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Fine Motor Developmental Delay and Associated Factors among Children Aged 3-5 Years in Surabaya

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ABSTRACT

In a preliminary study conducted in March 2018, 60% of children aged 3-5 years had a fine motor developmental delay. This research aims to determine the correlation between birth order, birth spacing, child abuse, religious values, parents' perceptions, educational level, and fine motor developmental delay among children aged 3-5 years. This research was a quantitative analytic with a cross-sectional approach. Sampling used the rule of thumb. Test the analysis applied multiple linear regression with p <0.05. Results: Birth spacing, religious values, parents' perceptions correlated positively with the fine motor developmental delay. While birth order had a negative correlation with fine motor development. There was no association between child abuse, educational level, and the development of fine motor in children. Conclusion: there was a correlation between birth order, birth spacing, religious values, parents' perceptions, and fine motor development among children.

INTRODUCTION

A preliminary study conducted in March 2018 in sub-district Wonokromo found that 60% of children aged 3-5 years experienced a developmental delay in fine motor skills including language, squeezing, holding a pencil, and folding. This period is called the critical period, marked by the growth of brain tissue that is twice as active as adults (Hartinger et al., 2017). Therefore, proper stimulation is needed at the critical period so that it contributes to increasing brain cell development.

Several factors that influence delays in fine motor development in children aged 3-5 years include genetics, nutrition, prenatal health conditions, stimulation, family environment, beliefs, and culture (Gentier et al., 2013; Jacobs, Miller, & Tirella, 2010; Sigmundsson & Stensdotter, 2013; Syafril, Susanti, Fiah, Rahayu, & Pahrudin, n.d.). Studies are needed to identify other factors that cause delays in fine motor development such as values, perceptions, birth order, age, gender, and psychological conditions.

Findings from studies can contribute to providing stimulation according to the cause. Fine motor development is described as a change in complexity that includes broad quality, maturity, and measurability (Gentier et al., 2013; Medicine, 2011; Pitchford et al., 2016).

MATERIAL AND METHOD

The research design in this research was quantitative with a cross-sectional approach. The population in this study was caregivers or parents of children aged 3-5 years with inclusion criteria. The sampling method used the rule of thumb. The total sample in this study was 70 respondents. Data analysis used multiple linear regression with $p < 0.05$.

RESULTS AND DISCUSSION

Table 1 Respondent Characteristics

Respondent Characteristics	N	%
Age		
3 Years	72	33.2
4 Years	62	28.6
5 Years	62	28.6
Fine motor developmental delay		
The prevalence of the fine motor ranged from 75% to 90%	46	23.5
The prevalence of the fine motor achievements ranged from 40% to 74%	49	25
The prevalence of the fine motor achievements ranged from 1% to 39%	51	26
No achievement in fine motor milestones	50	25.5
Total	196	

Table 1 explains that most respondents are children aged 3 years and they achieved 1% to 39% of the fine motor development.

Table 2 Variable Distribution

Variable	n	%
a. Independent		
1. Birth order		
The first child	18	8.3
The second child	39	18
The third child	59	27.2
The fourth child or more	80	36.9
2. Birth spacing		
2 years	13	6
> 2 – 4 years	44	20.3
> 4- 5 years	59	27.2
> 5 years	74	34.1
3. Educational level		
Primary school	51	23.5
Junior high school	51	23.5
Senior high school	51	23.5
University	43	19.8
4. Child abuse		
Never	16	7.4
Rarely	31	14.3
Often	76	35
Very often	73	33.6
5. Religious values		
Strongly disagree	9	4.1
Disagree	33	15.2
Agree	69	31.8
Completely agree	85	39.2
6. Parents' perceptions		
Adequate	34	15.7
Less adequate	47	21.7
Inadequate	65	30
Misperceptions	50	23
b. Dependent		
Fine motor developmental delay		
The prevalence of the fine motor achievements ranged from 75% to 90%	46	21.2
The prevalence of the fine motor achievements ranged from 40% to 74%	49	22.6
The prevalence of the fine motor achievements ranged from 1% to 39%	51	23.5
No achievement in fine motor milestones	50	23

Most of the respondents were the fourth child with a birth interval of more than 4 years. They often experienced verbal abuse, had misperceptions, and believed in religious values. 23.5% of their education level were primary school, junior high school, and senior high school (see table 2).

Table 3 Univariate Test Results

Variable	n	Mean	SD	Min	Max
Independent	196				
- Birth order		3.02	0.98	1	4
- Birth spacing		3.02	0.93	1	4

Variable	n	Mean	SD	Min	Max
- Educational level		2.56	1.10	1	4
- Child abuse		3.05	0.92	1	4
- Religious values		3.17	0.87	1	4
- Parents' perceptions		2.66	1.04	1	4
Dependent	196				4
- Fine motor developmental delay		2.53	1.11		4

Table 3 shows that most respondents have a third birth order (mean value: 3.02), a birth spacing of 2-4 years (mean value: 3.02), educational level of junior high school (mean value: 2.56), very strong religious values (mean value: 3.17), and inadequate parents' perception (mean value: 2.66).

Table 4 Bivariate Test Results

Variable	Fine motor developmental delay	p = 0.05
	the correlation coefficient (r)	N=196
Birth order	-0.780	0.001
Birth spacing	0.42	0.001
Child abuse	0.12	0.120
Religious values	0.13	0.050
Parents' perceptions	-0.01	0.991
Educational level	-0.07	0.269

Birth order had a weak negative effect on fine motor developmental delay. The more birth order, the smaller fine motor developmental delay. Religious values correlated but were not strong against fine motor developmental delay. The better understanding of religious values the better fine motor skill in children (see table 4).

Birth spacing correlated with fine motor developmental delay but it was not strong. The farther birth spacing, the farther fine motor developmental delay. Verbal or non-verbal child abuse, parents' perception, and educational level did not correlate with fine motor developmental delay (see table 4).

Kolmogorov Smirnov Test Results

The data was normally distributed-Kolmogorov Smirnov test value was 0.58.

Table 6 Linearity Test Results

Variable	Fine motor developmental delay	
	F	p>0.50
Birth spacing	1.45	0.235
Birth order	0.47	0.621
Child abuse	1.27	0.282
Religious values	0.48	0.614
Parents' perceptions	0.13	0.876
Educational level	1.65	0.194

There was a linear correlation between the dependent variable and independent variable with p> 0.05 and the F statistic is less (<) than the F table (see table 6). The data met regression test requirements.

Table 7 Homogeneity Test Results

Variable	Fine motor developmental delay	
	df2	p>0.05
Birth spacing	192	0.494
Birth order	192	0.900
Child abuse	192	0.114
Religious values	192	0.133
Parents' perceptions	192	0.847
Educational level	192	0.344

Table 7 explains that the data is not homogeneous so that it fulfills the regression test requirements.

Table 8 Heteroskedasticity Test Results

Variable	Fine motor developmental delay
	p>0.05
Birth spacing	1.00
Birth order	1.00
Child abuse	1.00
Religious values	1.00
Parents' perceptions	1.00
Educational level	1.00

There was no heteroskedasticity in the data-data had a constant error variance-so it was possible to use the regression test (see table 8)

Table 9 Multicollinearity Test Results

Variable	Collinearity Statistic	
	Tolerance	VIF
Birth spacing	0.991	1.00
Birth order	0.906	1.10
Child abuse	0.949	1.05
Religious values	0.940	1.06
Parents' perceptions	0.917	1.09
Educational level	0.955	1.09

Table 9 shows that there is no multicollinearity (data redundancy), so the data deserves a regression test.

Table 10 Multivariate Test Results

Variable	regression coefficient		CI	p
	Limit			
	Upper	Lower		
Multivariate constant	-0.21	1.80		
Birth spacing	0.41	0.34	0.64	0.001
Birth order	-0.08	-0.24	0.05	0.002
Child abuse	0.08	-0.05	0.25	0.206
Religious values	0.15	0.02	0.36	0.020
Parents' perceptions	-0.58	0.20	0.08	0.039
Educational level	-0.09	0.22	0.03	0.163
n = 196				
Adjusted R^2 = 32,1%				
p < 0,05				

There was a significant positive correlation between birth spacing and fine motor developmental delay. The rising 1 point of birth spacing score increased fine motor developmental delay in children aged 3-5 years at 0.41 points (see table 10). This condition is caused by a close birth spacing – the arrival of a new family member – affecting the intensity of stimulation by the caregivers to the child. Previous research reported that a focus on child stimulation of could predict fine motor development in children (Kanazawa, 2012; Suggate et al., 2019).

There was a negative correlation between birth order and fine motor developmental delay in children aged 3-5 years. The rising 1 point of birth order score increased fine motor developmental delay in children aged 3-5 years at -0.08 points. The first child tends to achieve fine motor stages better than the next birth order. The first child likely gets more attention from caregivers so that stimulation is carried out optimally. Besides, parent's motivation in optimizing child development is very strong – they expect the first child to become a role model for their next children. Previous studies found that birth order influenced parents' motivation in stimulation fine and gross motor development (Booth & Kee, 2009; Brenøe & Molitor, 2018; Dunkel, Harbke, & Papini, 2009; Kanazawa, 2012).

The result showed that there was no effect of child abuse on fine motor developmental delay in children. This is because children focus on activities they like, such as running and climbing stairs – activities that describe gross motor milestones. The dominant child abuse is verbal – yelling – but children less likely to notice it. This result was not following earlier studies that stated that child abuse could trigger damage to certain

nerve cells. The damage hinders motoric development in children (Grissmer et al., 2010; Lin et al., 2015; Suggate et al., 2019). Physical, emotional, and verbal violence against children, as well as child exploitation, could interfere in motor development. Those caused physical and psychological disorders, including post-trauma syndrome, stress, depression, and suicidal thoughts (Eshelman & Levendosky, 2012; Keenan & Campbell, 2015; Liel et al., 2019).

Parents' perceptions correlated negatively with fine motor developmental delay in children. The lower the parents' perceptions score, the higher the fine motor developmental delay. Maladaptive perceptions affect a person's perspective, resulting in maladaptive behaviors (Mohebi et al, 2018). Perceptions influence the way of seeking knowledge, health service facilities, and procedures for stimulating child developments (Cubaka, Schriver, Cotton, & Nyirazinyoye, 2018; Villar et al., 2017; Zare & Ghodsbin, 2016).

Religious values related statistically and positively to fine motor developmental delay in children. The rising 1 point of religious values score increased fine motor developmental delay in children aged 3-5 years at 0.15 points. This is because the implementation of values in the realm of faith, such as believing in God, has a close connection with one's mental health. This has an impact on the optimal growth and maturity of nerve cells in the child's brain (Bonelli & Koenig, 2013; Lu & Gao, 2017; Olson, Marshall, Goddard, & Schramm, 2015). Worship domains (such as prayer) can stimulate fine motor development in the areas of language, hands, and fingers. Prior studies reported that the worship domain – included the habit of reading prayers before and after activities – would stimulate the stages of fine motor development, namely the coordination of language, fingers, hands, and thoughts (Bejenaru & Rusu, 2010; Cameron et al., 2012; Lin et al., 2015).

The level of parental education did not affect the fine motor developmental delay. This is because high parental education does not center on understanding fine motor development, but focuses on gross motor development (such as walking, running, climbing stairs). Research conducted by Sigmundsson & Stensdotter in 2013 stated that some parents and caregivers prefer to monitor gross motor development (Bassey, 2017; Matsuyama, Karama, Tanaka, & Kaneko, 2013; Norström, 2015).

Birth spacing, birth order, child abuse, religious values, parents' perceptions, and

educational level correlated simultaneously with fine motor developmental delay among children aged 3-5 years ($p<0.05$). 32.1% of the associated factors of fine motor developmental delay among children aged 3-5 years could be explained by five variables in the regression model (*Adjusted* $R^2 = 32.1\%$).

CONCLUSION

There was a simultaneous correlation between birth spacing, birth order, child abuse, religious values, parents' perceptions, educational level, and fine motor developmental delay among children aged 3-5 years with *adjusted* $R^2 = 32,1\%$, while 77.9% was influenced by other factors.

SUGGESTION

The results of this study can be used as a basis for exploring the factors that can affect the fine motor developmental delay among children.

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