on motor disorders and activity targets at Puskesmas Belimbing. The ethical consideration was obtained from the Research Ethics Committee at the Public Health Faculty, Universitas Andalas, under approval number: B/45/UN16.12.D/PT.01.00/2024.

Data from measurements of body weight and height determine nutritional status based on WHO Anthro which is grouped as follows; Weight according to Age (W/A) is categorized as very low (<- 3 Standard Deviations or SD), deficient (- 3 SD to < -2 SD), normal (- 2 SD to + 1 SD) and at risk of overnutrition (> + 1 SD). Height according to Age (H/A) is categorized as very short (<- 3 Standard Deviation or SD), short (- 3 SD to < -2 SD), normal (- 2 SD to + 3 SD) and tall (> + 3 elementary school). Body Weight according to Height (W/H) is categorized as poor nutrition (<- 3 Standard Deviation or SD), malnutrition (- 3 SD to < -2 SD), good nutrition (- 2 SD to + 1 SD), nutritional risk over (>+ 1 SD to + 2 SD), over nutrition (>+ 2 SD to + 3 SD) and obesity (> + 3 SD)[7].

The Semi Quantitative Food Frequency Questionnaire (SQ-FFQ) was used to gather data on iron intake. It was categorized as either sufficient (≥77%) or insufficient (<77%). (Handayani, 2017). The Home Observation for Measurement of the Environment (HOME) questionnaire was used to measure the stimulation data, and it was categorized as low (score ≥25) or high (score <25)[12]. Children's motor development was assessed through the Denver Development Screening Test II (DDST II) questionnaire with categorization, normal (no delays, at most one warning) and suspect (one or more delays and/or two or more warnings) [13].

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The data collection results undergo univariate analysis to ascertain the distribution and frequency of each variable. Next, bivariate analysis was carried out to determine the relationship between variables using the Chi Square Test. The significance of the relationship between variables is known from the p value <0.05 with a Confident Interval of 95%. Then a Multiple Logistic Regression Test was carried out to determine the most dominant factors related to motor development in children aged 6-36 months by looking at the largest Odds Ratio (OR) value and p value <0.05.

RESULTS

The research results showed that more than half of toddlers had fine and gross motor development in the normal category, 80.8% and 84.6% respectively. In addition, it was found that more than half of toddlers lacked iron intake (52.6%), almost the majority of toddlers had moderate category stimulation (76.9%). Judging from the nutritional status based on the W/A, H/A and W/H indices, it shows that the majority of toddlers have normal nutrition, respectively 83.3%, 78.2% and 80.8%. In the study, it was found that more than half of the toddlers were male (61.5%) and aged ≤ 2 years (67.9%) (Table 1).

Table 1. Characteristics of Toddlers Aged 6-36 months, the Belimbing Community Health Center, Padang

Variable	n	(%)
Motor Development		
Fine Motor		
Normal	63	80.8
Suspect	15	19.2
Gross Motor		
Normal	66	84.6
Suspect	12	15.4
Gender		
Male	48	61.5
Female	30	38.5
Age		
≤ 2 years old	53	67.9
> 2 years old	25	32.1
Iron Intake		
Adequate	37	47.4
Low	41	52.6
Nutritional Status		
Weight/Age		
Very Low	2	2.6
Low	6	7.7
Normal	65	83.3
Risk of being overweight	5	6.4
Height/Age		
Very Short	2	2.6
Short	15	19.2
Normal	61	78.2
Tall	0	0.0
Weight/Height		
Malnutrition	0	0.0
Low Nutrition	7	9.0

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Variable	n	(%)
Good nutrition	63	80.8
Risk of Overnutrition	5	6.4
Overnutrition	2	2.6
Obese	1	1.3
Stimulation		
High	3	3.8
Moderate	60	76.9
Low	15	19.2

Besides the characteristics of toddlers, the characteristics of mothers of toddlers are also described. The univariate analysis's findings about mothers of toddlers characteristics include age, educational attainment, and employment status. The highest percentage of maternal characteristics is non-risk age: 20-35 years old (85.9%), high education level, such as senior high school or higher (91.0%) and not-working or as a housewife (82.1%) (Table 2).

Table 2. Characteristics of Mothers at the Belimbing Community Health Center, Padang

Variables	n	%
Mother's Age		
No Risk	67	85.9
High Risk	11	14.1
Education Level		
Senior High School or higher	71	91.0
Junior High School or lower	7	9.0
Occupation		
Not-working	64	82.1
Working	14	17.9

The following stage is analysis of bivariate to examine the association of variables. Table 3 and Table 4 indicates that the development of toddlers' gross and fine motor skills is unrelated to the mother's age or employment status. The development of toddlers' fine motor skills is then associated with the mother's educational attainment (p-value=0.023), but there is no significant association with the development of toddlers' gross motor skills (p value=0.293). Iron consumption, however, is significantly correlated with toddlers' development of fine motor skills (p value = 0.008) and gross motor skills (p value = 0.045). Furthermore, there is a significant association between stimulation and fine motor skills (p value = 0.001) and gross motor skills development among toddlers (p value = 0.009).

Table 3. Determinants of Toddlers' Fine Motor Development at Ages 6–36 Months

Variable	Fine Motor Development				*p value*
	Suspect		Normal		
	n	(%)	n	(%)	
Mother's Age					
High Risk	2	18.2	9	81.8	1.000
No Risk	13	19.4	54	80.6	
Mother's Occupation					
Working	2	14.3	12	85.7	
	13	20.3	51	79.7	1.000

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Not-working					
Education Level	4	57.1	3	42.9	
Junior High					0.023
School/lower	11	15.5	60	84.5	
Senior High					
School/higher					
Iron Intake	13	86.7	28	44.4	0.008
Low	2	13.3	35	55.6	
Adequate					
Nutritional status					
Weight/Age	5	33.3	8	12.7	0.115
Not-normal	10	6.7	55	7.3	
Normal					
Height/Age	7	46.7	10	15.9	0.016
Not-normal	8	53.3	53	84.1	
Normal					
Weight/Height	6	40.0	9	14.3	
Not-normal	9	60.0	54	85.7	0.034
Normal					
Stimulation	8	53.3	7	11.1	
Low	7	6.7	56	8.9	0.001
High					

Toddler nutritional status is based on W/A, W/H and H/A, then the relationship with motor development is traced rough and smooth in toddlers. The analysis of nutritional status result based on the W/H index have a significant association with the fine motor skills development (p value = 0.034) and gross motor skills in toddlers (p value = 0.047). Nutritional status based on the H/A index has a significant association with the fine motor development (p value = 0.016), but there is no significant association with gross motor development of toddlers (p value = 0.282). Furthermore, nutritional status based on W/A indicates that there is no significant correlation between the development of toddlers' fine motor skills (p value = 0.115) and gross motor skills (p value = 0.411) and the nutritional status of the W/A index (Table 3 and 4).

Table 4. Determinants of Toddlers' Gross Motor Development at Ages 6-36 Months

Variable	**Gross Motor Development**				***p value***
	Suspect		**Normal**		
	n	**(%)**	**n**	**(%)**	
Mother's Age					
High Risk	1	9.1	10	83.6	
No Risk	11	16.4	56	90.9	1.000
Mother's Occupation					
Working	1	7.1	13	92.9	0.683
Not-working	11	17.2	53	82.8	
Education Level					
Junior High School/ lower	2	28.6	5	71.4	
Senior High School/ higher	10	14.1	61	85.9	0.293
Iron Intake					
Low	10	83.3	31	47.0	
Adequate	2	16.7	35	53.0	0.045

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Nutritional status					
Weight/Age					
Not-normal	3	75.0	10	12.7	0.411
Normal	9	25.0	56	7.3	
Height/Age					
Not-normal	4	33.3	13	19.7	0.282
Normal	8	66.7	53	80.3	
Weight/ Height					
Not-normal	5	41.7	10	15.2	0.047
Normal	7	58.3	56	84.8	
Stimulation					
Low	6	50.0	9	13.6	0.009
High	6	50.0	57	6.4	

Following the bivariate analysis, the Multiple Logistic Regression Test with the Enter Model was used to perform a multivariate analysis. The most dominant factors related to toddlers' motor development can be seen in Table 5. The results indicated that the stimulation is the most dominant factor related to fine motor development (p value=0.006; OR=6.559; 95%CI=1.704-25.249) and gross motor skills. (p value=0.007; OR=6.333; 95%CI=1.671-23.999). In addition, fine motor development was associated with iron intake (p value=0.035; OR=5.814; 95%CI=1.136-29.412).

Table 5. Dominant Factor Associated with Toddler Motor Development

Variable	***p value***	**95% CI**		**OR**
		Lower	**Upper**	
Fine Motor Development				
Iron Intake	0.035	1.136	29.412	5.814
Stimulation	0.006	1.704	25.249	6.559
Gross Motor Development				
Stimulation	0.007	1.671	23.999	6.333

DISCUSSION

Fine and gross motor skills development with the suspect category was found to be almost 20% in this study, 19.2% and 15.4% respectively. The results are not much different from the findings of Shalza Ellian Farthur Ihza, et al among toddlers aged 24-59 months in Semarang[14]. The development of toddlers in the suspect category with a slightly higher figure was found 26.7% by Suriani B, et al in toddlers in Makasar[15].

In this study, the level of maternal education had a significant association with the development of toddlers' fine motor skills. Then a significant association was also found between iron intake and the development of fine and gross motor skills among toddlers aged 6 to 36 months in Puskesmas Belimbing. The results of the research showed that the largest percentage of toddlers experienced fine and gross motor development with the suspect category being those with insufficient iron intake compared to sufficient iron intake.

Previous research results found similar and different results to this research. Damayanti's research in 2022 showed that there was a significant association between iron intake and fine motor development (p

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value=0.01), but there was no significant association between iron intake and gross motor skills (p value=0.41)[16]. Contrary to research conducted by Nurul Huda et al, it was stated that there was a significant association between children's gross motor development and their intake of iron and protein. This study also showed that there was no association between zinc, fat and energy intake and children's motor development[17]. This result is in accordance with the theory that lack of iron intake is a factor in motor development, where children who experience iron deficiency can have an impact on cognitive function, physical growth and delays in motor function in children. Furthermore, the findings of Mingyan Li, et al prove that iron status in the early postnatal period of premature babies is associated with motor development and the enhancement of brain structural connectivity. Then, motor delays are linked to decreased structural connectivity in the brain[18].

Toddler nutritional status based on the W/A index is known to have no significant relationship with fine motor and gross motor development in toddlers aged 6-36 months in the working area of Puskesmas Belimbing (p value <0.05). This finding is consistent with research by Siti Hanifah et al., which found no correlation between gross motor development stages in children aged 1–5 years and undernutrition (W/A), with a p value of 0.20 (<0.05)[19]. This study, however, contradicts that of Martantia et al. (2023), who found a significant association between toddlers' motor development at 24 months of age and their nutritional status (W/A)[20] and research by Shalza Ellian Farthur Ihza, et al in 2024 which found there was an association between W/A and gross and fine motor development. The difference in results is likely due to the different age groups of toddlers studied[14]. The non-significant finding of nutritional status based on the W/A index with motor development might be related to other potential confounding factors, such as stimulation. Good stimulation and environment will help the child's development process to be appropriate even if their nutritional status is lacking.[19]

The absence of a relationship between nutritional status based on the W/A index can occur because the majority of young children have experienced decreased appetite or what is known as Close Mouth Movement. This causes the child's weight to tend to remain constant until it decreases at toddler age. However, in this instance, intake is not the only factor influencing motor development. The role of stimulation, environment and family economy play a role in children's motoric development. Aprilidia research in 2020 indicated that there was no association between malnutrition and motor development in children, due to the factor of providing good stimulation from parents so that children's motor development stages were not disturbed even though they were malnourished[21].

Statistical tests result carried out between the nutritional status of the W/H index and motor development in toddlers aged 6-36 months, showed that there was a significant association between the nutritional status of W/H and fine motor and gross motor development (p value<0.05). This result is consistent with research, Sarah in 2019 showed that there was an association between W/H and motor and cognitive development of children aged 3-5 years with a p value of 0.002 (<0.05)[22]. This current study are supported by research by Sri Mulyani et al in 2020 which concluded that there was an association between obesity (W/H) and gross motor development in toddlers aged 12-59 months and stated that children with obesity were 12 times more at risk of experiencing gross motor delays[23]. Eka Afrika's findings also support these findings indicating the existence of a relationship between nutritional status and motor development in children aged 2-3 years[24]. Different results were found by Shalza Ellian Farthur Ihza, et al in 2024 who found that there was no relationship between nutritional status based on W/H and fine and gross motor development of toddlers aged 24-59 months[14].

The results of this research are in accordance with the theoretical review on nutritional status as one of the factors that influences children's development. The nutritional status of W/H is sensitive to changes in body weight and provides an indication of acute nutritional problems as a result of events that occur in

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a relatively short time, such as certain disease infections or starvation conditions[23]. These acute changes in body weight will affect physical growth and development. Physical development influences each other's motoric development in toddlers.

Nutritional status based on H/A was proven to be significantly related to fine motor development but not to gross motor development of toddlers aged 6-36 months. These results are different from the results of research by Shalza Ellian Farthur Ihza, et al in 2024 which found that there was a significant relationship between nutritional status based on H/A both with fine motor development and gross motor development in toddlers aged 24-59 months[14]. Different results may occur due to differences in the age groups studied, sampling techniques and child development measurement instruments used according to the age groups studied.

Bivariate analysis result proved a significant relationship between stimulation and fine motor and gross motor development in toddlers aged 6-36 months (p value <0.05). These results are consistent with research, Ayu et al. In 2023, there were 53.4% of toddlers with normal motor development and 22.3% of toddlers were declared suspect, then it was discovered that there was a relationship between stimulation and children's motor development[25]. Likewise, research by Suriani B, et al found the same results that there was a relationship between the mother's role in stimulation and the motor development of toddlers in Puskesmas Mangasa, Makassar[15].

According to multivariate analysis, the toddlers with low stimulation tend to experience fine motor and gross motor development in the suspect category 6 times more compared to toddlers with high stimulation. Then toddlers with insufficient iron intake tend to experience fine motor development in the suspect category 5.814 times more compared to toddlers with adequate iron intake.

The further analysis through multivariate analysis showed that low stimulation in toddlers is the factor most related to the development of fine motor and gross motor skills in the suspect category in toddlers aged 6-36 months. This finding is supported by the results of Yuanita Devi Santoso's research, that parental stimulation has a significant association with gross motor and fine motor development of stunted children[26]. A positive pattern of stimulation from parents will promote a child's healthy motor development. The role of parental stimulation can be carried out by means of stimulation through habituation, stimulation through example, stimulation through practice, and stimulation through competence. This habit is mostly done by parents to motivate their children. The results of the multivariate analysis also showed that iron intake had a significant relationship with fine motor development. The previous studies noted that iron has an important role in the process of nerve development. However, the evidence is still not consistent about the impact of iron deficiency on early development. More studies are needed to understand these association (S. McCann, et al, 2020).

Toddlers who are given stimulation from an early age by their parents are likely to have good motor development. Helmizar et al’s research found that children's growth, cognition and development can be improved by psychosocial stimulation in combination with nutritional supplementation[27]. The provision of stimulation must be adjusted to two basic concepts, namely developmental stages according to age and individual suitability. Every child has a different growth pattern, personality, curiosity and background. In this case, the child's environment will have a significant influence on the child's motor development. The more comfortable the child is with the environmental, the more optimal the child's development will be.

CONCLUSION

In this study, it was discovered that the factor most related to fine and gross motor development in toddlers aged 6-36 months was stimulation provided by parents. Apart from that, iron intake also plays a role in the motor development of toddlers. Thus, the role of parents is needed in stimulating children with

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various approaches so that children are comfortable with the environment and feel support from their parents in addition to fulfilling nutritious food including sources of iron in optimizing the development of children's fine and gross motor skills. However, the study still has advantages because it could not answer the causality of the relationship dan for the future study, it is recommended to use longitudinal or interventional study.

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REFERENCES

[1] Kemenkes, "PERATURAN MENTERI KESEHATAN REPUBLIK INDONESIA NOMOR 66 TAHUN 2014," 2014.

[2] L. O. Anhusadar, "Perkembangan Otak Anak Usia Dini," *Shautut Tarbiyah*, vol. 20, no. 1, pp. 98–113, 2014.

[3] N. Mutiarawati, T. Wulan Dari, and M. Bahrudin, "Growth and Development Screening in Preschool-Age Children Based on Denver Development Screening Test II," *Proceeding International Conference on Health Polytechnic Ministry of Health Surabaya (ICOPHS)*, vol. 2, no. 2, 2023.

[4] B. E. Medise, "Mengenal Keterlambatan Perkembangan Umum pada Anak," Ikatan Dokter Anak Indonesia.

[5] Dinkes Kota Padang, "Profil Kesehatan Kota Padang Tahun 2023," 2023.

[6] K. S. Kretch *et al.*, "Opportunities for learning and social interaction in infant sitting: Effects of sitting support, sitting skill, and gross motor delay," *Dev Sci*, vol. 26, no. 3, Mar. 2023, doi: 10.1111/desc.13318.

[7] Kemenkes, "Peraturan Menteri Kesehatan Republik Indonesia Nomor 2 Tahun 2020 Tentang Standar Antropometri Anak," 2020.

[8] Puskesmas Belimbing, "Laporan Tahunan Puskesmas Belimbing Tahun 2023," 2023, *Padang*.

[9] S. McCann, M. P. Amadó, and S. E. Moore, "The Role of Iron in Brain Development: A Systematic Review," 2020, *MDPI AG*. doi: 10.3390/nu12072001.

[10] D. J. Cech and S. Martin, "Chapter 3 - Motor Development," in *Functional Movement Development Across the Life Span (Third Edition)*, Third Edition., D. J. Cech and S. "Tink" Martin, Eds., W.B. Saunders, 2012, pp. 45–67. doi: https://doi.org/10.1016/B978-1-4160-4978-4.00003-X.

[11] D. F. Utari and V. Sunarti, "The Relationship Between Parents' Understanding In Fine Motor Development And Giving Stimulation Skills To Children," *Jurna Pendidikan Luar Sekolah*, vol. 9, no. 4, pp. 512–522, 2021.

[12] F. Timothy and M. Y. Yang, "Brief in-Home Assessments of Low-Income Mothers and Children using a New Affection Subscale of the HOME Inventory," *Child Youth Serv*, vol. 41, no. 1, pp. 28–50, 2020, doi: 10.1080/0145935X.2019.1605895.

[13] S. Anggriani and R. Choirunnisa, "Pengaruh Stimulasi Psikososial Oleh Ibu Terhadap Perkembangan Balita Usia 1-3 Tahun Di Wilayah Kerja UPT Puskesmas Manggar Kabupaten Belitung Timur Tahun 2022.," *Jurnal Ilmiah Kesehatan*, vol. 14, no. 1, pp. 153–159, Mar. 2022, doi: 10.37012/jik.v14i1.809.

DOI: http://dx.doi.org/10.35730/jk.v16i3.1276

[14] S. E. F. Ihza, D. R. Pangestuti, A. F. Asna, and N. Lisnawati, "Nutritional Status and Motor Development of Toddlers Aged 24-59 Months in Agricultural Area of Semarang District," *Amerta Nutrition*, vol. 8, no. 2, pp. 199–205, 2024, doi: 10.20473/amnt.v8i2.2024.199-205.
[15] S. B, N. Nurfatimah, D. Saadong, S. Subriah, and K. Ramadhan, "The Relationship of Mother's Role in Stimulation with Motor Development in Toddler," *Jurnal Info Kesehatan*, vol. 20, no. 1, pp. 20–28, 2022, doi: 10.31965/infokes.vol20.iss1.618.
[16] A. Damayanti, "Asupan Zat Besi (Fe) dan Berat Badan Lahir terhadap Perkembangan Motorik Anak Usia 3-5 Tahun," *Indonesian Journal Of Nutrition Science And Food*, vol. 1, no. 1, pp. 17–22, 2022.
[17] N. Huda and W. N. Angga Dewi, "Hubungan antara Tingkat Asupan Gizi dan Perkembangan Motorik Kasar pada Anak Usia 4-6 Tahun di Kota Semarang," *Journal of Studies in Early Childhood Education (J-SECE)*, vol. 1, no. 2, p. 58, 2018, doi: 10.31331/sece.v1i2.721.
[18] L. Mingyan *et al.*, "Effects of Daily Iron Supplementation on Motor Development and Brain Connectivity in Preterm Infants: A Diffusion Magnetic Resonance Study.," *Front Neurosci*, vol. 15, p. 769558, 2021, doi: 10.3389/fnins.2021.769558.
[19] S. H. Destriani, R. Andriani, and D. Novryanthi, "Hubungan gizi kurang dengan tahap perkembangan motorik kasar pada balita usia (1-5 tahun) di Desa Bojongkerta," *Journal of Public Health Innovation*, vol. 4, no. 01, pp. 93–101, 2023, doi: 10.34305/jphi.v4i01.805.
[20] M. E. Widyantika, Y. N. E. Sary, and I. Ermawati, "Gross motor development nutritional status, malnutrition, normal nutrition C," *Jurnal Ilmiah Ilmu Kebidanan dan Kandungan*, vol. 15, no. 3, pp. 324–330, 2023.
[21] A. Damayanti, R. W. Pusari, and N. Kusumaningtyas, "Status Gizi Anak Terhadap Perkembangan Motorik Kasar Pada Anak Usia 1-2 Tahun," *PAUDIA : Jurnal Penelitian dalam Bidang Pendidikan Anak Usia Dini*, vol. 10, no. 1, pp. 219–227, 2021, doi: 10.26877/paudia.v10i1.8252.
[22] S. M. Davidson, A. Khomsan, and H. Riyadi, "Status gizi dan perkembangan anak usia 3-5 tahun di Kabupaten Bogor," *Jurnal Gizi Indonesia (The Indonesian Journal of Nutrition)*, vol. 8, no. 2, pp. 143–148, 2020, doi: 10.14710/jgi.8.2.143-148.
[23] S. Mulyani, M. Musfiroh, E. B. Cahyanto, I. Sumiyarsi, and A. Nugraheni, "Obesitas Terhadap Perkembangan Motorik Kasar Pada Anak Balita," *PLACENTUM: Jurnal Ilmiah Kesehatan dan Aplikasinya*, vol. 8, no. 1, p. 6, 2020, doi: 10.20961/placentum.v8i1.39651.
[24] E. Afrika, A. Anggraini, A. R. Dhini, and A. Fitria, "Factors Related to Motor Development in Toddlers Aged 2-3 Years at Nagaswidak Health Center , Palembang," *Jurnal of Edukational Innovation and Public Health*, vol. 2, no. 4, pp. 30–37, 2024.
[25] A. P. Amelia, L. D. Ayuningrum, and M. Dwiarini, "Relationship of psychosocial stimulation by mother to development children age 3th-5 th years in Gamping 1st Public Health Center Working Area," *JNKI (Jurnal Ners dan Kebidanan Indonesia) (Indonesian Journal of Nursing and Midwifery)*, vol. 11, no. 4, p. 430, 2023, doi: 10.21927/jnki.2023.11(4).430-441.
[26] Y. D. Santoso, F. Efendi, I. D. Kurnia, I. A. Susanti, A. P. Pramono, and A. N. Habibie, "The correlation between parental stimulation and motor development in stunted toddlers," *International Journal of Psychosocial Rehabilitation*, vol. 24, no. 7, pp. 9134–9139, 2020, doi: 10.37200/IJPR/V24I7/PR270905.
[27] H. Helmizar, F. Jalal, N. Lipoeto, and E. Achadi, "Local food supplementation and psychosocial stimulation improve linear growth and cognitive development among Indonesian infants aged 6 to 9 months," *Asia Pac J Clin Nutr*, vol. 26, pp. 97–103, Jan. 2017, doi: 10.6133/apjcn.102015.10.

DOI: http://dx.doi.org/10.35730/jk.v16i3.1276