EFFECT OF MATERNAL STIMULATION ACCORDING TO MCH BOOK IN DEVELOPMENT OF CHILDREN AGED 3 – 5 YEARS OLD IN AISYIYAH BUSTANUL ATHFAL PRESCHOOL AND KINDERGARTEN SURABAYA, INDONESIA

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ABSTRACT

The early developmental period in children is a crucial stage marked by rapid growth and development. The number of interconnected neurons can be observed to determine the quality of brain development in a child. Stimulation affects the connections between neurons. This research is an analytical, observational, cross-sectional study that aims to investigate the relationship between stimulation using the Mother and Child Health (MCH) book and the development of children aged 3–5 years at Aisyiyah Bustanul Athfal Preschool and Kindergarten, Surabaya. The sample for this research consists of 104 pairs of mothers and children aged 3–5 years old selected using a purposive sampling method. This research utilized primary data collected through a questionnaire based on the MCH book, completed by the mothers in the sample. A total of 79 children in the good stimulation category exhibit good development, while 21 exhibit deficient development. Meanwhile, four children in the deficient stimulation category show developmental delays. Fisher's Exact Test shows a significant relationship (p-value = 0.003 < 0.05) with a weak relationship (C = 0.335) between maternal stimulation based on the MCH book and the development of children aged 3-5 years old in Aisyiyah Bustanul Athfal Preschool and Kindergarten, Surabaya. Therefore, it can be concluded that maternal stimulation, as outlined in the MCH book, has a significant impact on the development of children aged 3–5 years old in Preschool and Kindergarten Aisyiyah Bustanul Athfal Surabaya.

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Highlights:

1. Stimulation by the mother using the MCH (Mother and Child Health) book as a reference is a factor related to the development of children aged 3–5 years.
2. Boys have a higher risk of experiencing developmental delays compared to girls.

INTRODUCTION

The early period of a child's life, spanning from the fetal period to age 6, is a crucial time for rapid development. From an anatomical perspective, the development of children's brains can be observed through the number of interconnected neurons, with higher numbers indicating better brain development. Positive environmental stimulation is a factor that influences the formation of neural connections. Without good stimulation, children's development will not reach its maximum potential and might also lead to growth and developmental problems[1].

Kruk *et al*. in the Lancet Global Health state that in low to moderate-income countries, it is poverty and stunting that hinder children's development, affecting around 249 million children below 5 years old. Not only that, but a developmental problem that disturbs physical activity, learning capability, and behavior occurs in 50 million children[2]. Meanwhile, in Indonesia, around 13–18% of children are reported to have delayed development. The majority of the mentioned numbers above are not even diagnosed or treated properly[3].

Research in Ruphandi, Nepal, shows that inadequate stimulation and learning facility causes a tendency for children to have delayed development[4]. In the long term, children with delayed development could be troubled with poor economic productivity, mental problems, and difficulty in social interactions as they grow up[5].

The Mother and Child Health (MCH) book is one of the preventive measures implemented by the government, which enables parents to conduct self-screening and provide stimulation for their children to promote optimal growth and development. However, Irwanto, *et al.* found that out of 200 respondents, 9.03% of mothers only read the MCH book without actually using it, and 21.18% of mothers never used the MCH book[6]. The findings of the research are backed up by Riskedas data in 2018, which states that 29.9% of mothers in Indonesia never own any MCH book[7]. These data indicate that many parents still have limited awareness of the importance of stimulation for optimal child growth and development. Alongside the findings, research conducted in 2018 in Surabaya indicates that 17.5% of the children studied are likely to have delayed development, based on the MCH book screening[8].

The purpose of this research is to investigate the relationship between maternal stimulation, as outlined in the MCH book, and the development of children aged 3–5 years old in Preschool and Kindergarten Aisyiyah Bustanul Athfal from September 2023 to February 2024.

MATERIALS AND METHODS

This is an analytical, observational study with a cross-sectional design, aiming to understand the effect of maternal stimulation, as outlined in the MCH book, on children's development. This study was conducted at Preschool and Kindergarten

Aisyiyah Bustanul Athfal, located in East Surabaya, specifically in the Sukolilo and Mulyorejo Subdistricts, from September 2023 to February 2024.

The sample for this research consists of 104 mothers with children aged 3–5 years old at Preschool and Kindergarten Aisyiyah Bustanul Athfal Surabaya. The number of samples was determined using a cross-sectional formula, with a minimum of 100.

Samples were collected using a purposive sampling method with inclusion criteria consisting of mother with children aged 3–5 years old who consented to be respondents of this research and exclusion criteria comprised of children aged 3–5 years that is diagnosed with psychiatric disorders such as autism and Attention Deficit Hyperactivity Disorder (ADHD), children aged 3–5 years old where their mother is not the primary caretaker, and mother of children aged 3–5 years old who has a condition that requires them to have prolonged therapy.

Primary data collection is conducted using a stimulation and development questionnaire based on the MCH book, which mothers complete by marking a column describing the stimulation and development of children aged 3–5 years. The obtained data are further coded, and significance is assessed using the Chi-Square Exact test in the Statistical Package for the Social Sciences (SPSS) version 25 (IBM SPSS Ver. 25) before being presented in tables and percentages. The ethical protocol for this research has been approved by the Health Research Ethics Committee, Faculty of Medicine, Universitas Airlangga (Approval Number: No. 45/EC/KEPK/FKUA/2024, Date: 19 February 2024).

RESULTS

Based on Table 1, the majority of mothers in this study were aged 20–35 years, comprising 67 individuals (64.4%), while 37 were aged 36 or older (35.6%). Seventy-two mothers were not working (69.2%), and 32 mothers were working (30.8%). Meanwhile, the majority of children in this study were aged 48–60 months, comprising 90 children (86.5%). There are 59 female children (56.7%) and 45 male children (43.3%). Regarding the stimulation and development of children, the majority exhibit good development (76%) and receive good stimulation (96.2%).

Table 1. Frequency Distribution from Respondent Characteristic

Variable	Frequency (n)	Percentage (%)
Children Age		
36 – 47 months	14	13.5%
48 – 60 months	90	86.5%
Children Sex		
Male	45	43.3%
Female	59	56.7%
Mother age		
20 – 35 years	67	64.4%
>35 years	37	35.6%
Mother's Highest Education Level		
Moderate	47	45.2%
High	57	54.8%
Mother Occupation		
Not working	72	69.2%
Working	32	30.8%
Children Development		
Good	79	76%
Deficient	25	24%
Stimulation		
Good	100	96.2%
Deficient	4	3.8%

(Source: Primary Data)

In Table 2, test results for children's development and respondent characteristics showed a significant relationship between

children's development and the children's sex variable, with a significant Chi-Square test score (0.030) using the continuity correction, $p < 0.05$. This result also shows a score of 0.229 for the relationship between the two variables, indicating a weak relationship between children's development and sex. The Prevalence Risk score is 3.06 (1.20–7.82), suggesting that male children have a threefold higher risk of delayed development than female children.

No significant relationship between children's development and other respondent characteristics, such as children's age, mother's age, mother's highest educational level, and mother's occupation, was found in this research. Similar findings were observed in the relationship test between stimulation and the total respondent characteristic, as shown in Table 3, indicating that there is no relationship between stimulation and respondents' overall characteristics.

Table 2. Analysis Result of Chi-Square Test of Stimulation and Respondents' Characteristics

Variable	Children's Development				Total		p Score	PR (95% CI)
	Good		Deficient					
	n	(%)	N	(%)	N	(%)	C (*p*)	
Children's Age								
36 – 47 months	12	15.2%	2	8%	14	13.5%	0.509[a]	-
48 – 60 months	67	84.8%	23	92%	90	86.5%	-	
Children's Sex								
Male	29	36.7%	16	64%	45	43.3%	0.030[b]	3.06
Female	50	63.3%	9	36%	59	56.7%	0.229 (0.016)	(1.20 –7.82)
Mother's Age								
20 – 35 years	48	86%	19	76%	67	64.4%	0.251[b]	-
>35 years	31	14%	6	24%	37	35.6%	-	
Mother's Highest Education Level								
Moderate	35	44.3%	12	48%	47	45.2%	0.926[b]	-
High	44	55.7%	13	52%	57	54.8%	-	
Mother's Occupation								
Not Working	56	70.9%	16	64%	72	69.2%	0.688[b]	-
Working	23	29.1%	9	36%	32	30.8%		

a = *Fisher's Exact Test*, b = *Chi Square Test with Continuity Correction*
(Source: Primary Data)

Table 3. Analysis Result of Chi-Square Test of Stimulation and Respondents' Characteristics

Variable	Stimulation				Total		p Score	PR (95% CI)
	Good		Deficient					
	n	(%)	N	(%)	N	(%)	C *(p)*	
Children's Age								
36 – 47 months	14	14%	-	-	14	13.5%	1.00[a]	-
48 – 60 months	86	86%	4	100%	90	86.5%	-	
Children's Sex								
Male	42	42%	3	75%	45	43.3%	0.313[a]	-
Female	58	58%	1	25%	59	56.7%	-	
Mother's Age								
20 – 35 years	66	66%	2	50%	68	64.4%	0.615[a]	-
>35 years	34	34%	2	50%	36	35.6%	-	

Mother's Highest Education Level								
Moderate	44	44%	3	75%	47	45.2%	0.326[a]	-
High	56	56%	1	25%	57	54.8%	-	
Mother's Occupation								
Not Working	68	68%	4	100%	72	69.2%	0.309[a]	-
Working	32	32%	-	-	32	30.8%	-	

a = *Fisher's Exact Test,* b = *Chi Square Test with Continuity Correction*
(Source: Primary Data)

The Pearson Chi-Square test can't be performed for the relationship between stimulation and children's development because more than 20% of the cells have frequencies that don't meet the requirement of less than 5. In Table 4, the data are analysed using Fisher's Exact test, which requires a 2 × 2 table. The result shows a significance score of 0.003 < 0.05 with a contingency coefficient score of C = 0.335 (weak), indicating a significant relationship with a weak correlation between stimulation and children's development. Meanwhile, the Prevalence Risk score in this test is PR = 4.76 (3.26–6.96), indicating that children with deficient stimulation have a 4 times higher risk of deficient development than those with good stimulation.

Table 4. Result Analysis of Chi-Square Test Stimulation with Children's Development

		Development				Total		p Score	PR
		Deficient Development		Good Development				C *(p)*	(95% CI)
		n	(%)	n	(%)	n	(%)		
Stimulation	**Deficient Stimulation**	4	3.8%	-	-	4	3.8%	0.003 0.335 (<0.001)	4.76 (3.26 – 6.96)
	Good Stimulation	21	20.2%	79	76%	100	96.2%		
Total		25	24%	79	76%	104	100%		

(Source: Primary Data)

DISCUSSION

Based on the respondents' characteristics, the majority of children were aged 48–60 months (86.5%). Fisher's Exact test between children's age and development shows a p-value = 0.509 (>0.05), which signifies no relationship between children's age and development. Robinson *et al*. state that biological age in children only has a weak relationship with factors that affect children's development. Children's age can be a positive or negative factor in their development, depending on the environment's condition[9]. This statement shows that development is a complex process that can't be determined solely by age.

Fisher's Exact test between children's age and stimulation shows a p-value = 1.00 (>0.05), which means no relationship between children's age and stimulation. Briones *et al*. noted that several key factors contribute to the decrease in stimulation frequency, including the caretaker's low educational level, a decline in economic status, and an increase in family size[10]. Specifically, an increase in the number of children will decrease the frequency of stimulation over a two-year

period. This condition could negatively impact the quality of interaction between parents and children. This condition could negatively impact the quality of interaction between parents and children. However, previous studies show that parental burnout is not only affected by children's age but also by poverty and low education level[11].

Based on the respondents' characteristics, the majority of children are female (56.7%). Chi-Square test with continuity correction between children's sex and development shows a p-value = 0.03 (<0.05) with a contingency coefficient score of C = 0.229, which shows a weak relationship between children's sex and development. The prevalence risk for these two variables is 3.06, indicating that male children have a threefold higher risk of delayed development than female children. A study across nine countries, including Indonesia, involving 26,055 children aged 7–48 months, also finds that female children consistently outperform male children in language and socio-emotional aspects[12]. Aexopoulos *et al*. Finds that in the first year of life, female children tent to have faster language development, whether in production or perception, compared to male children[13]. In this case, language is a vital developmental aspect because children need a good understanding of language to interact correctly with their environment.

Fisher's Exact test between children's sex and stimulation variable shows p-value = 0.313 (>0.05), which means that there is no relationship between children's sex and stimulation. Kota, *et al.* found that the difference in the way children are raised based on their sex also has a correlation with economic status, the mother's education, and the number of family members[14]. The result of this research explained that children's sex can indirectly affect the stimulation given by the mother.

In terms of mothers' age, the majority fall within the 20–35 years old age range (64.4%). The Chi-Square test with continuity correction between the mother's age and the children's development variable yields a p-value of 0.251 (>0.05), indicating no significant relationship between the mother's age and the children's development. A study conducted in Puskesmas Marang, using secondary data from 68 child samples aged 3-60 months in 2019, yielded a p-value of 0.543 (> 0.05) for the Chi-Square test, and Fisher's Exact test was used to assess the association between mothers' age and children's development. This shows no significant relationship between the mother's age and the children's development[15].

Fisher's Exact test between the mother's age and stimulation variable shows p-value = 0.615 (>0.05), which means no relationship between the mother's age and stimulation. This finding aligns with previous cross-sectional research conducted by Misniarti and Haryani on 100 children within the scope of work of Puskesmas Curup, which shows a Chi-Square test with a p-value of 0.798 (> 0.05) between the mother's age and stimulation. This shows no significant relationship between the mother's age and stimulation[16].

Based on the mother's highest level of education, the majority of mothers are classified in the higher education category (54.8%). Previous research conducted in PAUD in Central Jakarta with 74 children and their mothers showed a p-value of 0.075 (>0.05), indicating no relationship between mothers' education and children's development. A mother's educational level does not always determine her knowledge

regarding children's development. Developmental knowledge can be gained from personal experiences or from others'. It also depends on the mother's effort to seek knowledge and develop skills[17]. Besides the mother's education, children's development is also influenced by several factors, including the father's education and the child's personality[18].

Fisher's Exact test between the mother's highest education level and the stimulation variable shows a p-value of 0.326 (>0.05), which shows no relationship between the mother's highest education level and stimulation. Parents' knowledge regarding stimulation can be an essential focus in intervening during children's development. Parents with a high level of education can absorb and understand information better[19]. However, aside from education, many factors can stimulate mothers to engage in activities that support children's development, such as social support, environmental demographics, socioeconomic conditions, and available infrastructure[16]. Someone with low education may not have a lesser competency in fulfilling children's developmental needs. If a mother actively seeks information regarding children's growth and development, her knowledge can become better[20].

Based on the mother's occupation, the majority of mothers were not working (69.2%). The Chi-Square test with continuity correction between the mother's occupation and children's development yields a p-value of 0.688 (>0.05), indicating no significant relationship between the mother's occupation and children's development. In previous research conducted by Syahailatua and Kartini, no notable relationship was found between the mother's occupation and children's development. This might occur because children's development is a complex process affected by many factors, such as physical, biological, and psychosocial environment[21].

Fisher's Exact test between the mother's occupation and the stimulation variable shows a p-value = 0.309 (>0.05), which shows no relationship between the mother's occupation and stimulation. According to previous research conducted by Saputri, occupations do not have a significant effect on stimulation and children's development. Currently, most parents tend to entrust their children to school rather than spending time interacting with them. In contrast, an optimal stimulation cannot be separated from the parents' role in children's growth and development. This might explain why parents who are not working cannot always give optimal stimulation to their children[22].

Based on stimulation and children's development variables, the majority of children aged 3–5 years in Preschool and Kindergarten Aisyiyah Bustanul Athfal Surabaya exhibit good stimulation and development, as indicated in the MCH book. Fisher's Exact test result between stimulation and children's development has a p-value = 0.003 (<0.05) with the largest contingency coefficient C = 0.335, which shows a significant but weak relationship between stimulation and children's development variable. The prevalence risk for these two variables is 4.76, indicating that children with deficient stimulation have a 4 times higher risk of delayed development than children with good stimulation. This research finding aligns with a previous study conducted at the Integrated Health Post (Posyandu) Penengahan Raya, Bandar Lampung, which saw a relationship between the stimulation

provided by mothers and the development of children aged 0-3 years, as measured by the Denver II test[23]. Another study conducted on 31 toddlers aged 29–59 months in Preschool Lentera Bangsa Kediri found that 71.4% of toddlers with deficient stimulation exhibit delayed progress in verbal and language development. This research is evaluated using the Chi-Square test, with a p-value of 0.00068 (<0.05), indicating a significant relationship between stimulation and toddlers' verbal and language development[24].

Brain development is highly influenced by children's experiences interacting with people around them[25]. Simple activities such as speaking, playing, telling stories, and singing with children can provide proper stimulation for neural connections to form, establishing a solid baseline for brain development[26]. The speed and efficiency of neuron connections will develop differently according to the brain's area. Sensory areas in the brain, including the visual and auditory cortex, initiate this process earlier than other regions that integrate multi-area information, such as those involved in language, memory, and attention[27]. It is known that language, memory, and attention are the main Components of working memory, which is very useful in the learning process[28]. Because of this, proper attention and care in using stimulation are essential to ensure and support the growth and development of children's brains to their maximum potential[25].

Strengths and limitations

This study utilized primary data collected directly by the research team. In addition to examining child stimulation, it incorporated other variables, such as maternal occupation and education, as potential indirect determinants of child developmental outcomes. The inclusion of these variables is expected to contribute to a more comprehensive understanding of the multifactorial influences on child development, thereby enriching future research in this field.

Nonetheless, several limitations should be acknowledged. First, data collection was conducted through self-administered questionnaires completed by mothers. Variations in maternal education levels and life experiences may have led to differences in comprehension and interpretation of the questionnaire items. Second, the study was conducted in seven schools located across two sub-districts—Sukolilo and Mulyorejo in East Surabaya. Although these areas are within the same city, they possess distinct demographic and socio-economic characteristics that may have influenced the study variables and outcomes.

CONCLUSION

This research reveals a significant relationship between children's gender and their development between the ages of 3 and 5. Furthermore, this research identified a significant correlation between maternal stimulation and children's development among 3–5-year-olds in Preschool and Kindergarten Aisyiyah Bustanul Athfal Surabaya. Therefore, to improve the quality of research data and obtain better results, it is hoped that future studies will include several specific variables, such as nutritional status, economic status, and stimulation time span.

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CONFLICT OF INTEREST

All authors declare that there is no conflict of interest regarding the publication of this article.

ETHIC CONSIDERATION

This research has been ethically approved by the Faculty of Medicine, Universitas Airlangga, in February 2024 (Approval Number: No.45/EC/KEPK/FKUA/2024, Date: 19 February 2024).

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AUTHOR CONTRIBUTION

Badzlina Agastasya Irmansah, Irwanto, Nining Febriyana, and Hanna Dyahferi Anomsari participated in the formulation of the research design, data collection, analysis, and paper writing.

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