CHAPTER II

REVIEW OF THE LITERATURE

This Chapter reviewed theories and findings related to play materials and cognitive development. The topics include play and child development, toy preferences and their classifications, factors related to cognitive development, and cognitive measurement using Capute scale.

2.1 Play and child development

The term development refers to physical and behavioral changes that occur as a person gets older. Age is correlated with development, but age is just a way of describing the passage of time; age does not cause development. Development results from two major factors that can function both separately and together: learning and maturation. Learning is a change in behavior that occurs as a result of experience. It can be simple or complex change. It can be a matter of behavior changing because parents has instructed the baby on what to do, but is more likely to involve discovery in the course of play or general observation. It may involve physical movements, symbols, or emotional reactions. Maturation is the term used to describe the infant's genetically determined growth and change that will take place as long as the environment is good enough. After the baby is born, it is exposed more sources of learning, but much of its development is still determined by maturational factors. After birth, normal infants grow according to genetically determined guidelines as long as their environment is adequate. Their motor development, production of sounds, and even emotional responsiveness are under the control of genetic determination as well [36, 37].

An infant is in sensorimotor stage of development [38, 39, 40]. They learn, explore, and exercise through sensorimotor and practice play in cognitive approach, which cognition in children refers to what the child knows and how the child thinks. Sensorimotor stage lasts on the first two years when they learn and grow through sensory and motor activities. It is initial learning, they use their senses, touch, taste, sight, sound, and smell to discover their world. When infants notice an object, they

find out and explore it by looking at, using hands to grasp, smell it, mouth to taste, and listen or feel when they drop or shake it. In addition, during the first three years, the brain develops at its most rapid rate [4, 27], two-and-a-half times more active than adult. Furthermore, the brain of a one-year-old looks more like an adult's than a newborn's. For that reason, adult should early support children at this age.

Parents and environment take part in engage children into play, parent's interaction, surrounding, and materials around them. Toys or objects are used as instrument for parent's interaction and links between children and environment. Infant begin interaction with objects approximately at nine months; they grasp an object with adequate eye and hand coordination then mouth it to pleasure their sensorimotor.

When infants find a new object, they always look through a sequence of four behaviors: exploration, manipulation, practice, and repetition [41]. Exploration must occur before until they gain knowledge of how to play with the object. It is a process of continuous experiment and learning what the object is; its properties, and how it might be dealt with. Therefore, object play might be the basic of creativity or divergent thinking in psychological sciences.

2.2 . Toy preferences and classifications

2.2.1 Toy preferences

It is accepted that to play is to learn, adult cannot do other than satisfy the freedom of children to select their own play [42]. For parent to fully engagement in play, attractive play material is one of the limit options for young children.

There is a plenty of studies on sex differences in toy-choice and demonstrates that boys prefer masculine toys such as construction and transportation toys and girls like feminine toys such as dolls and kitchen sets [43]. But 1-year-old boys and girls did not differ in preference [11, 43]. The percentage of infants reported at least one favorite toy was 88.6 at 12 months [18]. They preferred toy made of hard material than soft materials. Sound toys were the highest favorite of seven types but it was small magnitude (15%). And they like reddish colors over blue.

Exploring infants' toy preferences, the process of attention-getting and attention-holding were used. They are the processes of infant visual preferences

provided by Cohen (1973) [13]. The initial orientation to a stimulus is the procedure of attention getting. The stimulus must be highly-flavored enough to draw a response. The duration, engagement a stimulus, used as a measure of the attention-holding process. These two attentions are separate process, they are not related.

2.2.2 Toy classifications

Appropriate opportunities to learn from play depends on the skill with which adults make play materials and other objects available [10, 44]. Toy should be safe, affordable, and developmentally appropriate [17]. Lists of toys most suitable, by Richard Allen Chase (1994) [10], for 12 months are summaries in Table 2.1.

Table 2.1 Lists of toys most suitable

Age group	Toys
9-12 months	• First multi-part toys • Fill and dump toys • Peek-a-boo and Pop-up toys • First blocks • Walker (push-along) • Activity centers • Bath toys • Books • Balls and other rolling toys • Dolls and other soft toys
12-18 months	• Shape sorters • Stacking toys • Peg toys • First push-to-go ride-on • Pounding toys • Music toys (drums, keyboards, bells, xylophones) • First play phone • Nesting toys • Active play; climb, bounce on, slide down toys • Push/pull toys • Sand play toys • Blocks • Bath toys • Dolls and other soft toys • Balls and other rolling toys • Books

2.3 Factors associating to cognitive development

The factors were grouped into 3 major groups: infant factors, parent factors, and environment factors. The infant factors were classified into 2 subgroups: biological and the others. The next factors were categorized to 2 subsets: characteristics and the other. All factors were presented mean difference with 95% confidence interval using forest plot. The left hand side of each forest plot was age of children, authors with published year, the factor with its categories in square brackets and note of adjusted factors in parenthesis. For example, in Figure 2.1, the first line was "72 m-Mackner 2003-Sex [Boy VS girl](1)". It meant the mean difference of sex in this row, compared boy to girl, come from the study of Macker in year 2003 which studying in children age 72 months. And this magnitude was adjusted by (1) Education, sex, family size and HOME. The magnitude meant boy had cognitive score less than girl around 4.5 points with 95%CI: -8 to -1.

The biological factors of infant were sex, gestational age (GA), and birth weight (BW) (Figure 2.1). The studies had the different magnitudes which adjusted with the dissimilar set of covariates. It had shown children who born higher weight had more skills. And most of them investigated in infant aged more than 12 months. The other factors of infant were breast feeding (BF), nutrition status, weight for age z score, and behavior or skills which no evidence of aged 1 year but they presented the idea that the determinants in previous age relates the future (Figure 2.2). It was investigated until now and they still have been questions.

The next, characteristics of parent, were age, education, work, and income or socio-economics status (SES) (Figure 2.3). They looked like have effect in children under 36 months old but not in older. For parent supportive determinant, it appeared positive in average but not in 1 year (Figure 2.4).

The last, the Home Observation for Measurement of the Environment inventory (HOME) significantly supported the cognitive skill. The HOME has 6 subscales: emotional and verbal responsively of mother, avoidance of restriction and punishment, organization of environment, provision of appropriate play materials, maternal involvement with child, and opportunity for variety in daily stimulation.

The provision of appropriate play materials was the interesting variable in this report but it was not appropriate for Thai [45]. Therefore, classification of suitable toys by Chase (1994) was used.

In PCTC, report of cognitive development of toddler at aged 2 years, found that responsive parenting, life events in family, number of toys, birth weight, composite of socio-economic status, and iodine consumption affected this skill, especially language [46].

It is controversy in the determinants; these factors were not the whole. A number of them could not present because the papers concluded only the value of statistics test, p value, or the word "significant and not significant" which it was not able to know the importance. In addition, the varieties of definition of each factors and covariates were the big difference point.

The variables of PCTC data were sex, gestational age, birth weight, parent's education, family size, income, birth order, marital status, breast feeding, supportive parenting, and life events. The variables in literature review that the PCTC do not have were verbal comprehension, vocabulary production, non-symbolic play, symbolic play, mother's IQ, habitation, orientation, motor maturity, transition, cry, maternal intrusive, infant negative engagement, maternal verbal ability, HOME, SES, length of stay and father involvement. In theory, all area of child development works together so this study included physical development evaluated by height, weight, and health status assessed by admission during the last 2 weeks. The PCTC had measured social-emotional development by the Modified Infant Toddler Social and Emotional Assessment (MITSEA) but the authors could not find the information of modifying so the study did not adjust this skill.

The mean difference was adjusted by the following factors:

(1) Education, Sex, Family size, HOME

(2) Education, Sex, Verbal comprehension, Vocabulary production, Non-symbolic play, Symbolic play at 12 month-old

(3) Education, Sex, Verbal comprehension, Vocabulary production, Non-symbolic play, Symbolic play at 14 month-old

(4) GA, BW, GA x BW, Habitation, Orientation, Motor maturity, Transition, Cry, Maternal intrusive, Infant negative engagement, MDI at 12 month-old

(5) HOME, NCATS, GA, SES

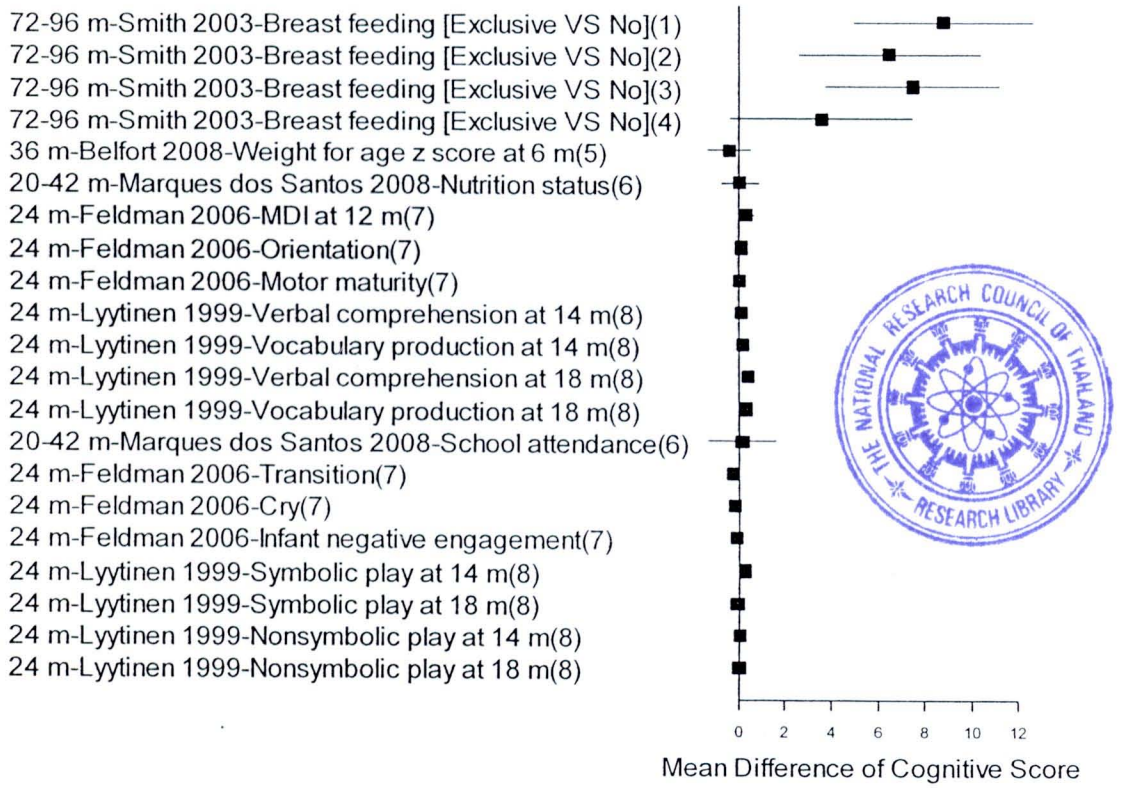
(6) Sex, Age, GA, BF, SES

(7) Age, Family size, No. of sibling, Sex, Income, Education, Birth order, Birth interval

(8) Age, Marital status, Income, HOME – Average IQ mother

(9) Age, Marital status, Income, HOME – Low IQ mother

Figure 2.1 Biological determinants [26, 29, 47, 48, 49, 50, 51]



The mean difference was adjusted by the following factors:

(1) Maternal verbal ability

(2) HOME

(3) SES

(4) Maternal verbal ability, HOME, SES, Length of stay

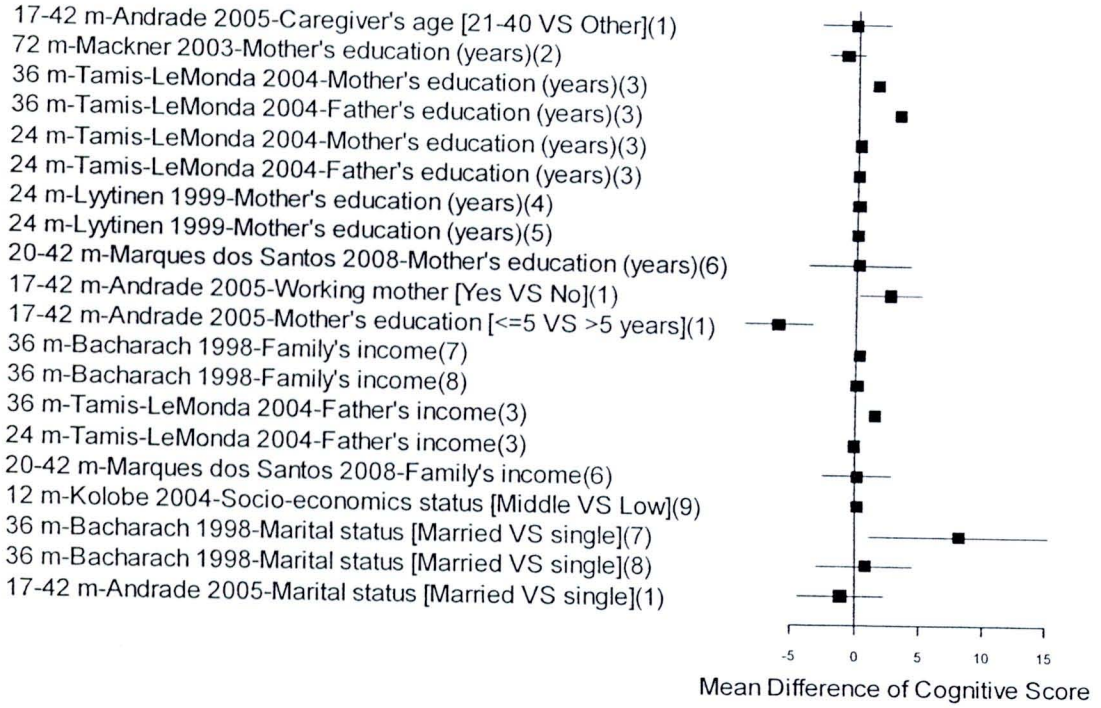
(5) Sex, Age, GA, BF, SES

(6) Education, Income, HOME, Family size, Toy, School attendance, Nutrition status

(7) GA, BW, GA x BW, Habitation, Orientation, Motor maturity, Transition, Cry, Maternal intrusive, Infant negative engagement, MDI at 12 month-old

(8) Education, Sex, Verbal comprehension, Vocabulary production, Non-symbolic play, Symbolic play

Figure 2.2 Infant determinants [7, 47, 48, 50, 52]



The mean difference was adjusted by the following factors:

(1) HOME, Family size, Marital status, Birth order, Father involvement, Working mother, Age, Education

(2) Education, Sex, Family size, HOME

(3) Supportive parenting, Education, Income

(4) Education, Sex, Verbal comprehension, Vocabulary production, Non-symbolic play, Symbolic play at 14 month-old

(5) Education, Sex, Verbal comprehension, Vocabulary production, Non-symbolic play, Symbolic play at 18 month-old

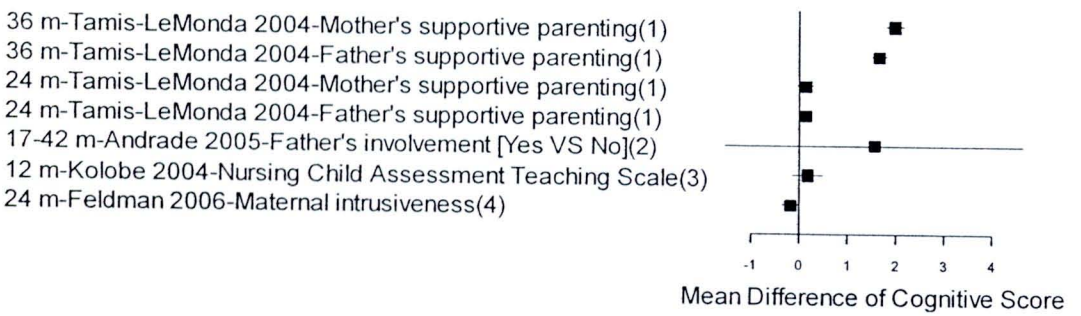
(6) Education, Income, HOME, Family size, Toy, School attendance, Nutrition status

(7) Age, Marital status, Income, HOME – Average IQ mother

(8) Age, Marital status, Income, HOME – Low IQ mother

(9) HOME, NCATS, GA, SES

Figure 2.3 Parents' characteristics determinants [7, 26, 28, 49, 50, 51, 53]



The mean difference was adjusted by the following factors:

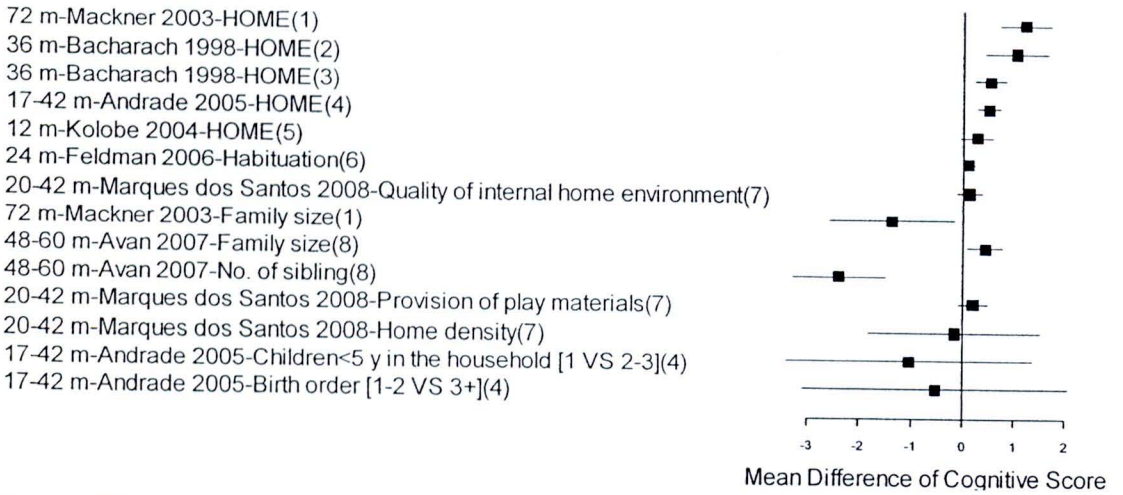
(1) Supportive parenting, Education, Income

(2) HOME, Family size, Marital status, Birth order, Father involvement, Working mother, Age, Education

(3) HOME, NCATS, GA, SES

(4) GA, BW, GA x BW, Habitation, Orientation, Motor maturity, Transition, Cry, Maternal intrusive, Infant negative engagement, MDI at aged 12 months

Figure 2.4 Parent supportive determinants [28, 48, 49, 53]



The mean difference was adjusted by the following factors:

(1) Education, Sex, Family size, HOME

(2) Age, Marital status, Income, HOME – Average IQ mother

(3) Age, Marital status, Income, HOME – Low IQ mother

(4) HOME, Family size, Marital status, Birth order, Father involvement, Working mother, Age, Education

(5) HOME, NCATS, GA, SES

(6) GA, BW, GA x BW, Habitation, Orientation, Motor maturity, Transition, Cry, Maternal intrusive, Infant negative engagement, MDI at 12 month-old

(7) Education, Income, HOME, Family size, Toy, School attendance, Nutrition status

(8) Age, Family size, No. of sibling, Sex, Income, Education, Birth order, Birth interval

Figure 2.5 Environment determinants [36, 37, 38, 39, 40, 41, 43]

2.4 Cognitive measurement using Capute scale

There are 2 subtests in Capute scale: Cognitive Adaptive Test (CAT) and Clinical Linguistic and Auditory Milestone Scales (CLAMS) [54, 55]. The first subtest is evaluating fine motor skills and problem solving skill. The other is determining language skill. It is a neurodevelopmental tool, by Dr. Arnold J. Capute, for the cognitive assessment of infants and toddlers ages 1-36 months old. It is easy to use and taking only 10-15 minutes less than the Bayley Scales of Infant Development-Mental Scale (BSID), 45-60 minutes.

The BSID is a standard series of measurements used to assess the motor, language, and cognitive development of infants and toddlers in the same age.

The CAT developed from the Developmental diagnosis of Gesell A. and Amatruda C. in 1941 and the measurement of intelligence of infants and young children by Cattell P. in 1940. The other based on milestones inventories on typical children and used to assess receptive and expressive language development.

The test highly correlated with the BSID, r=0.89 with 95%CI=0.83-0.93. Interrater reliability among the physicians was high (r=0.95-0.99). And also in the diagnosis of mental retardation on the psychologic assessment was high, too (sensitivity 95% with 95% CI=82-99, specificity 84% with 95% CI=66-95). Compare to BSID, the diagnostic test was widely range, sensitivity 5-90% and specificity 67-100%. There is no clear reason for the difference. The test, developed into Thai language, had already used [56, 57].

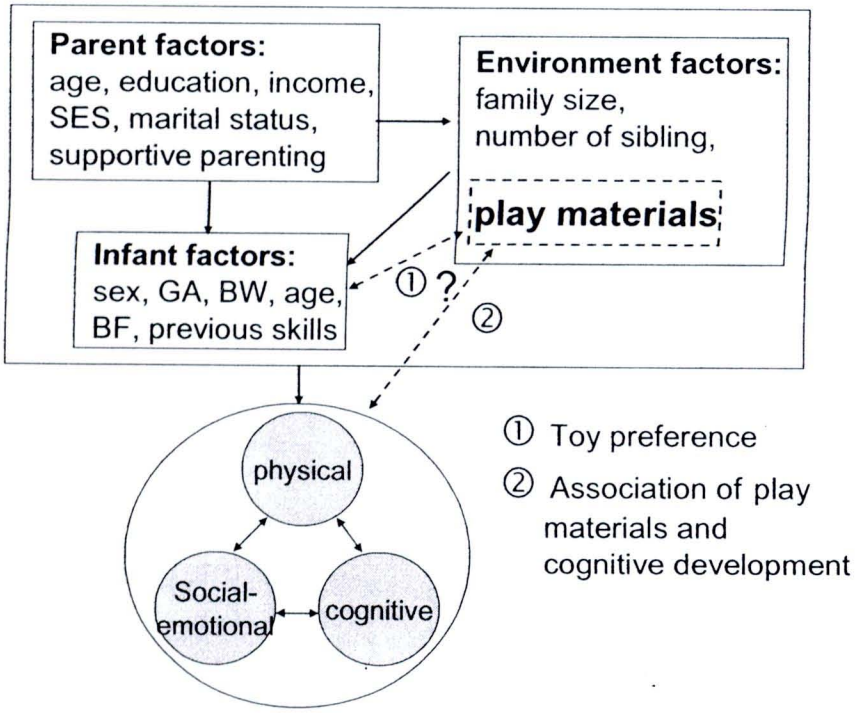
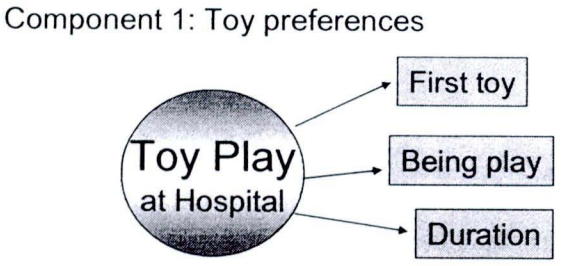


Figure 2.6 Conceptual framework



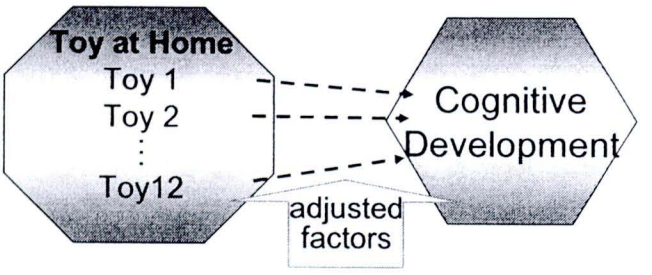


Figure 2.7 Research framework