

Child-Rearing Practices and its Effect on Cognitive Development of Children at the First Year of Age: The Prospective Cohort Study of Thai Children

Kansin S,¹ Thinkhamrop B,² Mongkolchati A,³ Laohasiriwong W⁴

¹Dr. P.H. Program in Public Health, Faculty of Public Health, Khon Kaen University, Thailand.

²Faculty of Public Health, Data Management and Statistical Analysis Center, Khon Kaen University, Thailand.

³ASEAN, Institute for Health Development, Mahidol University, Nakornprathom, Thailand.

⁴Faculty of Public Health, Research and Training Center for Enhancing Quality of Life of Working-Age People, Khon Kaen University, Khon Kaen 40002, Thailand.

Corresponding Author

Bandit Thinkhamrop

Faculty of Public Health,

Data Management and Statistical Analysis Center,

Khon Kaen University, Thailand.

E-mail: bandit@kku.ac.th

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ABSTRACT

Background

Child-rearing during the first year of age has long been known as a strong predictor of child cognitive development, particularly cognitive development. Most studies investigated styles and factors related to child-rearing, but the study of impact of child-rearing practices on child development is limited and unclear.

Objective

To investigate the child-rearing practices and its effect on cognitive development of children at the age of 12 months, in Thailand.

Method

This study is part of the prospective cohort study of Thailand. The data were collected via face-to-face interviews and child cognitive development assessment using Capute scale. The multivariable linear regression was used to determine the effect of child rearing practices on child cognitive development.

Result

Among the total of 4,116 infants. The most common child rearing practices mostly performed by care givers for the responsiveness domains were warmth (96.60%). Concerning demandingness, only proper confrontation was performed by (39.94%). Factor influencing the cognitive development were: Total score; the children who were not reared warmly, had lower Capute score with the mean difference of -7.69, 95% CI: -12.25 to -3.14. For Cognitive Adaptive Test score; the children who were not reared with warmly, had a lower Capute score with the mean difference of -8.11, 95% CI: -14.37 to -1.85. For Clinical Linguistic and Auditory Milestone Scales score; the children who were not reared warmly, had a lower cognitive score with the mean difference of -8.72, 95% CI: -14.74 to -2.69. Do not giving children in proper confrontation had a lower cognitive score than those who were, with the mean difference of -3.06, 95% CI: -5.26 to -0.86.

Conclusion

When controlled the influence of other variables, rearing with warmth was the strongest predictor of child cognitive development.

KEY WORDS

Child rearing, Cognitive development, Linear regression model, Prospective cohort study of Thailand

INTRODUCTION

Low academic achievement is one of major problems of Thai children. The result from the global children intelligence quotient (IQ) survey in 2006 indicated that the average of Thai children IQ was at 91, the 53th of the world rank among 192 countries. It was lower than the worlds' average and some other countries in Asia.¹ The basis of successful child cognitive development is to develop the children since their early stages of life. Cognitive development is one of the essential child development milestones, Piaget defined the cognitive development at this stage as a sensory-motor period.² Lack of stimulation from a parent or child rearing affects child cognitive development both in language development and thinking skills.³⁻⁶ Parents were interacting with their children in their homes and concluded that the dimensions of parent-child interactions, reflecting the types of responsiveness and demandingness could predict reliably children's social, emotional, and cognitive functioning.^{7,8} To achieve better results of child-rearing; the caregivers must be able to perceive sense and the nature of children. Most studies investigated styles.⁹⁻¹² A few explored the effect of child-rearing practices on child cognitive development. Therefore, should be studied in child rearing practices that how it effects on the cognitive development. The study of these issues in Thailand were limited. This has led to the first birth cohort in Thailand.

METHODS

The PCTC project was approved by the National Ethics Committee of the Ministry of Public Health on 22 September 2000. This research used data from the PCTC data base and did not directly contacted or collected data from the samples. Each subject was given an identification number by the project system. It could not link to the name, address or identity card. The research had been approved by the Khon Kaen University Ethics Committee for Human Research on 31 October 2016 (HE592022).

This study is part of the Prospective Cohort Study in Thailand Children (PCTC) conducted in 2005. The PCTC enrolled 4,245 children from four community hospitals, one from each region, the North, the Northeast, the Central and Southern regions; and a tertiary hospital in Bangkok. The infants born between October 15, 2000, and September 14, 2002, were enrolled. Our component of the study involved 4,116 children who've reached 12 months \pm 1 week and twin as an exclusion. When considering on the appropriate formula for sample size calculation based on multiple linear regression analysis and also be approximated from the simple calculation by using a variance inflation factor (VIF) indicated the final samples should be 488 subjects.¹³ This sample size will sufficient to give 80% power at the 0.05 level of significant to answer the research questions. However, the total of 4,116 subjects who enrolled in the PCTC project passed the inclusion criteria of this study. In

addition, using secondary data is not directly involve the samples. Therefore the study decided to involve a large sample size of the total of 4,116 subjects that will give closer to 100% power at the 0.05 level of significance to answer the research question.

The study used a structured questionnaires consisted of 3 parts including (a) individual characteristics of Child caregiver (b) individual characteristics of a child and (c) child-rearing practices under the concept of Baumrind's which was developed using two domains of child-rearing style there are Responsiveness and Demandingness, selected from PCTC's Case Record Form (CRF). If the caregiver answers "Yes" in all of items of each sub-domain it meant the children had an appropriated child rearing on this sub-domain. But, if the caregiver answer "No" for at least one item in each sub-domain it meant the children had inappropriate child rearing on this sub-domain.

Cognitive development was measured using the Capute scale, developed to assess cognitive skills in children between 1 and 36 months of age. This was done by pediatricians who were trained for the Capute scale application. The Capute scale consists of a Cognitive Adaptive Test (CAT) and Clinical Linguistic and Auditory Milestone Scales (CLAMS). The CAT is used to evaluate fine motor and problem-solving skills, while the CLAMS determine language skills. The Capute scale was found to have high correlation with the Barley Scales of Infant Development-Mental Scale (BSID) ($r = 0.89$; 95% CI: 0.83 to 0.93).¹⁴⁻¹⁶ It is the only cognitive development measurement available in the Thai language.

Data collection was started since the mothers were at 28-36 weeks gestational age. After the 36th weeks, the research assistant visited their home every week until delivery. 21 days after birth, research assistants visited the home to collect parenting information. Then, parent or mothers were trained to assess their child development and record in the child booklet. The research assistant checked the child data every 1-3 months and logged them into the CRF

Finally, when the child was 12 months \pm 2 weeks old, the caregiver's brought the child to the hospital to assess their development.

The effects of child-rearing practices on cognitive development being quantified by the mean difference of the Capute scale which drew a comparison between children who reared by each dimension and who did not rear-were analyzed using simple linear regression. This comparison serves as an exploratory effect of each dimension without adjustment for effects of other factors.

A univariate analysis for assessing the effects of selected factors on the Capute scale was also done, using simple linear regression. From these analyses, variables with $p < 0.25$ were included in the initial multiple regression models. From the final multiple linear regressions model. A mean difference of greater than two scores is considered as having high effect.

Table 1. Univariate analysis for assessing the effects of child-rearing practices on child cognitive development

The child-rearing practices	Total Score					CAT Score					CLAMS Score				
	Total n	Mean (SD)	Mean diff.	95%CI	P-value	Total n	Mean (SD)	Mean diff.	95%CI	P-value	Total n	Mean (SD)	Mean diff.	95%CI	P-value
Cuddle, Praise, Smile.(Warmth)					<0.001					0.029					<0.001
Yes	1443	119.40 (15.80)	0	0		1460	126.78 (18.68)	0	0		1456	111.90 (19.96)	0	0	
No	48	111.19 (16.37)	-8.21	-12.76 to -3.65		48	120.79 (19.84)	-5.99	-11.37 to -0.60		48	101.58 (19.34)	-10.31	-16.05 to -4.57	
Read story, Play music, Sing a song, Rock a cradle (Cohesion)					0.010					0.639					<0.001
Yes	21	123.73 (14.98)	0	0		21	123.32 (19.53)	0	0		21	124.14 (22.10)	0	0	
No	2705	115.26 (15.06)	-8.46	-14.93 to -1.99		2727	125.28 (19.04)	1.96	-6.22 to 10.14		2728	105.23 (17.7/)	-18.90	-26.53 to -11.27	
Counsel /Warned (High-quality communication)					0.010					0.638					<0.001
Yes	21	123.73 (14.98)				21	123.32 (19.53)	0	0		21	124.14 (22.10)	0	0	
No	2705	115.26 (15.06)	-8.46	-14.93 to -1.99		2727	125.28 (19.04)	1.96	-6.22 to 10.14		2728	105.23 (17.7/)	-18.90	-26.53 to -11.27	
Hold and Touch to sleep (Attachment)					<0.001					0.227					<0.001
Yes	2189	117.57 (16.23)				2209	125.78 (19.41)				2213	109.21 (19.65)	0	0	
No	1674	115.08 (14.9/)	-2.48	-3.48 to -1.48		1686	125.03 (18.61)	-0.74	-1.95 to 0.46		1690	105.15 (17.84)	-4.05	-5.25 to -2.86	
Demandingness															
Stimulating Teaching (Monitoring)					0.004					0.002					0.091
Yes	225	113.61 (15.15)	0	0		227	121.75 (19.01)	0	0		229	105.40 (17.87)	0	0	
No	3637	116.68 (15.74)	3.06	0.95 to 5.18		3667	125.70 (19.03)	3.95	1.39 to 6.50		3673	107.58 (19.06)	2.18	-0.35 to 4.71	
Playing with toys and Teaching (Proper Confrontation)					0.850					0.168					0.074
Yes	1525	116.55 (15.64)	0	0		1538	124.87 (18.73)	0	0		1538	108.20 (19.2-)	0	0	
No	2275	116.45 (15.75)	-0.09	-1.11 to 0.92		2293	125.73 (19.12)	0.86	-0.36 to 2.08		2302	107.08 (18.87)	-1.11	-2.34 to 0.10	
Hold /Sing a song until sleep (Consistent)					0.001					0.039					0.001
Yes	40	124.70 (16.10)				40	132.14 (20.97)	0	0		41	116.76 (19.88)	0	0	
No	3222	116.65 (15.64)	-8.05	-12.93 to -3.17		3248	125.92 (18.92)	-6.21	-12.12 to -0.30		3254	107.35 (18.84)	-9.41	-15.22 to -3.59	

The magnitude of the effect was presented as the mean difference with its 95% CI adjusted for the effects of: child-rearing practices (i.e., Responsiveness: warmth, cohesion, high-quality communication and demandingness: attachment, monitoring, Proper Confrontation and consistent, caregiver factors (i.e., mother’s age, principal caregiver, caregiver age, caregiver education, caregiver occupation), child factors (i.e., gender, birth weight, gestational age, weight, hospital admission, number of sibling and breast feeding) and design factor; study areas: Bangkok, North, Northeast, Central and South. All analyses were performed by using Stata software version 13.0 (Stata Corp, College Station, TX). The p-value less than 0.05 were considered as statistically significant.

RESULTS

Demographic characteristics of caregiver and infants

Among the total of 4,116 infants. About half were girls (50.24%). Their average gestational age and standard deviation (SD) were 38.74 (1.90) weeks with the average birth weight and standard deviation (SD) were 3,051.71 (451.67) grams. The principle care givers were mother (60.35%), Majority of them finished vocational certificate and bachelor degree (58.01%).

Child-rearing practices

The most common child rearing practices mostly perform by care givers for the responsiveness domains were warmth (96.60%; 95% C.I: 95.59 to 97.43), followed by attachment (56.60 %; 95% C.I: 55.07 to 58.12). Concerning demandingness, only proper confrontation was perform by 39.94%; 95% CI: 38.42 to 41.46%.

Child cognitive development

The results indicated that the average of child development and standard deviation (SD) for total score were 116.49 (15.72), while CAT score was 125.46 (19.07) and CLAMS score was 107.45 (19.00).

The effect of child-rearing practices on child cognitive development

For Total Score, the responsiveness domain on; high-quality communication and cohesion had the largest effects on child cognitive development with a mean difference of -8.46 (95%CI: -14.93 to -1.99), followed by warmth (mean difference = -8.21, 95%CI: -12.76 to -3.65) and attachment (mean difference = -2.48, 95%CI: -3.48 to -1.48) an. On Demandingness domain; consistent had the largest effects, with a mean difference of -8.05 (95%CI: -12.93 to -3.17), see (Table 1).

For CAT Score, the responsiveness domain on; warmth had the largest effects, with a mean difference of -5.99 (95%CI: -11.37 to -0.60). The Demandingness domain, consistent had the largest effects, with a mean difference of -6.21 (95% CI: -12.12 to -0.30), see (Table 1).

For CLAMS Score, in the Responsiveness domain on;

cohesion had the largest effects, with a mean difference of -18.90 (95% CI:-26.53 to -11.27) and high-quality communication (mean difference = -18.90, 95%CI: -26.53 to -11.27), followed by warmth (mean difference = -10.31, 95%CI: -16.05 to -4.57) and attachment (mean difference = -4.05, 95%CI:-5.25 to -3.86) and Demandingness; consistent had the largest effects, with a mean difference of -9.41 (95% CI:-15.22 to -3.59), see (Table 1).

The effect of child-rearing practices on child cognitive development: a multivariable analysis when adjusted for the potential factors using multiple linear regression

For Total Score; the children who did not rear with warmth had a lower Capute Score than those who did received, with the mean difference of -7.69, 95% CI: 12.25 to -3.14), see (Table2).

Table 2. The child-rearing practices on child cognitive development adjusted for the potential factors by used multiple linear regression

The child-rearing practices	Total n	Mean (SD)	Mean diff.			P-value
			Crude	Ad-justed	95%CI	
Total Score						
Cuddle, Praise, Smile. (Warmth)						
Yes	1443	119.40 (15.80)	0	0	0	<0.001
No	48	111.19 (16.37)	-8.21	-7.69	-12.25 to -3.14*	
CAT Score						
Cuddle, Praise, Smile (Warmth)						
Yes	1460	126.78 (18.68)	0	0	0	<0.001
No	48	120.79 (19.84)	-5.99	-8.11	-14.37 to -1.85**	
CLAMS Score						
Cuddle, Praise, Smile (Warmth)						
Yes	1456	111.90 (19.96)	0	0	0	<0.001
No	48	101.58 (19.34)	-10.31	-8.72	-14.74 to -2.69***	
Playing with toys and Teaching: up to child and teach (Proper Confrontation)						
Yes	1538	108.20 (19.2-)	0	0	0	
No	2302	107.08 (18.87)	-1.11	-3.06	-5.26 to -0.86***	

*Adjusted for the effects of principal caregiver, caregiver age, caregiver education, gender, birth weight, gestational age, hospitalization and study areas. (R2= 34.06%).

**Adjusted for the effects of principal caregiver, caregiver age, caregiver education, gender, birth weight, gestational age, hospitalization and breast feeding and study areas. (R2= 21.96 %).

***Adjusted for the effects of principal caregiver, caregiver education, gender, birth weight, gestational age, and hospitalization and study areas. (R2= 39.91 %)

For CAT Score; the children who did not rear with warmth had lower Capute Score than those who did received, with the mean difference of -8.11, 95% CI: -12.25 to -3.14), see (Table 2).

For CLAMS Score; the children did not rear with warmth had a lower Capute Score than those who did received, with the mean difference of -8.72, 95% CI:-14.74 to -2.69). For proper confrontation, the children who did not rear with proper confrontation had a lower Capute Score than those who did received, with the mean difference of -3.06, 95% CI: -5.26 to -0.86), see (Table 2).

DISCUSSION

The results indicated that only Bangkok, and the North had CLAMS score were lower than 90. It may be that in Bangkok we collected the data from the hospital. The samples might be low socio economic status who migrated from other regions.¹⁷⁻¹⁸ The North they are more ethnic hill types are more likely to pregnant and delivery the child than general population. These particular groups have lower standard of living that might affect their child rearing and child development.¹⁹

The linear regression model pointed out that warmth was the strongest predictor for child cognitive development. The practices of Thai warmth are similar to European countries. The Western beliefs in parental responsiveness include explicit displays of affection, such as hugging, kissing, complimenting, happy smiling and clapping.²⁰ However, it is different from China, specifically, Chinese parents may believe that praising their children could impede children's achievement.²¹ Similarly, Watson advised parents not to satisfy and spoil the children by hugging and kissing but instead treating them in a reasonable way and as for teenagers, to leave them alone to cry as much as they desire instead of hugging and shaking them to relieve their emotions. All of these will help avoid enhancing or promoting their indecent behavior.⁹

The theory of Piaget suggests that children are not born with the knowledge and ideas. However, are acquired through learning and thinking which are done through the senses and muscles. Infants learn from outside and develop the idea at the age of 1-4 months, from the sense organ, movement and the coordination of their eyes and muscles to reach what they see. Infants at the age of 8-11 months, known as the pursuit of the satisfaction, begin to creep up toys and later at the age of 11 months will try throwing toys for their curiosity.²²

Moreover, the infants respond to love to promote trust in themselves and others. It is the cornerstone of development, personality development, and others. The development aspects are interrelated with several dimensions. The National Scientific Council on the Developing Child and Wolff and Ijzendoorn indicated that warm, sensitive, and responsive caregiving provides the foundation for healthy brain development and increases the odds for success in

school.²³⁻²⁴ Similarly, The University of California at Los Angeles (UCLA) suggests that a loving parental figure may alter neural circuits in children that could influence health throughout a lifespan.²⁵ Meanwhile, Dawson and Ashman mentioned that positive parent-child relationships provide the foundation for children's learning as well.²⁶ With parents' sensitive, responsive, and predictable care, young children can develop the skills they need to succeed in life. Early parent-child relationships have powerful effects on children's emotional well-being.

The child-rearing practices were recorded when the child was 21 days. It is quite a long time, parents might forget some information which lead to information bias. However, the study has regular meeting with the parents to remind them to record child rearing practices regularly. The researcher also assess child development early since the child was 12 months \pm 1 week. Therefore the information bias should be minimized.

CONCLUSION

When controlled the influence of other variables. It was found that warmth was the strongest predictor. Therefore, should be an emphasis on the caregivers to awareness of the appropriateness of the child rearing by more hugs, compliment, and include giving opportunity to the child in decision-making.

The strengths of the study: To our best knowledge, this is the first and the largest study that assessed effects of child-rearing practices on cognitive development. The study also accounted for the largest number of confounders- about 13 factors plus several of the child rearing practices. It followed 4,245 infants from birth until three years old. It is the evidence that was based on the largest cohort study of Thai children. This project recruited children from four rural districts (one district in each region including North, Northeast, South, and Central) and Bangkok, which accommodate the cultural differences and collected the data on child development such as growth, social-emotional development, cognitive development and child rearing. In addition, it had a high quality collected of child-rearing data, well-trained researcher assistant. And most importantly this study is deeply investigated the child rearing practices. These make we know what should caregiver done to promote children's cognitive development.

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