



Correlation of Responsive Caregiving with Child Development

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ABSTRACT

Introduction: Caregiving or parenting significantly impacts a child's growth and development. Responsive caregiving is regarded as the optimal caregiving model. Current research pertains to responsiveness and the cognitive and psychosocial development of children. However, research linking responsive caregiving to children's development is still rarely conducted. This study aimed to determine the correlation between responsive caregiving patterns and child development.

Methods: This cross-sectional study was conducted on children aged 48 to 72 months in Bina Anaprasa kindergartens Surabaya within May 2024. Data collection was obtained through interviews and observation of interactions between caregivers and children. Responsiveness was measured using responsiveness criteria in the HOME assessment score. Child development was measured using Denver II. Denver II tests child development as general, which consist of gross-motor, language, fine motor and personal-social developments. Data analysis used a correlation test based on each variable's scale. Ethical approval was obtained from Komite Etik RS Dr. Soetomo, and participants provided written informed consent.

Results: A total of 67 children from 4 kindergartens were included in this study. This study found 7 children (10.5%) with developmental delay. A significant relationship was found between parenting responsiveness and general child development [$p=0.021$; OR: 7.5 (1.31-42.76)]. If specified, fine motor development have significant relationship ($p=0.006$). However, there was no significant correlation between responsive caregiving and gross motor development ($p=0.299$), language development ($p=0.060$), and personal-social development ($p=0.076$).

Conclusion: Responsive caregiving was correlated with general child development and fine motor development. However, there was no correlation between responsive caregiving and other development parts. Although responsive caregiving is already widely recommended for optimal child growth and development, it is not routinely evaluated. We recommend routine assessment and caregiving training as early intervention. The limitation of this study is that the sample were homogeneous, and did not involve other influential variables such as nutritional intake and socioeconomic status. Further study addressing this limitation can be conducted.

INTRODUCTION

The early years of a child's life are critical for cognitive, emotional, and social development. During this formative period, caregiving is a fundamental thing that every child experiences at every phase of their development. As such, caregiving is an environmental factor that can influence a child's growth and development. There are various types of caregiving styles for children, and it is important to choose the most appropriate one to provide the optimal growth and development effects for the child (1). Theoretically, caregiving is a form of stimulation that influences a child's brain development. In children, there are also sensitive periods in which providing stimulation will have a greater effect on the brain (2). The WHO recommends that parents adopt a responsive caregiving style for all children. Responsive caregiving, namely a caregiving pattern that can be adjusted specifically for each child and each situation, is considered an appropriate caregiving pattern to support child development (1).

Responsive caregiving encompasses a range of practices that go beyond mere physical care. Being responsive, it adapts to the child's condition at a given time and is in accordance with the child's needs and development. Responsiveness can take various forms, where parents mostly respond to signs from children: verbal signs, facial expressions, and others. The essence of responsive caregiving lies in its reciprocal nature (3).

The significance of early childhood development cannot be overstated. Research consistently shows that the experiences children encounter in their early years profoundly impact their physical, cognitive, and socio-emotional development (4). The period from birth to age 5 is marked by rapid brain growth, with critical neural connections forming as a result of interactions with caregivers. A lack of responsive caregiving during this stage can lead to detrimental effects on a child's development, increasing the risk of behavioural issues, learning difficulties, and emotional challenges later in life (5).

The WHO has recommended implementing responsive caregiving (1). However, research linking responsive caregiving to children's development is still rarely conducted. Some research is currently related to responsiveness and children's cognitive and psychosocial development (6). There are several studies related to parenting patterns and child motor development, language, personal-social, and general child development (7–10). None are from Southeast Asia. Therefore, a research gap was found in examining whether there is a relationship between responsive caregiving and child development. Responsive caregiving can be measured using Home Observation for Measurement of the Environment (HOME), which is an instrument for assessing environmental conditions and child-rearing patterns (11).

Given the call for research on responsive caregiving and its outcomes and given that parenting itself is a modifiable factor, it is important to assess the correlation between responsive caregiving and child development. This study was done in Surabaya, Indonesia. Its primary aim is to evaluate the correlation between responsive caregiving and child motor development, language, personal-social, and general development.

METHOD

This was an analytical, observational, cross-sectional study. Cross-sectional design was chosen to provide preliminary evidence on this topic. We conducted the study among children attending kindergarten in Surabaya, Indonesia. This kindergarten is under the foundation of the Indonesian Pediatrician Association. We selected this foundation due to its uniform presence in Surabaya, encompassing both central and suburban regions. Four schools from different urban districts with the largest number of students were selected: Sumber Rejo, Tambak Wedi, Penjaringan, and Medokan. The sample size was determined based on prior analogous study conducted at the same kindergarten (12). Sampling was conducted from May 2024 to June 2024. The inclusion criteria were children aged 48 months to 72 months and parents who were willing to sign an informed consent form to participate in the study. The exclusion criteria in this study were children who were uncooperative during the examination and suspected of having attention deficit hyperactive disorder, as evidenced by an Abbreviated Conners Rating Scale (ACRS) score of more than 13.

Data collection was obtained through interviews and observation of interactions between caregivers and children. All data was taken by the same researcher, who is a pediatric resident, trained in developmental examination. Each child was observed in the class with which they were already familiar. The independent variable in this study was caregiving responsiveness. Responsiveness was measured using the responsiveness criteria in the HOME assessment score. HOME was chosen because it included in the instruments recommended by UNICEF in measuring developmental environmental aspects, including responsiveness. There is currently no gold standard for assessing responsiveness (13). Care is considered responsive if it meets all assessments in the responsiveness dimension. Child development was

measured using Denver II. While it is not a gold standard diagnostic tool, it is popular due to its ease of use and is a widely deployed child development screening instrument recognized for its excellent sensitivity and specificity (14). Development aspect which been measured were general development as a whole, which consists of personal social, fine motor, language, and gross motor. For account of confounding variable, we do restriction by only taking first grade kindergarten, same range of age, in healthy condition, and from the same city. To prevent missing data, we only collected some essential variable. We acknowledge that several confounding factors, such as preterm status and dietary consumption history, were not assessed in this study due to the sample being five years old, which increases the likelihood of recollection bias. The collected data are presented in table. The data were statistically analysed using SPSS for Windows. Normality was tested using Kolmogorov-Smirnoff. The responsive caregiving and development data are presented on a nominal scale and were analysed using the contingency coefficient. If the number of 1 group was fewer than 5, then the test was conducted using the Fisher exact test. The age group data are presented on an ordinal scale and were analysed using the Spearman test. All tests were carried out with a significance level of $p < 0.05$. The odds ratio (OR) was measured with a 2x2 table by (ab)/(cd) formula and a 95% confidence interval (CI).

Ethical Approval

Before the study began, the researcher submitted an ethical eligibility to the Ethics Committee of Dr. Soetomo General Hospital, Surabaya, Indonesia. We obtained a certificate of ethical eligibility with registration number: 1633/LOE/301.4.2/IV/2024. The confidentiality of participant data is maintained in accordance with the Declaration of Helsinki.

RESULTS

A total of 70 children who satisfied the inclusion criteria were included in the screening. Two children were excluded from the final analysis because they were uncooperative, and 1 child was excluded because he was suspected of having ADHD, with an ACRS score of 15. Finally, 67 children were included in the final analysis. The subjects were divided based on age, gender, and school of origin, as presented in Table 1.

Table 1. Study subject characteristics

Characteristics	N (%)
Age in months	
Median (lower-upper)	68 (45-72)
<60	1(1.5)
60-66	21(31.5)
67-72	45(67)
Gender	
Boys	37 (55.2)
Girls	30 (44.8)
Kindergarten of origin	
Sumber Rejo	22 (32.8)
Tambak Wedi	13 (19.4)
Penjaringan	19 (28.4)
Medokan	13 (19.4)
Child development	
Normal	60 (89)
Suspected gross motor	1 (1.5)
Suspected language	6 (9)
Suspected fine motor	4 (6)
Suspected personal social	4 (6)
Suspected general	7 (10.5)

The correlation analysis was conducted between the child’s basic characteristics, responsiveness, and child development. Child development aspects were divided again into gross motor, language, fine motor, personal-social, and general child development. This study found 7 children (10.5%) with general developmental delay. Further analyses of the correlations between characteristics, responsiveness, and development are presented in Table 2.

Table 2. The correlation of basic characteristics to child development.

Characteristics	Gross motor		Language		Fine motor		Personal social		General Development	
	susp	norm	susp	norm	susp	norm	susp	norm	susp	norm
Age (months)										
<60	0(0)	1(1.5)	0(0)	1(1.5)	0(0)	1(1,5)	0(0)	1(1.5)	0(0)	1(1,5)
60-66	0(0)	21(31)	3(4.5)	18(26)	1(1.5)	20(30)	1(1.5)	20(30)	3(4,5)	18(26)
67-72	1(1.5)	44(65)	3(4.5)	42(63)	3(4.5)	42(63)	3(4.5)	42(63)	4(6)	41(61)
p (CI:95%)		0.49		0.379		0,724		0.724		0,585
Gender										
Boys	1(1.5)	36(54)	4(6)	33(49)	4(6)	33(49)	3(4.5)	34(50)	5(7,5)	32(48)
Girls	0(0)	30(45)	2(3)	28(42)	0(0)	30	1(1.5)	29(43)	2(3)	28(42)
p (CI:95%)		1.000		0.684		0.122		0.622		0.447
Kindergarten of origin										
Sumber Rejo	1(1.5)	21(31)	5(7.4)	17(25)	3(4.5)	19(28)	2(3)	17(25)	5(7,5)	17(25)
Tambak Wedi	0(0)	13(19)	1(1.5)	12(18)	0(0)	13(19)	0(0)	13(19)	0(0)	13(19)
Penjaringan	0(0)	19(28)	0(0)	19(28)	1(1.5)	18(26)	2(3)	17(25)	2(3)	17(25)
Medokan	0(0)	13(19)	0(0)	13(19)	0(0)	13(19)	0(0)	13(19)	0(0)	13(19)
p (CI: 95%)		0.557		0.040*		0.265		0.434		0.087
Responsiveness										
Yes	0(0)	47(70)	2(3)	45(67)	0(0)	47(70)	1(1,5)	46(48)	2(3)	45(67)
No	1(1.5)	19(28)	4(6)	16(24)	4(6)	16(24)	3(4.5)	17(25)	5(7,5)	15(22)
p (CI:95%)		0.299		0.06		0.006*		0.076		0.021*

Data is displayed in n (%). susp: suspect, norm: normal. *: $p < 0,05$ shown significant result, (bold): highlighted variable.

Table 2 presents the developmental characteristics of the topic. We do analyses on responsiveness and each developmental category. From basic characteristics, we found no significant correlation between age and gender on aspects of development with $p > 0.05$. However, there was a significant correlation between school of origin and language development ($p = 0.040$). From responsiveness status, there was a significant correlation between responsive caregiving and fine motor development ($p = 0.006$) and general development [OR: 7.5(1.31-42.76); $p = 0.021$; CI: 95%]. OR results in this study showed that children with unresponsive caregiving style are at 7.5x greater risk of experiencing general developmental delays. No significant link was observed between responsive caregiving and gross motor, language, and personal social development ($p > 0,05$).

DISCUSSION

This study's purpose was to examine the correlation between responsive caregiving and child development. The analysis shows a significant correlation between parents' responsive caregiving style and better general child development ($p = 0.021$). The OR results also show that children with an unresponsive caregiving style are at 7.5 times greater risk of experiencing developmental delays. This study's results agree with those of several previous studies. However, the studies conducted related to responsive caregiving were mostly conducted outside Southeast Asia, such as in the United States (7), Brazil (8), China (9) and Pakistan (10). Brazil and Pakistan share similar developing country conditions with Indonesia. Both studies are agreed with our study result. Studies conducted in Indonesia related to the correlation between responsive caregiving and development are not yet found.

A previous study in Grenada reported that responsive caregiving significantly improved fine motor development (15). This is in accordance with this study's results, where a significant correlation was obtained between responsive caregiving patterns and fine motor skills. However, the current study found no significant

correlation between responsive caregiving and language development. This finding differs from previous studies. There were 2 studies in the United States regarding responsive caregiving and language development. A 2017 study in Tennessee reported a correlation between responsive caregiving and language skills (16). Another study reported that responsive caregiving was significant for children's language development in terms of expressiveness. However, there was no significant difference in the responsive caregiving's effects on receptiveness (17,18). The current study's insignificant results may have been obtained because only general language screening was carried out, and screening was not differentiated based on expressive and receptive aspects.

This study also did not find a correlation between responsive caregiving and personal-social development. This result is different from previous studies, which found a significant correlation between responsive caregiving and personal-social development. Studies in Pakistan, Brazil, and China reported that responsive caregiving patterns were correlated with social development (8–10). The difference from these studies might be due to different development screening instruments. The study in Pakistan used the Strengths and Difficulties Questionnaire Instrument, which only assessed social skills through 5 questions that did not specifically detail each type of ability like Denver II, used in this study. Studies that analyzed the correlation between responsive caregiving and child development using the Denver II instrument were not found. The cultural factor may potentially influence the situation, given the cultural disparities between this study location and the cited country.

In this study, there was no significant correlation between responsive caregiving patterns and children's gross motor development. Results from previous studies were conflicting. In a study in England, a significant correlation was found in both gross and fine motor skills in children who were raised with responsive caregiving. However, another study found no correlation between responsive caregiving and motor development (19). Other studies have also shown that even though parents had been taught about responsiveness and follow-ups had been conducted by observers, there was still no significant correlation (20). These results suggest that other factors that are uncorrelated with parenting style play a role in motor development. Language development, fine motor skills, and personal-social skills require executive function as the main role. Executive function itself is regulated by the prefrontal cortex. Meanwhile, musculoskeletal function plays a more important role in gross motor development. It seems that responsive caregiving patterns play a greater role in the development of executive function. However, this still needs to be proven with further studies. Gross motor skills are more influenced by physical factors such as muscle strength, and fine motor skills are more influenced by visual and motor coordination (21). This study identified no children with gross or fine motor delays. This may be attributed to the baseline condition of all subjects being healthy children who have previously verified their eligibility for kindergarten admissions.

Analysis of the relationship between child characteristics and child development showed that the number of children with suspected developmental delays was 10%. The figure obtained from this research is comparable to the figure obtained from research in Jakarta, Indonesia, which is 10% (22). The numbers from other developing countries in Southeast Asia are not much different, with Thailand at 6.7%, Vietnam at 10%, and Laos at 18.4% (23). Among the age groups, there were no significant differences in the incidence of developmental delays, whether in gross motor skills, language, fine motor skills, personal-social, or overall development. This agrees with research assessing development and functional outcomes in preschool children, finding no significant differences between age groups (24).

Then, an analysis was carried out between age, gender, and developmental variables. There was no correlation between age and development, in accordance with previous research. Moreover, there were no differences in development between genders. This agrees with research in China, where there were no differences in development between boys and girls (25). The same thing was also found in research in Georgia (26). There were significant differences in language development by school of origin ($p=0.040$). The difference between these schools lies in their location: Some schools are on the rural borders, while others are in the city center. This is contrary to research conducted in Bandung, where there were no significant differences by school location for schools in both urban and rural areas (27).

Responsive caregiving itself has been recommended by the WHO and UNICEF as 1 of the 5 points of parenting for optimal child growth and development. However, the government has not yet recommended an official instrument guide for evaluating responsiveness. This study could be used as a basic benchmark for the future use of the HOME instrument in our country. HOME is included in the instruments recommended by UNICEF in 2013, listed with an internal consistency reliability of 0.44-0.89 and an inter-observer reliability of 90%. However, there is still no gold

standard for assessing responsive caregiving (13). Measuring responsive caregiving is important to determine whether parenting is optimal or not, in accordance with WHO recommendations.

Based on this study's results, we suggest doing a routine caregiving style assessment for every child. This assessment could be held in conjunction with the routine national yearly medical assessment or done as a particular assessment before the child is admitted to a preschool program. Given that caregiving is a modifiable factor that correlates with child development, we suggest early screening to prevent and manage developmental problems that have already presented. Caregiving training may be implemented as an early intervention for young parents or prospective couples preparing for marriage. Although responsive caregiving is correlated with child development in general, after getting a breakdown by subfactors, it does not seem as strongly related. Given the complexity of child development, other modifiable factors that contribute to child development need to be studied. Further studies could be conducted on longitudinal studies design. The responsiveness and child development may be assessed repeatedly from the age of 1 to 6 years. Additional research could be conducted with diverse sample characteristics, including urban and rural settings, and incorporate other variables influencing infant development.

Limitations

This study has several limitations. The samples were taken from kindergartens from the same foundation in the same city. This made the sample more homogeneous and less representative of other groups with different characteristics. In addition, this study did not include other variables that might influence child development such as nutritional intake and socioeconomic data. Further research could be done on children with more heterogeneous characteristics, such as those in different cities and rural areas. Other variables also need to be assessed, such as nutritional status and adequacy, medical history, environmental safety, and early learning opportunities.

CONCLUSION

There is a correlation between responsive caregiving and child development in general. This study could be used as initial evidence regarding the correlation between responsive caregiving and child development in Indonesia. Caregiving assessment and training should be implemented as an early intervention for young parents. The limitation of this study is that the sample were homogeneous, and did not involve other influential variables such as nutritional intake and socioeconomic status. Further studies might be conducted on longitudinal study designs, utilizing diverse sample characteristics, including urban and rural populations. Subsequent research may incorporate more aspects influencing infant development.

AUTHOR'S CONTRIBUTION STATEMENT

Study design and conceptualization: UI, AS and MI. Data Analysis: UI, AS and MI. Manuscript drafting: UI. Critical review of manuscript: UI, AS and MI.

CONFLICTS OF INTEREST

The authors declare no conflict of interest

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