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The Relationship of Child Rearing Context to the Complexity of Children's Block Building Structures

By

AnSook Kim

A DISSERTATION

Submitted to
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In partial fulfillment of the requirements
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ABSTRACT

The Relationship of Child Rearing Context to the Complexity of Children's Block Building Structures

By

AnSook Kim

The purposes of this study were: 1) to investigate the relationship between maternal behavior and physical home environment and the complexity of children's block building structures, 2) to identify other factors that predict the complexity of children's block structures, and 3) to determine if maternal behavior and physical home environment predict the complexity in children's block building while controlling for the effect of teacher behavior at school. Bronfenbrenner's ecological framework influenced the conceptual model in this study.

Thirty- five mothers and their 3 to 5 year-old children were included in the sample. The data were collected by parent interviews, home observations and taking photographs of the children's block structures. Descriptive statistics, ANOVA, Pearson Product Moment Correlation Coefficients, and Multiple Regression Analyses were used for data description and analyses.

Contrary to expectations, the childrearing context variables were not significantly related to the complexity of children's block structures. No differences in the complexity of children's block structures based on the demographic variables were found. Mothers' education was significantly positively related to total childrearing context, physical home environment,

marital status, maternal nurturing, discipline, and playful behavior. The presence of sibling(s) was negatively related to total childrearing context, the quality of physical childrearing context and maternal playful behavior.

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TABLE OF CONTENTS

LIST OF TABLES

TABLES **PAGE**

LIST OF FIGURES

FIGURES **PAGE**

CHAPTER 1

Introduction

Block play is a common activity in homes and programs for young children. Blocks come in a variety of shapes, sizes, colors, textures, and materials, and can be relatively inexpensive. In addition, they are versatile in that they can be useful regardless of children's levels of growth, learning styles, needs and interests. These merits have contributed to commonality and popularity in children's play.

Block play has been advocated as a way to enhance children's development of cognition (Cuffaro, 1995; Franklin, 1973), language (Donnelly, 1985; Isbell & Raines, 1991), and socialization (Meckley, 1994; Rogers, 1985). Especially, it has received increased attention in 1970's as a medium for the investigation of cognitive development of preschool children (Sugarman, 1982).

Blocks are also an excellent medium for helping young children express their representative or imaginative thoughts (Sugarman, 1982). The constructions created by children are either symbolic representations of other objects or they often ignite pretend episodes. Symbols can be more or less complex in a number of ways. The child can deal with a referent, such as "a house," as a complex structure, having many parts (e.g., walls, roof, doors, chimney), or the child can see the house as a single unit block. Blocks are useful materials for children to symbolize what is occurring in their thinking at a present time.

It has been proposed that a simple or complex block structure presents the level of representational ability in children's cognitive development (Forman, 1982; Sugarman, 1982). Additionally, it is also indicative of spatial intelligence (Gardner, 1993). In this sense, a complex structure is likely to represent a child's advanced representational or spatial cognitive development.

From one point of view, we can see structural complexity or pattern complexity. On the other hand, one unit block can symbolize a child's complex idea through pretense. That is, the structure can be cognitively complex but structurally simple.

What factors contribute to the complexity of children's block structures? Briefly, there could be two ways to approach this question. Internal factors such as age, abilities, gender, or previous experience with blocks might predict the complexity of children's block structures. On the other hand, external factors, such as home, school, teacher or parent could be also influential on the complexity of children's block structures.

As numerous previous studies show, both internal and external factors influence children's general cognitive development. Therefore they are likely to affect the specific factor of the complexity of block structures such as spatial organization. Each of the factors mentioned above will be discussed further in Chapter 2.

Both research studies and professional literature on children's block play have addressed potential causes or possible effects on children's developmental changes, as well as the sources that influence such changes (Church & Miller,

1990; Gregory, Kim & Whiren, 2003; Isbell & Raines, 1991; Schlank & Metzger, 1997). Within the same vein, the current study addresses the questions: why are children's block structures varied in terms of their structural complexity? Which ecological factors predict the complexity of children's block structures? By using an ecological model and examining both internal and external factors at the same time, greater insight may be obtained. This approach may illuminate how children's development proceeds from an ecological perspective. A child development cannot be fully explained without an ecological perspective (Daniels, 1999). Sources of influence such as children's characteristics, school or teacher effect, and parental or home environment should be considered at the same time. The elements pertaining to various components of the child's ecosystems are integral parts of a hypothesized ecological model within which the effects of mother or teacher behavior, home or school environment, and a child's characteristics on the complexity of children's block structures are taken into account (see Figure 1).

Statement of the Problem

A number of studies have identified parental behavior and home environment as important predictors of cognitive development in the early years (Carlson & Corcoran, 2001; MacPhee, Ramey & Yeates, 1984; Gottfried & Gottfried, 1984; Hubbs-Tait, Culp, Culp & Miller, 2002; Meadow, 1995; Morris, 1992; Morrison, 1997). However, no research has been found that examines the

Figure 1. Conceptual Model of the Interrelationships of Child Characteristics, Mother Behavior, Physical Home Environment, and Teacher/School Effect to the Competence of Children's Complex Block Structures.

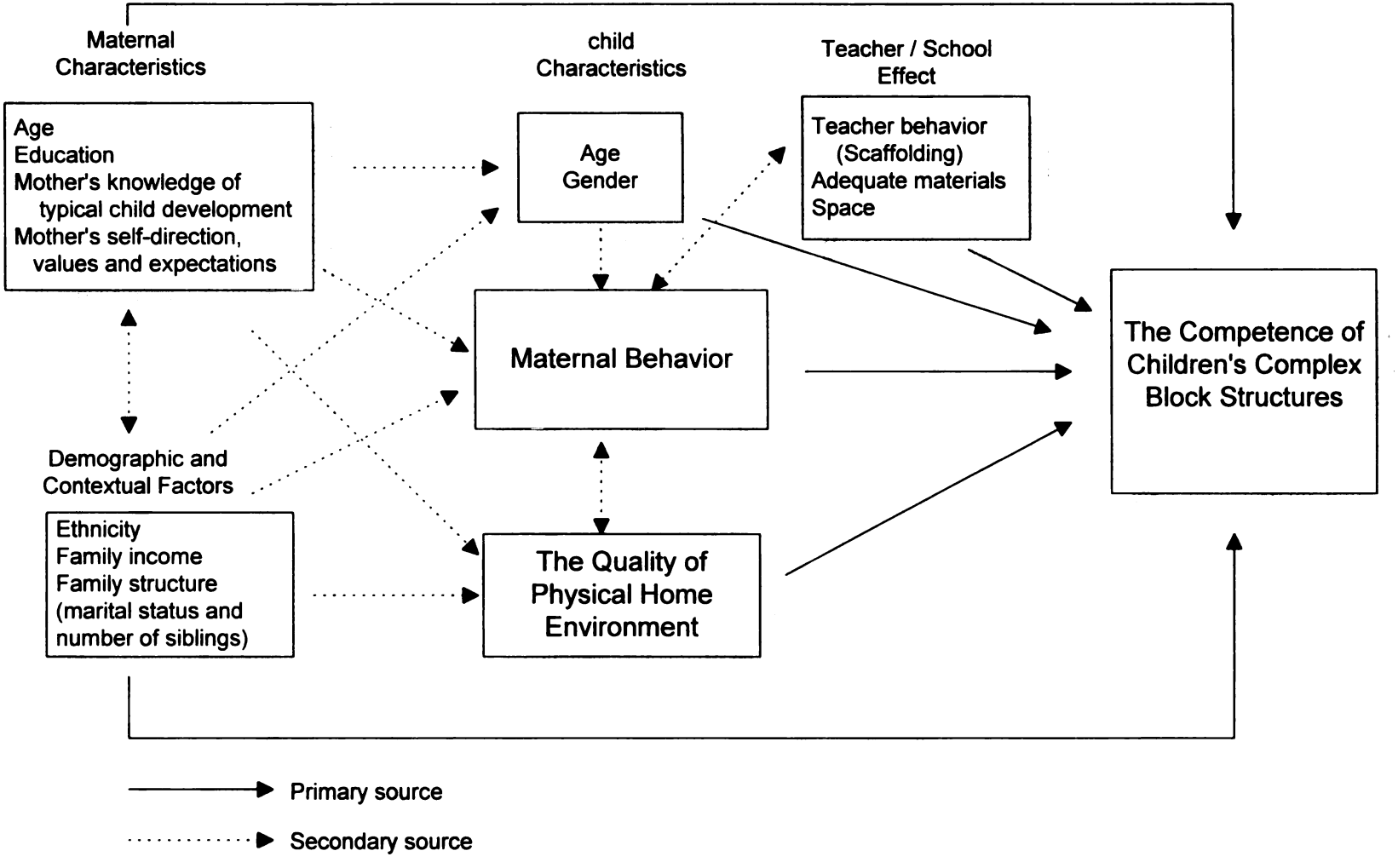


Figure 1. Conceptual Model of the Interrelationships of Child Characteristics, Maternal Behavior, Physical Home Environment, and Teacher/School Effect to the Competence of Children's Complex Block Structures

relationship directly between parental and home variables and the competence of children's complex block structures as seen in a group setting.

Purpose of the Study

The objectives of this study were: 1) to investigate the relationship between parent behavior, including physical home environment, and the complexity of children's block building structures, 2) to identify factors in the parental and home environment that predict the complexity of children's block building structures, and 3) to determine if maternal behavior and physical home environment predict the complexity in children's block building while controlling for the effect of teacher behavior at school.

Conceptual Framework

The present research is set within a framework of the ecological systems model of human development articulated by Bronfenbrenner (1986), who asserted that human development research should include an awareness of the environmental systems within which people are operating. The ecological systems model of human development focuses on four ecological levels, each nested within the next according to its immediacy to the developing person. With this perspective, the focuses of the persons and the environments for this study are specified as an individual (child), family (particularly parents), home, teacher and school environment.

When looking at the development of a young child, the most immediate level, the *microsystem*, consists of a network of face-to-face relationships experienced by an individual including the child's family, peers, teachers, preachers, doctors, and the early childhood staff. The *mesosystem* is the interlinked system of microsystems in which an individual participates, such as linkages between the family and the school (a mother talking with a child's teacher). The external environments in which a person does not participate but which exert indirect influences, such as the work settings of family members or county policy makers deciding to turn a parking lot into a local park, are referred to as *exosystems*. Finally, the *macrosystem* consists of the broad belief systems, attitudes, ideologies of the larger culture within which the child lives, and institutional patterns that provide the context for human development (Bronfenbrenner, 1986). Use of an ecological approach can enhance the understanding of the relationship of behavior to environmental conditions and the effects on families of the institutions and the organizations with which they interact (Andrews, Bubolz & Paolucci 1980).

Although the Ecological Systems Theory has many supporters within the field of human ecology, there was concern that the theory did not take into consideration the characteristics of the people involved in the environment but, instead, only considered the characteristics of environment. Sigel and Park (1987) argued that much of the research has concentrated essentially on the parent-child dyadic relationship and that parent-child research should involve much more complexity than past parent-child research, including variables that

indicate the *how* and the *what* of child development. Responding to this criticism, Bronfenbrenner in 1989 further postulated an ecological process-person-context model within his ecological systems theory. This model jointly takes into account the characteristics of the person as well as environmental characteristics, providing a more complex model of human development.

Although he did not change the definitions of the mesosystem or exsosystem, Bronfenbrenner expanded his systems to include personal characteristics as well as environmental factors and the interactions between the two. The microsystem was redefined as "a pattern of activities, roles, and interpersonal relations experienced by a developing person in a given face-to-face setting with particular physical and material features and containing other persons with distinctive characteristics of temperament, personality, and systems of belief" (Bronfenbrenner, 1989, p. 227). This new definition took into account the "possible why," which motivated the interactions between the child and his or her environment.

Additionally, the macrosystem was now defined as "consisting of the overarching pattern of micro-, meso-, and exosystems characteristic of a given culture, subculture, or other broader social context, with particular reference to the developmentally-instigative belief systems, resources, hazards, life styles, opportunity structures, life course options, and patterns of social interchange that are embedded in each of the systems" (Bronfenbrenner, 1989, p. 228). Developmentally instigative characteristics were depicted as "aspects of a person most likely to produce powerful interactive effects on another person"

(Bronfenbrenner, 1989, p. 227). These aspects could include demographic variables such as age and sex, as well as more psychological variables, such as power, parenting styles, or interaction styles.

With the reorganization of the ecological research model for the study of human development, Bronfenbrenner (1989) was effectively able to open up new areas of research. Researchers were now able to explore microsystems and macrosystems within a structural model by looking at more than one system, thus, providing more information about the role of parental behavior and child development.

Based on Bronfenbrenner's theory of human development and findings from past studies, the conceptual model, as a broad picture for this study is illustrated in Figure 1. For the purposes of this research, the focus is on the direct interactions particularly among maternal behavior, home environment, and child's outcome (see Figure 2). The independent variables are maternal behavior and the quality of physical home environment. The dependent variable is the children's scores on the complexity of block structures. Demographic characteristics were also considered to see if they were related to the independent variables and the dependent variable.

Meadows (1996) discusses that there is an association between parent-child interaction and the child's cognitive development, such that within the normal range of child ability and parent –child interaction, those children who receive more facilitation from their parents may do better cognitively and educationally than those who receive less. Moreover, the complexity of the

Figure 2. Conceptual Model of the Interrelationships of Maternal Behavior and Home Environment to the Competence of Children's Complex Block Structures

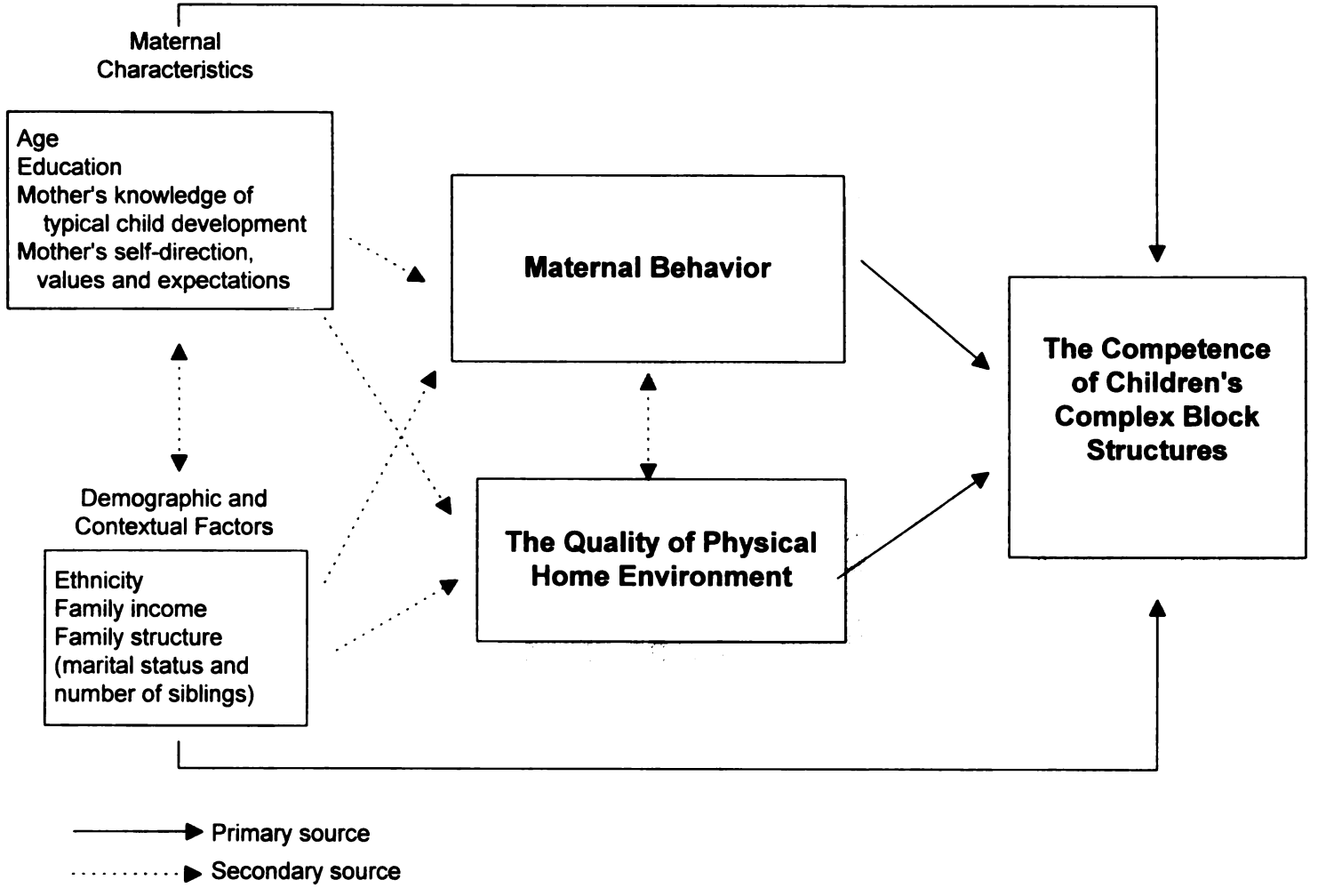


Figure 2. Conceptual Model of the Interrelationships of Maternal Behavior and Physical Home Environment to the Competence of Children's Complex Block Structures

causes of this association was reviewed. She addresses in her book that there is no simple one- way effect of parent input on child outcome, but rather the interacting parent and child react to each other's characteristics and the history of their relationship, in ways which are affected by their genes, by their prior learning and by their expectations of the future, in a very complicated interdependence of genes and environments. A potentially confounding influence in the relationship between family variables and child outcomes is that parents and children influence each other over time. This process is known as the transactional model of development (Cicchetti, Toth, Bush, & Gillespie, 1988; Sameroff & Chandler, 1975), in which the child and the social and physical environment are seen as reciprocally influencing each other, such that development at a later point reflects not only quality of earlier adaptation but also the effect of intervening environmental inputs. So for example, children with delayed development may be less responsive to stimulation and may provide insufficient cues to families for toys and activities that contribute to development.

Using the ecological process-person-context model as a theoretical basis, a conceptual maternal behavior model can be depicted based on the various parent-child researches. In fact, Piaget (1969), another developmental theorist who believed that knowledge was the result of one's interaction with the environment, defined a scheme as a "structure or organization or actions as they are transferred or generalized by repetition in similar or analogous circumstances" (p. 4). People's own behaviors are guided by these schemas. In

the case of a parent and child, the parent's schema (expectation) could guide their behavior and thus, affect the child's behavior (developmental achievement).

The words parental *expectations, beliefs, and behaviors* pertaining to a child's development could be defined in various ways depending on the researchers' definitions or goals for studies (e.g., Goodnow, 1988; Miller, 1988; Tunstall, 1993). According to Collins (1992), expectations have been defined as "complex schemata of thought, action, and emotion that affect perception and interpretation of other persons' behavior, and that, therefore, guide actions and reactions in relationships" (p. 179). Thus, expectations cannot only contain thoughts and emotions but also guide actions and reactions in relationships. Building on that premise, for the purpose of the current study, parental behavior will be operationally defined as *"parents' actions and relationships guided by their futuristic thoughts/expectations and reactions of a child's skill or behavior."* With this definition in mind, this study attempted to define an ecological model, based on two microsystems (family and school) and macrosystem elements such as culture, educational and political systems that are mediated by parent behavior, home environment and school/teacher effect, which help explain the development of children's spatial understanding.

Within the conceptual model of the present study, it was postulated that a macrosystem element, ethnicity, and microsystem elements including the mothers' education, marital status, income, self-direction expectations, values, and general knowledge of child development, would be associated with the complexity of children's block structures directly (Primary source) and when

mediated by mother's parenting behavior and the quality of the physical home environment (Secondary source). The mediator function of maternal behavior and the physical home environment elements were defined as "the mediator function of a third variable, which represents the generative mechanism through which the focal independent variable is able to influence the dependent variable of interest" (Baron & Kenny, 1996, p. 1173). Furthermore, maternal behavior and the quality of the physical home environment would be associated with the complexity of children's block structures directly.

The quality of the school environment and teachers' qualifications, including their characteristics and educational philosophy, are very likely to be directly related to the complexity of children's block structures. Additionally, child characteristics including the child's age and gender are also expected to be associated with the complexity of children's block structures.

Conceptual and Operational Definitions

Total Childrearing Context (Independent Variable)

Conceptually, *total childrearing context* refers to both the social and physical home environment that a parent provides for his or her child (as discussed in the operational definition).

Operationally, it refers to the mothers' scores on the combined scale of the Parent Behavior Checklist (PBC) and Home Observation for Measurement of Environment (HOME) measurements (see Figure 3). A total of 116 items were selected: 100 items from the PBC concerning parental behavior and 16 items (1,

2, 3, 4, 5, 6, 7, 8, 12, 19, 20, 21, 22, 23, 24, and 25) from the HOME measuring aspects of the physical home environment. The scores from each measure were standardized and averaged.

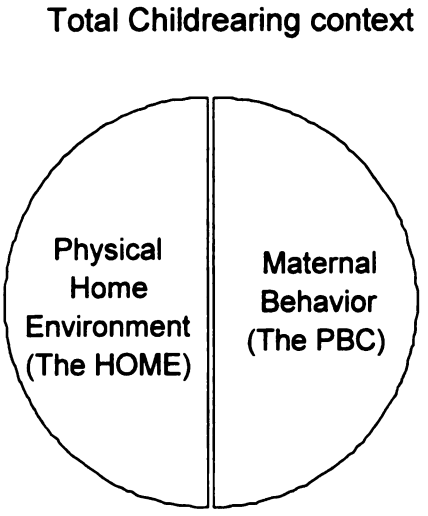


Figure 3. The Composition of Total Childrearing Context

Total Maternal Behavior (Independent Variable)

Conceptually, *total maternal behavior* refers to the mothers' actions and relationships guided by their futuristic thoughts/ expectations and reactions of a child's skill or behavior on childrearing and education (Collins, 1992). It represents the social home environment, the quality of the rearing environment provided by the mother for her child.

Operationally, it refers to the mothers' total scores on the "Parent Behavior Checklist" (PBC) (Fox, 1994). It measures a parent's nurturing, discipline and

expectations. For the current study, the total maternal behavior construct is composed of four subscales: Nurturing, Discipline, Expectations and Playfulness (see Figure 4). The PBC subscale on nurturing was separated into two components: Nurturing and Playfulness.

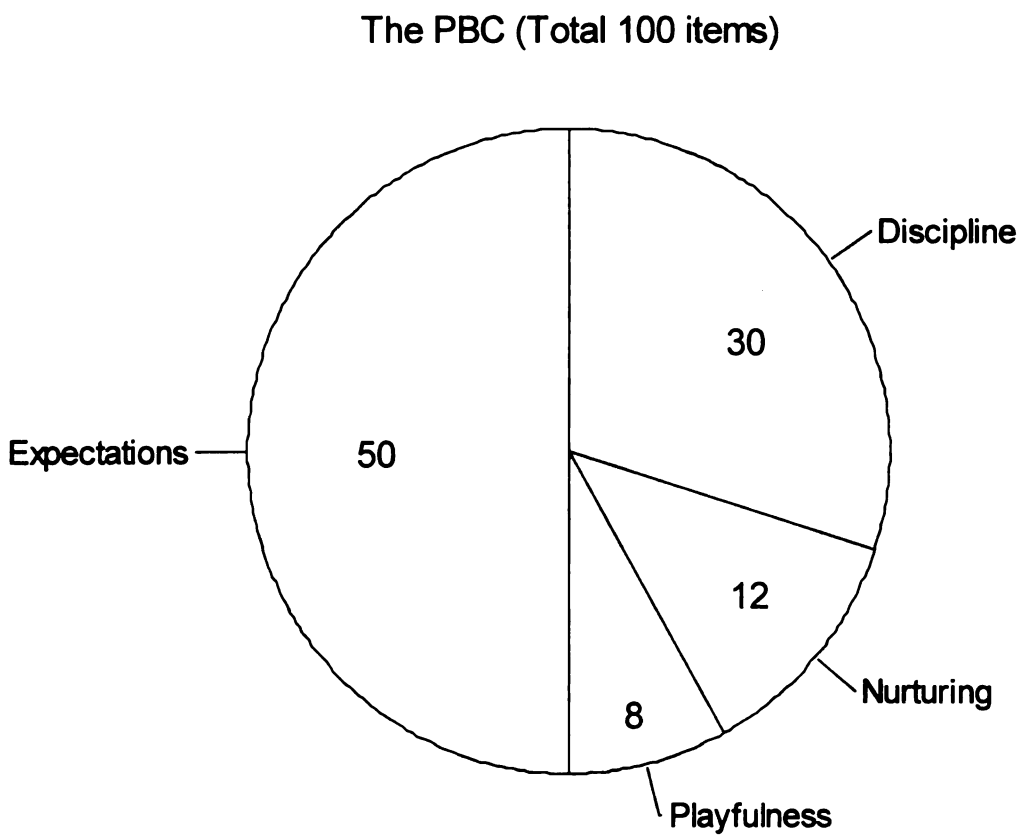


Figure 4. The Composition of the PBC subscales

Maternal Playful Behavior (Independent Variable)

Conceptually, *maternal playful behavior* refers to the mother's actions or responses supporting children's play activities.

Operationally, it refers to the mothers' scores on the 8 items measuring maternal playful behaviors. The items to construct maternal playful behavior were selected and mutually exclusive from the PBC subscale on nurturing. Each item represents a mother's behavior supporting children's play (i.e., "I play make-believe with my child"). The selected items are 5, 21, 25, 41, 55, 70, 75, and 95 (See Appendix B). The scores were standardized and averaged.

Home Environment (Independent Variable)

Conceptually, *home environment* refers to the caregivers' behavior and attitudes, and to the qualitative and quantitative atmosphere of the rearing environment. It has a broader and more inclusive (both social and physical environments) meaning than that of parent behavior.

Operationally, it refers to the mothers' scores on the "Home Observation for Measurement of the Environment (HOME Inventory for Families of Preschoolers: Three to Six)" (Caldwell & Bradley, 1984). It is composed of eight subscales measuring learning stimulation, language stimulation, physical environment, warmth and affection, academic stimulation, modeling, variety in experience, and acceptance. The subscales on learning stimulation and physical environment were used in this study.

Physical Home Environment (Independent Variable)

Conceptually, *physical home environment* refers to the qualitative atmosphere of the rearing environment.

Operationally, it refers to the mothers' scores on the 16 items selected from the HOME subscales (Caldwell & Bradley, 1984) to measure physical childrearing context. The selected items are 1, 2, 3, 4, 5, 6, 7, 8, 12, 19, 20, 21, 22, 23, 24, and 25 (See Appendix D). Nine items represent learning stimulation and 7 items correspond to physical environment. These items measure the qualitative or quantitative characteristics of the physical environment (i.e., "Child has toys which teach color, size, shapes" or "Child has three or more puzzles").

Complexity Level of the Block Structures (Dependent Variable)

Conceptually, *the complexity level of the block structures* refers to the categorical level of block building that is hierarchical in nature (Gregory, Kim, & Whiren, 2003). Block structures refer to anything the child creates with the blocks during the session.

Operationally, it refers to the child's score on the complexity of block building structure measured using stages, arches, dimensionality and a composite which combined all three (Gregory, et al., 2003).

Need for the study

A growing body of literature indicates that block play is particularly appropriate for meeting or measuring the developmental needs of young

children, providing opportunities for social, physical, and cognitive growth. While the professional literature concerning children's play is vast, the portion of it that deals with block play is still relatively small. It is also disorganized, with few attempts to collect and interpret empirical support for it (Conrad, 1995).

No empirical evidence regarding the influence of the parent and home environment on children's block play has been located. Most block play research has been investigated exclusively in a group environment such as preschool or laboratory setting without taking into account the family or household as a factor (Conrad, 1995).

A large number of studies show family variables including the home environment to be correlated with children's performance on tests of general cognitive ability, including IQ, and with achievement in school (Carlson & Corcoran, 2001; Landry, Smith, Swank, & Miller-Loncar, 2000; Daniels, 1999; Crane, 1996; Masud, 1993; Morris, 1992). These results are sometimes interpreted as evidence that family and home interaction directly influences children's cognitive development or school achievement. In the same sense, the relationship of the parent behavior and home environment to the complexity of children's block building structures could be inferred.

Although various studies have been conducted on parental behavior or home environment and its effects on specific aspects of social and cognitive development, no early childhood study has been found that incorporates an ecological model that includes 1) maternal behavior; 2) physical home environment; and 3) the complexity of children's block structures as a

performance in block building while controlling for the effect of teacher behavior at school.

In addition, both empirical and non-empirical literature has addressed the impact of parental and home environment on child development. Although the relationship between the parental and home environment and general cognitive competence has been well established (Gottfried, 1984a), using block building complexity as an indicator of a child's spatial competence has not previously been attempted.

The process-person-context of the study facilitates assessment of developmental outcomes but also contributes to the understanding of the effectiveness of the processes producing these outcomes. Additionally, the research design may reveal how developmental outcomes and processes within the systems vary as a joint function of the characteristics of the person and of the environment, consequently, permitting the detection of synergistic effects (Bronfenbrenner, 1989).

Assumptions

The following assumptions are made in this study.

1. Parents take care of their children in ways that affect the growth and development of children.
2. Teaching and learning occur in the home environment as well as other settings.

3. Parents play a very active role in the family's home environment and the cognitive competence of children.
4. The quality of home environment affects the development of children.
5. The complexity of children's block structures represents their abilities of spatial understanding.
6. The environment of social and physical classroom has a potential effect on parent and child behavior.

CHAPTER TWO

Review of the Literature

The review of literature is divided into three parts. The first part presents how the complexity of children's block structures on block play is related and contributes to child's cognitive development. The second part examines the factors of physical and social environments such as the influences of school or home and teacher or parent on the child's cognitive development. Finally, the third part deals with the question of how parental behavior including home environment is associated with the complexity of children's block structures.

Block Play & Cognitive Development

Play with blocks provides lots of educational benefits to promote child development. Play theories suggest that children engaged in block play practice and consolidate skills, demonstrate flexible thinking and behavior, and develop abstract thinking by using objects as representative props (Piaget, 1962; Vygotsky, 1978). It may engage the affective, the cognitive, and the psychomotor domains of education (Provenzo, Jr., & Brett, 1983). In addition, working with blocks gives the child a creative release and basic ease for learning (Montopoli, 1999). "In short, 'building with blocks' is exactly what the name implies: building materials for the child's total growth" (Laitres, 1997).

One view of the role of block play in children's development is that such play influences or is influenced by cognition (Nicolopoulou, 1991). Here the

guiding question may be, what concepts do children reveal or are they acquiring through block play?

Block play introduces the start of many different skills that make the foundation for growth of doing and thinking actions that are essential to all learning, and touches on many different stages of development of physical, social, emotional, artistic, language, scientific and mathematical growth (Montopoli, 1999). It provides children challenge, visual stimulation and hands-on experience. It also offers opportunities for thinking, reasoning, and problem-solving (Cuffaro, 1995; Moore, 1997). Several empirical studies examining the uses and benefits of children's block play show its multi-dimensional impact on children's construction of physical, logico-mathematical, and social knowledge (Cuffaro, 1995; Donnelly, 1985; Moore, 1997; Reifel, 1981; Reifel & Greenfield, 1982).

Some scholars believe that playing with blocks allows a logical thinking procedure to begin. Yet, before the development of logical thinking, a great deal of thought and communication is essential. Block play can be one of the best activities supporting this experience in the classroom and at home (Reifel & Yeatman, 1991).

The Complexity of Block Structures & Cognitive Development

Children build their block structures in various ways and shapes. What do children's block structures stand for? What does a child's block construction convey in terms of cognitive development? Forman (1982) proposed that

through block play, one could see children's structure of thought. According to Forman, more complex structures have been suggested to be evidence of more complex representational thinking abilities.

Young children's block building activities have attracted the attention of educators and psychologists since the first nursery schools early in the twentieth century. Building blocks were immediately recognized as a symbolic medium for children; psychoanalysts, for example, have used block play as a means to get into the psyche of the young child (e.g., Erikson, 1972; Klein, 1955). On the other hand, cognitive psychologists set out to formulate developmental stages that captured the increasing spatial and constructional complexities of children's constructions with age. Based on these stages, sample construction tasks have been introduced into psychological and educational tests assessing the spatial and cognitive development of young children and measuring them against "normal" development (see discussion in Vereecken, 1961).

A group of researchers who studied the developmental complexity of block play attempted to document the uses of blocks by children. They looked at various aspects of complexity such as stage complexity (Forman, 1982; Guanella, 1934; Hulson, 1930; Johnson, 1933), arch complexity (Goodson, 1982), dimensionality and integration complexities (Reifel & Greenfield, 1982), and spatial complexity (Stiles-Davis, 1988).

Although children's constructions were recognized early on as being both spatial and symbolic in character, these aspects have been analyzed as if they were entirely separate and autonomous from each other. With respect to the first

aspect, research on constructive play has characterized in detail the different levels of the elaboration of space that children achieve (e.g., Forman & Hill, 1980; Langer, 1986; Reifel & Greenfield, 1982). Nicolopoulou (1991) described the different levels of the stages of children's block structures. At the first level (from 6 months to 1 year), infants use blocks in non-spatial ways; that is, they handle mainly single objects, and, as far as their handling extends to more than one object, their interest centers on physical relations (e.g., hitting, rolling) rather than on spatial properties emerging from the combination of objects. It is only during the second stage (second year of life) that children make linear arrangements of objects, either vertical or horizontal. Then, in the third stage (beginning around the end of the second year), they begin to elaborate bi-directional arrangements eventually producing enclosed horizontal spaces. During the fourth stage – at around three years of age – children construct solid tri-dimensional structures, which soon give way to enclosed tri-dimensional spaces. Children's constructions may also include further elaborations such as openings in walls, adjacent structures, "stories" or layers of enclosure, bridges, and so on; but once the fundamentals of space are mastered, there is great diversity in development and we can no longer talk of "stages." Furthermore, after children reach a higher stage, they do not discontinue the use of earlier forms (e.g., Forman, 1982; Guannella, 1934).

Thus far, the research reported has made a case for a sequential developmental progression in various types of complexity of block structures with

predominately more complexity with increased age of the builder. Each of the studies examined only one or two aspects of complexity at a time.

However, Gregory, Kim and Whiren (2003) developed and utilized a complexity composite component using all three aspects: stages, arches and dimensionality simultaneously to look at the overall complexity of a given block structure.

Block Structures as Symbolic Representation and Spatial Development

Symbolic representation, or the ability to create and use symbols, is central to the human capacity to think and express thought. It includes any of the methods humans use to express the activities of their minds. Past theoretical and empirical work had called attention to the need to understand more about children's increasing abilities to use representational media such as drawing (Gardner, 1980; Goodnow, 1978), language (Bates, 1979), and play (Fein & Apfel, 1979, Scales, Almy, Nicolopoulou, & Ervin-Tripp, 1991). Much of that attention has focused on symbolic functioning in childhood, when the growth of symbolic representation provides an index of mental development (Piaget, 1962; Forman, 1982).

A construction is usually defined as symbolic when children claim – whether spontaneously or not – that their construction depicts a thing in the real world (e.g., "house," "boat," "railroad"). Research has shown that the development of such "symbolic" – that is, representational – constructions increased remarkably from about 1 to 7 years (Nicolopoulou, 1991). In particular,

these constructions come to conform more and more to the actual form of the thing represented; this change in form reflects an increased sensitivity to both the object's contour and its details, as well as to the internal relation of the parts to the whole (Guanella, 1934; Johnson, 1933). Exploring this development in more detail, Reifel and Greenfield (1982) demonstrated that as children grow older their symbolic constructions increase in spatial complexity.

However, Nicolopoulou (1991) argued that the symbolic element in human activity could not be reduced to the direct representation of particular objects. Equally symbolic are those constructions that derive meaning from their formal or aesthetic properties, and that elaborate the structural and aesthetic possibilities of the materials used in making them (Nicolopoulou, 1991). Wolf and Gardner (1979) have shown that some children – whom they call "patterners" – choose to elaborate the structural and formal elements of the materials (medium) provided to them, while others – "visualizers" or "dramatizers" – depict objects in the world. What this distinction captures, Nicolopoulou suggests, are two different styles of symbolic activity – or two different aspects of children's symbolic imagination. When children make designs (or abstract patterns), they elaborate aesthetic principles that are realized by utilizing successfully the inherent structure of the medium. In case of the "dramatizers" the focus is less on formal aesthetic principles, and more on depicting and copying objects in the world. According to Nicolopoulou, investigations that address the symbolic dimension of both of these forms of activity can help provide a better understanding of what guides and holds children's interest in constructive play. In addition, the development of

mental representations as reflected in symbolic representation is important for our understanding of the knowledge children have gained (Gardner, 1993).

Blocks are a representational material that is commonly found in early childhood education programs. Children use blocks as tools to express the meanings they have created and the understandings they have achieved (Hirsch 1984). As children handle blocks, moving them around to create different forms and structures, they become mentally active, interpret sensory information more accurately, combine that interpretation with prior knowledge, and learn strategies needed to produce the effect they desire (Williams & Kamii, 1986).

To investigate the representational potential of block play in early childhood, Reifel (1984) explored the nature of mental representations of children at different ages and sex, as reflected in their building block symbolic representations of a story. Stiles-Davis (1988) studied developmental change in young children's spatial cognitive functioning by testing on spontaneous block construction tasks.

Another important aspect of young children's cognitive development is part-whole relations. As children grow to know more of the world and as their cognitive structures mature, we expect to see in their behavior a better understanding of the relationship of parts to the whole. Children's block building play is a good source for learning about part-whole relations. Children begin to play with blocks in any number of ways, including toting them, stacking them, or creating patterns with them. By the age of four, children usually show some interest in using blocks representationally (Guanella, 1935; Johnson, 1974). That

is, they use blocks to stand for objects or events that they have experienced, such as farms, roads, houses, train stations, and so on. These block representations of houses and roads are significant, because they reveal how the child's mind can deal with referents, such as houses and roads in child play. Thus, children's block structures reflect various aspects of cognitive development and allow us to gain insight into symbolic functioning.

As a result of block play a child reflects the basic details present in the real world. Children are able to put together their ideas and understanding in building block models of their real world. "Through blocks the child recreates his or her environment and clarifies ideas about the world. The child can represent various aspects of community life using blocks, perhaps building a model of a place the class or family has visited." (Provenzo & Brett 1983, p. 43) On the other hand, the world around children is likely to influence the concepts and understandings of the children.

A review of the next section presents in two ways how a child develops his or her cognition and what factors support children's cognitive development. First, it deals with age, gender and children's internal maturation (Heredity) as internal factors. And second, childrearing context factors including parental behavior and home environment are examined as external factors.

Internal Factors Predicting Children's Cognitive Development

Age

Sugarman (1982) argues that an analogous process of distancing between internal structure and external form takes place between thought and action during 1.5 to 3 years of age. The mapping from thought or "internal structure," to sequence of action, or "external form," becomes increasingly elaborate as children's conceptual schemes develop in complexity.

Children's thought and constructive action in symbolic play are also subject to influences by the child's knowledge and values, i.e., the child's interest with respect to objects and by other environmental factors. Older children seem to have more knowledge of the referent, but they also have greater skills in arranging blocks in more complex configurations (Guanella, 1934; Johnson, 1974; Reifel & Greenfield, 1982).

Reifel and Greenfield (1983) demonstrated that children's part – whole relationships become increasingly complex with age. One cause that may limit younger children's inclusion of parts in block constructions is their inability to create complex block configurations (Reifel & Greenfield, 1983). Younger children can create arches and enclosures, but they are less likely to be able to create closed enclosures with embedded arches, configurations that are necessary for duplicating the real-world complexity of a house. Since younger children do not have the cognitive structures to create more complex configurations out of blocks, they cannot show the detailed relationships of parts (such as doors and walls) to the whole. They are more likely to produce symbols that do not show parts, such as a house that consists of one block. Older children, who have the cognitive structure to create complex configurations, do

make use of their skills in the representation of parts and the whole (Reifel & Greenfield, 1983).

As findings from the Reifel (1984)'s study reveal, block representations constructed by younger children are indistinguishable; it is difficult to understand visually what they are meant to be. On the other hand, older children use space and create configurations that reflect more differentiation. This leads to a number of questions regarding young children's understanding of a given referent and their abilities to use materials like blocks to represent that understanding.

Gender

A number of previous studies which had looked for gender differences in children's cognitive development had reported contradictory findings: (1) no evidence of such a difference (Henderson & Duncombe, 1982; Hoare & Larkin, 1991; Livesey & Parkes, 1995; Livesey & Intili, 1996; Plomin & Foch, 1981); and (2) evidence of such a difference (Gregory, Kim & Whiren, 2003; Harris, 1978; Jahoda, 1980; McGuinness & Morley, 1991).

Regarding no evidence of gender differences, Plomin and Foch (1981) claimed that accounting for only gender differences between groups appeared to be trivial compared with individual differences within groups although differences on verbal ability as one of the most well-established cognitive gender differences, and the other specific cognitive abilities had been found. Lovesey and Intili (1996) investigated a gender difference in visual-spatial ability in 4-year-old

children. The results indicated that the gender difference in kinesthetic visual-spatial cues was due to differential use of these cues rather than to a gender difference in kinesthetic acuity. These results support the case for the gender difference in the extra cues condition being due to boys' superior use of visual-spatial cues but not when the extra cues were absent.

On the other hand, speculation over the source of such a gender difference in visual-spatial ability in young children has been provided by Harris (1978), Jahoda (1980) and McGuinness & Morley (1991). Gredlein (2001) studied gender differences in constructive play and problem solving through the use of tools, and found that boys engaged in more constructive play than girls and were more likely to use tools to solve a problem. Similarly, Gregory, Kim and Whiren (2003) examined a gender difference in the complexity of children's block structures. Gender was a significant factor to predict the complexity of children's block structures. Boys did build significantly more complex than girls did overall.

A gender difference may reflect a bias in motivation to interact with objects such as toys or blocks, with the amount of time spent in constructive play predicting performance on the tool-use, suggesting that much of the variance in the gender difference in tool use can be attributed to experience in constructive play (Gredlein, 2001).

Numerous causal explanations on the study of gender in children's cognitive development have been offered, including hemispheric specialization

and environmental and genetic explanations, none of which provide an unequivocal and universally acceptable explanation (Harris, 1978).

A Child's Internal Maturation (Heredity)

Piaget (1973) recognized that not only does heredity provide the newborn with the initial equipment to cope with problems she or he will meet in the world, but heredity also establishes a time schedule for new development possibilities to open up at periodic points throughout the child's growing years. Maturational change creates possibilities for new schemes to be created that could not have been generated earlier, but this action neither requires nor guarantees that the potential schemes will materialize (Piaget, 1973). In other words, internal maturation is a necessary but not sufficient condition for development to proceed.

Piaget (1969) stressed that the child is an active organism, adapting to his or her environment through a combination of *assimilation* (incorporating *ailment* [new stimulus] into existing schema or cognitive structures) and *accommodation* (adjusting those in the light of *ailment* from the socio-cultural-physical environment around the child).

Development will always involve processes such as Piaget described (1973), because brain maturation, experience of the physical world and experience of other people go on all the time and cannot but impinge on the development of cognition. But much cognition is part of the social fabric which is also being woven all the time; and the more that cognition facilitates social life,

or is among the goals of a society's acculturation of its members, the more it will be constituted by social interaction (Meadows, 1995).

The developmental roots for understanding block play related to cognitive structure come from the constructivist developmental theory of Jean Piaget (e.g., 1950). With regard to children's block representations, Piaget (1962) related his observations on children's block play to the foundations of the "semiotic function," or theory of signs and symbols. He noted that play representations reflect the child's differentiation of the signifier (the block construction) and the signified (the house, woodshed, path, etc.). In his discussion of Piaget's work, Mounoud (1976) built on this distinction in an important way. He argued that Piaget had studied "psychological development from the subject's point of view (that is, structure or operations) and not from the object's point of view (that is, representations or translations of the object as content)" (p. 177). Piaget's work explained more about the child's egocentric organization of experience (the child's play view of "true to life") than about the objective experience (i.e., a real-world referent) being organized by the child. This seems to be an important distinction to make, especially in terms of the young child's learning and the curriculum that is to support that learning. What experiences (especially, with parents at home) contribute to the child's "egocentric organization of experience"? What experiences help transform that egocentric organization into "objective experience" that has social or shared meaning? What constitutes a so-called "real-world referent" that a child could come to transform? These questions will be examined in the following section of the literature review.

Bronfenbrenner (1989) defined the microsystem as "a pattern of activities, roles, and interpersonal relations experienced by a developing person in a given face-to-face setting with particular physical and material features and containing other persons with distinctive characteristics of temperament, personality, and systems of belief" (p.227). Thus, direct parent-child interactions are a critical microsystem element within the ecological model. There are two elements of external factors addressed on children's cognitive development in the following section: adult-child relationships and the quality of the child's home environment.

The intention of the literature review in this current study needs to move toward this fuller account and the possible contribution made by the child's social environment including parent or teacher - child interaction, and physical environment including home or school - child interaction.

External Factors Predicting Children's Cognitive Development

Early researchers noted that real-world experiences and social learning provide ideas for block representation (Bailey, 1933; Guanella, 1934). They saw that blocks could represent unspecified objects, such as houses, roads, and trains, and that by at least the primary grades; groups of children can use blocks to represent locations they have visited (Reifel & Yeatman, 1991). Garlikov (1993) reported on an interpretive study of block play in a class of 16 kindergartners. Over the course of a school year 16 hours of videotape of the children's block play was recorded and analyzed. Data from the study indicate that young children arrive at school with a wealth of prior knowledge that is vastly

more complex than the suggested kindergarten course of study found in public schools. The study suggests that there are at least two different agendas at work in the classroom, one usually associated with the classroom teacher, whose primary concern is directing the curriculum and instruction, and another associated with the children, whose main concern revolves around social interaction and construction of personality relevant knowledge.

As findings from the Garlikov (1993)'s study reveal, children might build block structures based on their past experiences and knowledge. That is, each child has different experiences accompanied by different levels of SES, family factors, or cultural background. Children came to school with these understandings and they were not gained through school experience. Different social interaction and construction of personally relevant knowledge are reflected on children's block structures. This notion supports the premise that the experiences children have had and interactions with the external factors such as cultural, social, parental and home environments can impact on the complexity of children's block building structures as a cognitive developmental outcome.

Culture

When discussing the formative influences of adult-child interaction in cognitive development, it is essential to recognize that there are cultural differences in both input and output outcome (Meadow, 1995). Cultures differ in how they support children's cognition.

Bryant (1995) argued that in children's early arithmetic, a good self-generated understanding of operations such as sharing, adding and subtracting, developed to a considerable degree before schooling begins, has to be grafted on to the number system which is culturally provided. The social facilitation of children's number skills eases them into the culturally given mathematical systems that are made available to them (Lave, 1988; Stevenson, Lee, & Stigler, 1986). It is clearly an important route of access to mathematical understanding, but it is not to deny the existence and the importance of self-generated understanding such as Piaget described and researchers like Gelman (1990) and Bryant (1995) investigated a variety of components of mathematical understanding.

Vygotsky's approach emphasizes that to understand and nurture children's competencies, teachers must take into account each child's history and cultural background. Because cultures differ in the activities they emphasize and in the tools they use, higher mental functions in humans vary across cultures (Berk & Winsler, 1995).

Socioeconomic Status

Parents' education, income, and occupation are among the most powerful but least understood influences on child rearing. These three factors are usually related and it is difficult to separate their effects; most studies have used a combined index of two or more of these factors to assess socioeconomic status (SES) (Maccoby, 1980).

Socioeconomic status has proven to be a consistent and powerful predictor of parenting behavior. Having established that socioeconomic status is a powerful marker variable, there has been a shift in the interest from socioeconomic status to the processes through which socioeconomic status influences the home environment or parenting behavior (Masud, 1993). There is a growing body of evidence which suggests that socioeconomic status influences parental ideology (beliefs, values and expectations) which in turn influences parents' behavior (Luster, 1985). He found out in his study that low-SES mothers were more likely than middle-class mothers to worry about spoiling their children by being too responsive and/or affectionate. This belief by the low - SES group led them to provide less stimulating rearing environments than other mothers.

Level of education has repeatedly been found to be related to parenting behavior (Bradley & Caldwell, 1984; Gottfried & Gottfried, 1984; Menaghan & Parcel, 1991). Highly educated parents are more likely than less educated parents to provide relatively stimulating home environments. This, in turn, will help to enhance their children's cognitive competence.

Menaghan and Parcel (1991) examined the effects of mothers' and fathers' occupational conditions on children's home environment and of changes in occupational and family conditions on change in home environment. The study found that mothers who work in occupations with more complex activities provide a more enriched home environment than those who work in occupations with less complex activities.

School/Teacher

The focus of the current study is on the parents' influence including home environment as a factor on cognitive development. However, it is necessary to examine how children's interaction with unrelated adults who have a formal responsibility for their learning affects the children's cognitive development because the classroom setting also influences children's behavior.

The theory of Vygotsky illuminates the role of the child's social world, including the teacher's part in it (Nicolopoulou, 1991). Children spend a great deal of their lives away from their parents in our society, even before they are of school age (Clarke-Stewart, 1994), but once they are in school that is the main setting in which their learning is supposed to take place (Berk & Winsler, 1995). Berk and Winsler argued that the role of the teacher includes both designing and educative environment and collaborating with children by scaffolding their efforts to master new skills.

The term *scaffolding,* although not originally used by Vygotsky, was introduced by scholars trying to determine the most important components of tutoring (Wood, Bruner, & Ross 1976; Wood 1989). This interaction style has repeatedly been shown to foster general cognitive growth and to increase children's performance on a wide variety of tasks (Diaz, Neal, & Vachio 1991; Fleer 1992; Pratt et al. 1992; Gregory, Kim, & Whiren 2003).

Research in Bahrain has demonstrated that children in educationally oriented day care made significantly greater gains in cognitive, social and emotional measures than children in custodial-oriented provision or at home

(Hadeed & Sylva, 1994). As a follow-up study, Hadeed and Sylva (1995) observed children and staff behaviors in two different types of preschool settings, custodial and educationally - oriented, in order to describe what actually occurred in these two preschool settings that might account for the differing child outcomes (Hadeed & Sylva, 1994) and identify behaviors that would serve as possible predictors of children's social and cognitive progress. The following background variables on the children selected from each center were controlled: age, mother's age and education, father's occupation, month in pre-school, and sex. The results showed that staff practiced more active, child-centered approaches to learning in the educationally – oriented settings. Moreover, their children had longer concentration spans, more task involvement (cognitive challenge), and were engaged in more dialogue with adults. Therefore, the teacher's influence, not only at the moment of interaction but in structuring the learning environment, can be crucial because, when appropriately applied, it can shape and direct the child's cognition by providing the mediating and enabling frameworks from the adult culture (Nicolopoulou, 1991).

A number of experimental teaching projects have used scaffolding ideas in approaches to more effective teaching of children who are not performing well in schools (Cobb el al. 1991; Palincsar, Brown, & Camione 1993; Cobb, Wood, & Yackel 1993). Gregory, Kim and Whiren (2003) examined the effect of adult verbal scaffolding on the complexity of children's block structures. The results suggest that adults can effectively enable children to build more overall complex structures as well as more dimensionally complex structures.

Schooling is traditionally associated with learning and education. School environment and teacher effect have been addressed as significant roles in early learning through play (Berk & Winsler, 1995). On the other hand, it could be viewed that fundamental early learning has already occurred in the home setting where learning is usually informal and often playful (Morris, 1992).

The effects of school environment or teacher's role appear to be a promising factor for explaining some aspects of the child's cognitive development. On the other hand, the factors of parent behavior and home environment are not yet nearly as well understood as those of the teacher and school environment (Morris, 1992).

Parental Behavior

According to Morris (1992), parents impact their children's development in multiple ways. Their first contribution is the child's genetic inheritance. Parents also strongly influence their children's development through parent-child interaction and the home learning environment they establish.

The findings from infant and early childhood research have been applied to designing home and/or center-based intervention programs for populations at risk for educational failure. High quality programs have been successful at teaching parents to provide more developmentally appropriate learning environments for their young children that support cognitive development (MacPhee, Ramey, & Yeates, 1984). The children from these programs have shown significant increases in intellectual performance when compared with

similar children in control groups (Day & Parker, 1977; Lazar & Darlington, 1982; Clarke-Stewart, 1983; Bruner, 1982; Comport, 1988). The quality of the parent-child relationship is thought to play a crucial role in the development of individual differences in children's early cognitive and language development (Hess & Halloway, 1984; Culp, Hubbs-Tait, Culp & Starost, 2000; Bakel & Riksen-Walraven, 2002).

A positive affective tone (Jennings & Connors, 1989; Berk & Winsler, 1995; Culp et al., 2002) and a positive affectional relationship (Estrada et al., 1987; Diaz, Neal, & Vachio, 1991; Hubbs-Tait, Culp, Culp, & Miller, 2002), as defined by the mother's responsiveness to and warm concern for her child, her flexibility in interaction, and a low frequency of punishment, were shown to be significant predictors of cognitive ability in preschoolers. In addition, children from dyads with positive affective qualities were more likely to persist in activities, to initiate new activities, and to choose challenging tasks than children from dyads with less positive affective qualities (Estrada et al., 1987; Roberts, 2001). Similarly, parental cognitive stimulation, emotional support, and intrusive behavior were found to be significantly associated with children's cognitive abilities (Hubbs-Tait, Culp, Culp, & Miller, 2002).

Belsky (1984) argues that developmental differences in capabilities such as intelligence, social competence, and sex role orientations result from differences in parental care that children experience in their families during the preschool and childhood years. MacPhee, Ramey and Yeates (1984) synthesized the voluminous research on different elements of the home

environment and identified the aspects of the child's social environment that have the strongest relationship to the child's cognitive development. The social element of the home environment found to be most supportive of cognitive development was the relationship of the child with a primary caregiver (usually the mother) who was (1) warm and affectionate, (2) actively involved with the child, (3) contingently responsive in verbal interaction with the child, and (4) routinely managed the child's environment so that there was some regularity in the meal and nap schedule (MacPhee, Ramey, & Yeates, 1984).

Although parental warmth and sensitivity seem to influence a child's development in a consistent fashion, the pattern of influence of control or restriction appears more variable or contingent. High levels of control, defined as intrusiveness or restriction, are seen as problematic, as are very low levels of control. Maternal intrusiveness and control early on in a child's life have been related to lower competence and maladaptation later in development (Egeland, 1985; Egeland, Pianta, & O'Brien, 1993; Culp, Hubbs-Tait, Culp & Starost, 2000; Hubbs-Tait, Culp, Culp, & Miller, 2002). Using longitudinal data, children of mothers judged to be intrusive at 6 months were anxiously attached at 12 months (Egeland, 1985). In addition, these children showed less positive affect and persistence and more noncompliance and frustration at 24 months (Egeland, 1985) and were doing poorly academically, socially, emotionally, and behaviorally in first and second grade (Egeland et al., 1993). More moderate levels of controlling behavior defined as attention-focusing or facilitative directing, however, are seen as necessary for cognitive development and improved

problem-solving abilities (Jennings & Connors, 1989; Wertsch et al., 1980). The key issue with this type of behavior is for the parent to know when to step in and provide structure for the child, and when to step back and allow the child to try on his/her own, often referred to as scaffolding (Doty & Wolery, 1992; Roberts & Barnes; 1992; Gonzalez, 1994; Berk & Winsler, 1995).

In the last two decades, several studies have been conducted to explore parental influences on children's play and cognitive development. Derrington, Sophian, and James (1997) studied the impact of different styles of parental communication and teaching on children's problem-solving focusing on how parental teaching and communication styles affected children's performance on four problem-solving games involving deduction/categorization and planning. While children must invent their own solutions to problems (Siegler, 1991), the strategies selected may originate in social interactions with adults (Mullis & Mullis, 1986). The study conducted by Derrington, Sophian, and James (1997) found that as parental metacognition instruction and strategic explanation increased so did children's posttest scores compared to their pretest scores. Different kinds of parental interaction benefit children's immediately subsequent performance of planning and deduction/ categorization skills.

Doty and Wolery (1992) examined the effects of teaching mothers to imitate their young children (a measure of maternal responsiveness) to modify the amount of maternal directiveness (as measured by the number of maternal demands or commands) during play sessions with 18 to 36 months old children who exhibited developmental delays in cognition, gross/fine motor skills,

speech/language, self-help, and social skills. The results for maternal interactive behavior indicated that (a) mothers increased the frequency with which they imitated their children's behavior, (b) they decreased the number of demands or commands (directiveness) during intervention without specific programming demands or commands, (c) the decrease in maintained on two-week follow-up measures, and (d) a decrease in demands or commands was found in the home for five of the six mothers. The results for children indicate that during intervention (a) they engaged in longer durations of toy play, (b) they engaged in shorter periods of watching their mothers play, and (c) they engaged in more unique play behaviors.

In an investigation of mothers assisting their preschoolers with challenging construction tasks, effective parental scaffolding was associated with an authoritative parenting style (Pratt el al., 1988). *Authoritative parenting,* a term first introduced by Diana Baumrind (1966), refers to a childrearing style characterized by appropriate structure and expectations combined with warmth and responsiveness – a democratic approach that encourages child independence within limits negotiated between parent and child. Additional studies show that authoritative parents, compared to authoritarian (strict and punitive) and permissive (warm but disengaged) parents, have children who are more cognitively and socially competent and emotionally well adjusted (Steinberg, Elmen & Mounts, 1989; Culp, Hubbs-Tait, Culp & Starost, 2000).

It may be concluded that parental behaviors, when interacting or playing with their children, can be related to some reliable change in children's play

behavior and developmental outcome. Children take to school the values learned at home, the language used, and ways of interacting and dealing with people, and attitudes toward learning; therefore what children learn at home is often manifested in their behavior at school (Masud, 1993; Hubbs-Tait, Culp, Culp & Miller, 2002).

Home Environment

In addition to the importance of parental behavior, the effect of the home environment on child's cognitive development has been addressed as a crucial factor. There is empirical evidence that demonstrates that the nature of the home environment can modify a child's cognitive competence (Bloom, 1964; Bradley & Caldwell, 1984; Sigman, Neumann, Carter, Cattle & Bwido, 1988; Crane, 1996; Hwang, 2001; Carlson & Corcoran, 2001).

Based upon the definition of microsystem by Bronfenbrenner (1989), the quality of the home environment is also part of the microsystem within the ecological model, as the child interacts with his or her parents is a part of the microsystem. By the early 1960s many researchers were convinced that in order to identify and map the influences of the environment on child development it was necessary to look at the proximal social and physical variables in the home (Morris, 1992). As scientists planned studies to provide a picture of the actual living conditions experienced by children and began to differentiate between the various elements of the home environment, they found that the instruments available to measure the home environment in the 1950's and 1960's were

inadequate (Bradley & Caldwell, 1984). In response to this need Bettye Caldwell (1967) and her colleagues at the Syracuse Early Learning Project designed the Inventory of Home Stimulation (STIM), which has evolved into the instrument now called the Home Observation for Measurement of the Environment Inventory (HOME). The Original 72 items were reduced to the 45 items currently on the scale and divided into the following subscales: (1) Emotional and Verbal Responsivity of the Mother, (2) Acceptance of the Child (previously called "Avoidance of Restriction and Punishment"), (3) Organization of Physical and Time Environment, (4) Provision and Appropriate Play Materials, (5) Maternal Involvement with Child, and (6) Opportunities for Variety in Daily Stimulation (Bradley & Caldwell, 1984).

Many studies have used the HOME inventory and other similar instruments (Poresky, 1982, 1987, 1989) to study the relationship of the home environment to cognitive development. The volume of the research and the demonstrated strength of the relationship between home and outcome variables have been so strong that Gottfried (1984b) has unequivocally stated, "it is an empirical fact that environmental variables within the home correlated significantly with cognitive development" (Morris, 1992, p. 1).

Compelling evidence has been presented that measures of the home environment and variables that influence the intellectual level of the home environment are important correlates of intellectual development in early childhood (Bradley, 1993; Bradley, Caldwell, & Rock, 1988; Molfese, DiLalla, & Lovelace, 1995; Schaimberg & Lee, 1991). These studies report strong

correlations between markers for home environment quality (SES, maternal intelligence, characteristics of the home, and parenting practices) and performance on intelligence tests in infancy and early childhood. Similarly, a large number of studies show parental and home environmental factors to be significantly correlated with children's cognitive development (Sigman, Neumann, Carter, Cattle, & Bwido, 1988; Doty & Wolery, 1992; Ricciuti, White, & Fraser, 1993; Groze & Heana, 1995; Carlson & Corcoran, 2001). The type and quality of the home environment in which children are raised affects their attitude towards and behavior in school as well as performance in academic activities (Masud, 1993).

For the intimate environment MacPhee, Ramey & Yeates (1984) identified the following elements as those most consistently supportive of cognitive development: (1) the presence of appropriate play materials, (2) an environment that permitted both visual and physical exploration (e.g. floor freedom, access to reading materials, and windows), and (3) the amount of personal space or lack of crowding. As parents have primary control of parent-child interactions and the use of the family's resources, parents strongly influence both the young child's social and inanimate home environment.

Childrearing Context and the Complexity of Children's Block Structures

While a number of studies have been conducted to indicate that children's cognitive development is significantly related to parent behavior and home environment, research that relates the complexity of children's block structures

and parental behavior or home environment has not previously been attempted. As these studies have shown evidence that parent behavior and home environment as predictors affect children's cognitive development. In a same sense, this study hypothesizes that these factors are likely to influence the complexity of children's block structures. Furthermore, as previously cited (Vereeken, 1961), cognitive psychologists use developmental stages that captured the increasing spatial and constructional complexities of children's constructions with age to assess the spatial and cognitive development of young children and to measure them against "normal" development. Therefore, it is premised that the complexity of block structures can be used as an indicator of the development of children's spatial understanding.

Summary

Past research has provided evidence of the association between parent behavior including home environment and children's cognitive outcomes. Furthermore, these studies have reported many ecological elements that are linked with parent behavior toward their children.

The review of literature considered the growth of cognitive development especially focusing on representational and spatial ability in children. However, it was not enough to explain where the developmental change in the complexity of children's block structures was derived from. Some possible answers were mentioned as developmental maturity as a child gets older, teacher effect with specific guidance at school, or the quality of parental behavior or home environment. With regard to the influence of scaffolding of teacher, it has not been examined why the children's block building structures were varied even among the children in the intervention group (e.g., Gregory, Kim & Whiren, 2003). In terms of early play experiences, it could be hypothesized that young children who have experienced or been often exposed to building blocks or other construction materials at their homes might build their block structures or other constructions in more advanced/complex ways. In addition, the quality of the relationship between the parent and the child might contribute to the levels of children's block building complexity.

Based on this hypothesis the purpose of the present study was to investigate if parental behavior and physical home environment were associated with this unexplained variance of the complexity of the children's block structures.

A clear causal relationship can not be asserted but the efforts of this study at considering other explanatory variables and partialling out cognitive development seems to lend some support to a sort of "rolling" interaction between parental behavior and physical home environment and the complexity of children's block structures. The next chapter describes the methodology to accomplish such a study of the relations between childrearing context and the complexity of children's block structures.

CHAPTER THREE

Methods

The objectives of this study were: 1) to investigate the relationship between maternal behavior including physical home environment, and the complexity of children's block building structures, 2) to identify factors that predict the complexity of children's block building structures, and 3) to determine if maternal behavior and physical home environment predict the complexity in children's block building while controlling for the effect of teacher behavior at school. The methods used to meet those objectives were described in this chapter. The chapter was divided into the following sections: (a) research questions and hypotheses, (b) research design, (c) research sample, (d) research instruments, (e) data collection and procedure, (f) data analyses, and (g) summary.

Research Questions and Hypotheses

The questions and hypotheses of the present study are the following:

Q 1: Are differences in the complexity of children's block structures related to the demographic characteristics of their families?

H_0 : There are no differences in the complexity scores of children's block structures based on ethnicity, marital status, presence of sibling(s), or mothers' education .

H_a: There are differences in the complexity scores of children's block structures based on ethnicity, marital status, presence of sibling(s), or mothers' education.

Q 2: Are the childrearing context variables related to the complexity of children's block structures?

H_0 1: There is no relationship between the complexity of children's block structures and total childrearing context, physical home environment, or total maternal behavior.

H_a 1: There is a relationship between the complexity of children's block structures and total childrearing context, physical home environment, or total maternal behavior.

H_0 2: There is no relationship between the complexity of children's block structures and maternal nurturing, discipline, expectations, or playful behavior.

H_a 2: There is a relationship between the complexity of children's block structures and maternal nurturing, discipline, expectations, or playful behavior.

In addition to the above research questions and hypotheses, the following further research question was explored in this study: Does childrearing context predict the complexity of children's block building while controlling for the effect of teacher behavior at school?

Research Design

The present study of the relationship of maternal behavior and physical home environment to the complexity of children's block structures was an exploratory study since the subject of the study is itself relatively new and unstudied. A correlational design was used to achieve the objectives of this study. The study contained two major categories of independent variables: (a) total maternal behavior, which includes parenting styles, maternal expectations and childrearing values, maternal education, contextual and demographic factors; and (b) physical home environment, which includes the quality of the physical environment provided by mother. The dependent variable to be examined in this study is the complexity of children's block structures. The unit of analysis in this study is the mother and her 3 to 5 year-old child.

The present study was based on a secondary analysis of the data of children's block structures gathered by Gregory, Kim and Whiren's study in 2001 entitled "The Effect of Verbal Scaffolding on the Complexity of Head Start Preschool Children's Block Structures." This study was conducted in a controlled setting: the floor size of the block play area, the number of blocks and accessories, and adult presence in the block area. The researcher for the current study collected the data from mothers' interviews and home observations.

Research Sample

The original research sample consisted of 75 preschool children from four classrooms in a Head Start program in the Midwestern United States. Both the morning and afternoon sessions from two classrooms participated. The four classes served low-income families from ethnically diverse backgrounds. Of the 72 children, a sub-sample of 51 children (21 female and 30 male) between the ages of 40 and 61 months was used for analysis. The reduction was due to the necessity of including in the analysis sample only those children who participated in block play at least once during each time segment (baseline, treatment, and follow-up) in the study. This sub-sample included 24 children in the control group and 27 children in the treatment group. As the children were assigned to the classes prior to the onset of the study, their classes were randomly designated as control or experimental groups for the original study.

The research sample in the current study consisted of 35 preschool children and their mothers from the original sample. Criterion for inclusion of participants in this study included parents who gave written permission for both parts of the study: (1) Block Study for their children and (2) Home Observation for the parents.

Demographic characteristics of the sample were derived from the PBC and the HOME which were administered to mothers whose children were in the sample. The data collected through these instruments provided information about child's age and sex, age of mother, education and occupations of mothers,

ethnicity and family structure (marital status and number of children). Table 1 shows demographic information on the mothers. Table 2 presents the demographic information about the children.

The total number of mother-child pairs who were interviewed and observed was 35. Sixty-six percent of the children studied were males and thirty-four percent were females. The age of children ranged from 41 to 61 months, with an average age of 51.1months (SD = 6.05). The largest ethnic group was Asian (31%) and the smallest group was Hispanic at 20%. The rest of the ethnic groups were African American (26%) and Caucasian (23%). Forty - nine percent of the children stayed with their mothers before they enrolled in the Head Start preschool. Thirty - one percent had an experience in a group/center-based setting. The rest of the children stayed either with their relatives or at a non-family out of household setting.

Mothers' ages ranged from 21 to 49 years, with an average age of 33.2 years (SD = 5.97). Data on marital status revealed that 63% of the mothers were married or lived with a partner, and 29% were single mothers. The rest were either separated (6%) or widowed (3%).

All families participating in the current study were low-income, defined as being less than or equal to 100 percent of the federal poverty line to receive Head Start services (National Head Start Association 2002 Policy Agenda). Thirty- four percent of the mothers were employed while 66% were unemployed. As far as the education of the mothers was concerned, 11% of the mothers did not complete high school while 26% completed high school and some post

Table 1

Demographic Information about the Mothers (N= 35)

Characteristic	n (and %)
Age	
21 – 30 years	10 (28.6%)
31 – 40 years	21 (60.0%)
41 – 49 years	4 (11.4%)
Marital Status	
Married	22 (62.9%)
Single	10 (28.6%)
Separated	2 (5.7%)
Widowed	1 (2.9%)
Mother Employment	
Unemployed	23 (65.7%)
Employed	12 (34.3%)
Mother Occupation	
Homemaker	20 (57.1%)
Student	3 (8.6%)
Unskilled Worker	3 (8.6%)
Skilled Worker	2 (5.7%)
Minor Professional	4 (11.4%)
Major Professional	3 (8.6%)
Mother Education Level	
Some High School	4 (11.4%)
High School Graduate	8 (22.9%)
Some Post Secondary	1 (2.9%)
Associate Degree	5 (14.3%)
Bachelors	9 (25.7%)
Post Bachelors	4 (11.4%)
Ph. D and Post doctorate	4 (11.4%)

Table 2

Demographic Information about the Children (N= 35)

Characteristic	n (and %)
Gender	
Male	23 (65.7%)
Female	12 (34.3%)
Age	
41 – 50 months	18 (51.4%)
51 – 61 months	17 (48.6%)
Ethnicity	
Asian	11(31.4%)
African American	9 (25.7%)
Caucasian	8 (22.9%)
Hispanic/Latino	7 (20.0%)
Past Child Care Experience	
Care by parents	17 (48.6%)
Group/Center-based setting	11 (31.4%)
Non-family out of household	4 (11.4%)
Care by relatives other than primary caregiver(s)	3 (8.6%)

secondary education. Sixty- three percent of the mothers earned an Associate Degree or higher. Regarding the common characteristics of a Head Start group such as SES or parents' education, this Head Start group had a unique characteristic. Some of the Head Start group came from a nearby university who were experiencing short - term poverty and may not have had the same population characteristics that would be found in another urban setting.

Research Instrumentations

The current study was completed in two phases. Phase One consisted of a home visit, administration and completion of parent behavior checklists, and parent interviews pertaining to parental behavior and home environment. Phase Two was the assessment of the complexity of children's block structures, assessed at the preschool settings.

Phase One

Parent Behavior Checklist (PBC)

The Parent Behavior Checklist (PBC, Fox, 1994) assesses the parenting behaviors of parents of children ranging in age from 1 to 5 years old. The measure contains 100 items broken down into 3 subscales, empirically derived through factor analyses: Nurturing (20 items), Discipline (30 items), and Expectations (50 items).

The maternal behavior construct is composed of four subscales: Nurturance, Discipline, Expectations and Playfulness. The PBC subscale on nurturing was separated into components: Nurturing and Playfulness. The Expectations subscale measures a parent's developmental expectations ("My child should be able to feed him/herself"). The Discipline subscale represents how a parent responds to difficult child behaviors ("I yell at my child for spilling food"). The Nurturing subscale measures strategies parents use to promote their child's psychological growth ("I read to my child at bedtime"). And the Playfulness subscale measures maternal behavior supporting their children's play activities ("I play make-believe with my child"). To more closely examine which type of maternal behavior was particularly related to the complexity of children's block structures, the construct of playfulness was created.

Each item is rated on a 4-point frequency scale (4 = almost always/always, 3 = frequently, 2 = sometimes, and 1 = almost never/never). Items for each scale are summed to form a total score and may be converted to T-scores based on the child's chronological age. The total scores were standardized and averaged to be used for the analyses.

The PBC's formation was guided by a developmental-environmental conceptual framework that considers a child's development as resulting from an interaction between the child's internal characteristics and her environmental experiences. The two factors that were considered essential aspects of the environment were what parents expect of their child and how parents behave

towards them. Within this framework, an empirical-inductive methodology was used to develop the PBC.

The test-retest reliability correlations for each of the PBC subscales were reported as Expectations = .98; Discipline = .87; and Nurturing = .81. In order to determine the internal consistency of the three PBC subscales, coefficient alpha was computed as follows: Expectations = .97; Discipline = .91; and Nurturing = .82. For the present study, coefficient alphas were computed; Expectations = .88; Discipline = .44; Nurturing = .77; Playfulness = .67. Much lower alpha for discipline would be explained that the subjects used in the current study to establish the reliability had demographic differences from the original variance.

The content validity of the PBC items was assessed using two separate groups of individuals: professionals and parents. As a second assessment of content validity, item-construct correlations were computed for each PBC subscale. The average item- construct correlations found for the three PBC subscales were: Expectations = .65; Discipline = .53; and Nurturing = .47.

The PBC requires about 10 to 20 minutes to complete. Oral administration of the PBC to a parent or group of parents requires more time.

Home Observation for Measurement of the Environment (HOME)

The Home Observation for Measurement of the Environment (HOME) scale, developed by Caldwell and Bradley (1984), is an observation/interview instrument that assesses mother's responsiveness, avoidance of restriction and punishment, organization of the environment, play materials, maternal

involvement in the child's activities, and opportunities for variety in daily stimulation.

The independent variable, home environment, was measured by the preschool version of the HOME. It contains 55 items scored in binary (yes – no) fashion and is composed of eight subscales and a total scale. The eight subscales of the HOME are as follows: (a) Learning Stimulation, (b) Language Stimulation, (c) Physical Environment, (d) Warmth and Acceptance, (e) Academic Stimulation, (f) Modeling, (g) Variety in Experience, and (h) Acceptance. Total scores earned on this instrument were summed to create a single index of overall quality of the early childhood home environment.

Means and standard deviations for each of the eight HOME subscales and the total HOME score were established in a study with 238 families with children ages 3 to 6 in Little Rock, Arkansas (Bradley & Caldwell, 1978). For the total scale, the mean score for families with children 36 to 42 months was 37.5 (S.D. 10.4), and for families with children 48 to 57 months the mean score was 41.9 (S.D. 10.0). Bradley and Caldwell reported interrater reliabilities from six studies in the high .80s to low .90s, and 6-month test-retest subscale correlations ranging from .45 to .87. Internal consistency estimates based on the Kuder-Richardson 20 formula showed coefficients ranging from .53 to .83 for the HOME subscales while the internal consistency estimate for the total scale was .93. The validity of the HOME was established by correlating the HOME with measures of cognitive development. The correlation between HOME score for children ages 3 to 6 years and Stanford-Binet intelligence test scores ranged from .55 to .58.

The HOME is administered in a child's home at a time when the child is awake and can be observed in his or her normal routines for that time of day. In this study, all of the interviews were conducted with the mother as the primary caregiver. The investigator originally intended all items to be based on direct observation of caregiver-child interactions; however, other important child experiences were excluded as a result, and the investigator decided to add interview data as well. Therefore, the HOME inventory was administered in the home using both observation and interview data while the child was present and awake.

Physical home environment was measured by 16 items concerning the quality of physical childrearing environment selected from the HOME. These items were used to create a combined scale (the PBC and the HOME) measuring both social and physical childrearing contexts. The scores from each measure were standardized and averaged.

In addition, the family and child demographic information were obtained through the cover page demographic sheets of the PBC and the HOME which included child's age and sex, past child care experience, the family's ethnicity, household composition, the parents' age and education level, the mother's occupation, and the father's occupation, marital status and number of children at household.

Phase Two

The Complexity of Children's Block Construction Scale

The Complexity of Children's Block Construction Scale was developed for the block study conducted by Gregory, Kim and Whiren in 1998 to study the complexity of children's block play and the effect of teacher's verbalizations. This scale was adapted from a combination of Johnson's (1930), Guanella's (1934) and Forman's (1982) stages of block construction; Goodson's (1982) work for the arches scale; Reifel and Greenfield's (1982) description of dimensionality in block play; and the elements of spatial complexity used by Stiles-Davis (1988). In the block study (Gregory, Kim, & Whiren, 2003), complexity was considered with each of the following individual components: stage, arches and dimensionality (see Appendix A). In addition to these three categories, a fourth category, the block complexity composite was created and utilized to assess the overall complexity of a given block structure.

In the current study, it aimed not to look at each individual aspects of the complexity of the block structure but to consider the overall complexity scores. This appeared to be a logical combination as each of the three areas to be combined occurred simultaneously in the structure, not in a linear fashion (Gregory, Kim & Whiren, 2003).

The block areas in both classrooms were continuously observed by the research team. Still photographs were taken for the entire duration of the study, and each photograph was examined by a member of the research team and coded in each of the four areas: stage, arches, dimensionality, and overall complexity composite. A second member of the team also examined such photograph and coding. Agreement between the research team was achieved.

It was noticed through the data coding that some children built at one stage for an extended period of time, and then began building several stages above that level. Therefore, multiple observations of children's block play provide a more accurate understanding of their abilities than a one-time observation. The most complex structure of multiple trials over a 4 week period of naturalistic observation was used as an indicator of the capability of a child's block building performance.

Data Collection and Procedure

Data collection of the children's block structures began in February and ended in April, 2001, over 11 weeks. Teachers and student teachers in the Head Start classrooms took still photographs of children's block constructions in the block area designed for meeting the conditions of the study.

The data of the parent interviews and home observations were collected during the first 4 weeks of the study. All the observations and interviews were conducted in the home environment.

The investigator contacted mothers of children according to their area of residence. Between one and four families were interviewed and observed by the investigator in one day, and at least 2 hours were spent with each family. After the initial contact, each mother was contacted once again at least 24 hours before the visit to remind her of the visit and to make certain that she knew whom the researcher represents, what kind of information was needed, and how much

time she should allow for the visit. She was also reminded about how important it was for the child to be present and awake.

The interviews were conducted in English. Since the subjects were ethnically diverse, the investigator asked each respondent if she was comfortable using English. Most of the mothers were able to read and answer the HOME and PBC inventories in English. In 4 cases, Korean was used in interviewing the mothers since Korean was the first language for these mothers and the investigator. The mothers were encouraged to ask questions regarding unclear items, and the investigator explained the scale and asked their opinion for each statement. A couple of the mothers asked to explain terms such as make-believe play or food gratification.

After the warm-up period, demographic information was collected. The investigator asked the mothers to fill out the section of family background on the PBC, and this information was recorded on the HOME scale by the investigator. While the mothers were completing the PBC, the investigator observed their physical environment. The mothers were interviewed for several items regarding maternal involvement in the child's activities, and opportunities for variety in daily stimulation. The interactions between the mother and her child were observed while administering the scales.

Data Analyses

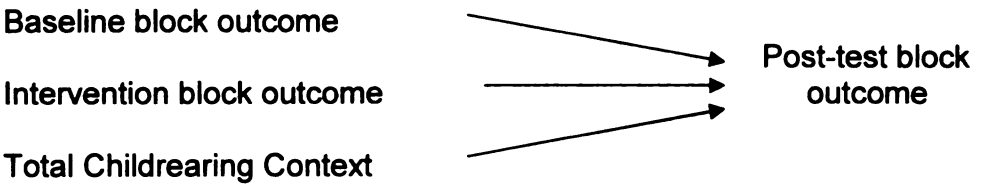
Photographs taken during the first 4 weeks of the study were used to examine the relationship of total maternal behavior and physical home

environment to the complexity of children's block structures. This avoided any possible contaminating factors such as the effect of teacher behavior or accumulated experience of playing with blocks in the school setting for the period of the study. For further examination of the effects of maternal and home environmental factors on the complexity of children's block structures, the data from the photographs taken during the entire 11 weeks of the primary study were used.

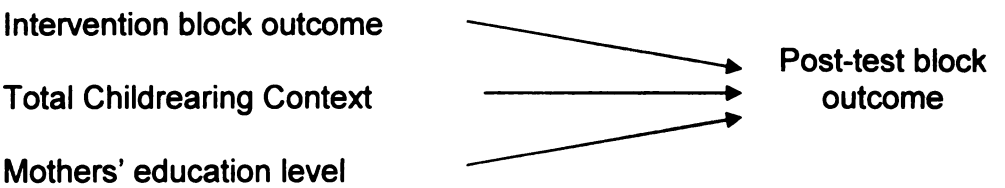
Data were coded by the investigator and analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were used to determine the basic distributional characteristics of each of the variables. To determine whether the differences noted in the demographic variables come from the same or different populations, univariate analysis of variance (ANOVA) was computed. Pearson Product Moment Correlation Coefficients were computed to determine the extent of associations between the independent variables and the complexity of children's block structures.

Multiple regression analyses, employing the simultaneous procedure, were performed to examine which of the variables would be related to the complexity of children's block structures when other variables were statistically controlled. Mothers' education was added to this procedure because it was anticipated to be significantly associated with the several variables. For the current study, two regression models were estimated as shown below:

Model 1



Model 2



In these analyses, the independent variables, total maternal behavior and physical home environment, were entered together as a combined variable named Total Childrearing Context. In addition, multiple regression analyses were computed to determine the extent to which childrearing context predicts the complexity of children's block structures when the effect of teacher behavior was controlled. A chance probability level of less than .05 was set to reject the null hypotheses.

CHAPTER 4

Results

The presentation of results in Chapter IV is divided into four sections and is organized in the following way. The first section examines the differences in the complexity of children's block structures as a function of the demographic characteristics. In section two, the relationships of the components of total childrearing context including maternal demographic characteristics to the complexity of children's block structures are presented.

In section three, the results of the analyses of the two regression models are presented. In the final section of this chapter, a summary of the results of the study is presented in terms of the research questions and research hypotheses posed in Chapter III.

Relations of the Complexity of Children's Block Structures to Demographic Characteristics of the Sample

This section examines the differences in the complexity of children's block structures as a function of the demographic characteristics. The relations of the complexity of children's block structures to the demographic characteristics of the sample are presented. The demographic characteristics included ethnicity, family structure (Marital status: Married or Not married; and Presence of Siblings: Having sibling or Not), and mothers' education (High school graduation or lower, or Associate degree or higher). Univariate analysis of variance (ANOVA) was

computed to determine whether the differences noted in the demographic variables come from the same or different populations. Results of the analyses indicated that there were no differences in the complexity of children's block structures as a function of the demographic characteristics (see Table 3). Therefore, the hypotheses that there are differences in the complexity of children's block structures based on the demographic variables are not supported.

Table 3

Analyses of Variance for Demographic Characteristics

Characteristic	df	F
Ethnicity	3	.34
Spouse/partner	1	.54
Sibling(s)	1	.65
Mothers' education	1	.01

* $p < .05$

Relations between the Components of the Total Childrearing Context Variables and the Complexity of Children's Block Structures

This section presents the associations between the independent variables, total maternal behavior as an indicator of social childrearing context, physical

home environment as an indicator of physical childrearing setting, and total childrearing context as a combined variable of social and physical childrearing context, and the dependent variable, the complexity of children's block structures. To determine the relations between the independent variables and the dependent variable, correlations were computed. Results of the analyses indicated that none of the variables were significantly related to the complexity scores of children's block structures (see Table 4).

Table 4

Relations between the Components of Total Childrearing Context and the Complexity of Children's Block Structures

	Total Childrearing Context	Physical Home Environment	Total Maternal Behavior	Maternal Nurturing	Maternal Discipline	Maternal Expecations	Maternal Playfulness
The Complexity Of Children's Block Structures	.14	.18	.05	- .13	.04	.10	.07

*p < .05

For the present study, it was hypothesized that there were significant relationships between childrearing context variables and the complexity of children's block structures. The hypotheses are not supported.

Multiple Regression Analyses

The purpose of multiple regression analyses was to identify factors that predict the complexity of children's block building structures, and determine if maternal behavior and home environment predict the complexity in children's block building. However, these procedures were neither productive nor meaningful because the correlations were so low.

Summary of Results

Table 5 presents the summary of the results in terms of the research questions and hypotheses addressed in the study. In chapter 5, conclusions, discussions, limitations and recommendations for future research will be presented.

Table 5

Summary of the Results

Questions	Hypotheses	Measures	Analyses	Results
Q1: Are differences in the complexity of children's block structures related to the demographic characteristics of their families?	H_0: There are no differences in the complexity scores of children's block structures based on ethnicity, marital status, presence of sibling(s), or mothers' education . H_a: There are differences in the complexity scores of children's block structures based on ethnicity, marital status, presence of sibling(s), or mothers' education.	The PBC & the HOME	ANOVA	There were no differences in the complexity of children's block structures based on ethnicity, marital status, presence of sibling(s), and mothers' education .
Q2: Are the childrearing context variables related to the complexity of children's block structures?	H_0 1: There is no relationship between the complexity of children's block structures and total childrearing context, physical home environment, or total maternal behavior.	The PBC & the HOME	Pearson Product Moment Correlation Coefficients	There was no relationship between the complexity of children's block structures and total childrearing context, physical home environment, and

	H_a 1: There is a relationship between the complexity of children's block structures and total childrearing context, physical home environment, or total maternal behavior. H_0 2: There is no relationship between the complexity of children's block structures and maternal nurturing, discipline, expectations, or playful behavior. H_a 2: There is a relationship between the complexity of children's block structures and maternal nurturing, discipline, expectations, or playful behavior.			total maternal behavior. . There was no relationship between the complexity of children's block structures and maternal nurturing, discipline, expectations, and playful behavior. .

CHAPTER 5

Conclusions, Discussions, Limitations and Recommendations for Future Research

In this concluding chapter, the purpose of the study and findings are summarized; conclusions are drawn from the results; and interpretations of the findings are discussed. At the end of the chapter, the limitations and recommendations for future research are presented.

Summary of the Study

The purposes of this study were: 1) to investigate the relationship between parent behavior, including physical home environment, and the complexity of children's block building structures, 2) to identify factors in the parental and home environment that predict the complexity of children's block building structures, and 3) to determine if maternal behavior and physical home environment predict the complexity in children's block building while controlling for the effect of teacher behavior at school.

Thirty five preschool age children and their mothers in a Head Start program in the Midwest United States were studied. The following research instruments were used to collect the data: Parent Behavior Checklist (PBC), Home Observation for Measurement of the Environment (HOME), and the Complexity of Children's Block Construction Scale.

In this section, the findings pertaining to the objectives of the study are summarized.

Objective 1

The first objective of the study was to examine the differences in the complexity of children's block structures according to the demographic variables. The demographic variables included ethnicity, presence of a spouse or partner in the home, presence of sibling(s), mothers' education. The analysis of the data demonstrated that no differences in the complexity of children's block structures based on the demographic variables were found. The complexity of children's block structures did not vary across ethnicity, family structure and mothers' education.

Objective 2

The second objective was to determine the relationship between the composition of social and physical childrearing context and the complexity of children's block structures. It was hypothesized that there were significant relations between the independent variables and the dependent variable. Contrary to expectations, none of the childrearing context variables and the complexity of children's block structures were significantly related. These hypotheses are not supported.

Conclusions

The findings of the present study have demonstrated that maternal behavior and physical home environment are not significantly related to the complexity of children's block structures. Inconsistent with expectations, the complexity of children's block structures was not related to the factors measured in the ecosystem of children.

Bronfenbrenner (1989) assumed that environments surrounding the children influence their developmental outcomes, and each environment is influenced by the other. Most of the results from this study are inconsistent with the conceptual model which is based on Bronfenbrenner's theoretical framework.

Discussions

Contrary to expectations, maternal behavior and physical home environment are not associated with the complexity of children's block structures in the population studied. One possible explanation is that because block building is not dependent on interpersonal interactions with others so that the behavioral and physical environment of the household may have less impact on this aspect of development than on other aspects such as language or logical-mathematical capabilities.

Another possible reason for the low correlations is because the PBC and the HOME may not be sensitive enough to measure the aspects of maternal

behavior and physical home environment that specifically support the competence of children's complex block structures. In this case, the maternal behavior and physical home environment should be measured with more specific items regarding the presence of construction materials in the home or otherwise available for children to use. Furthermore, the maternal behavior measure used in this study did not include specific dimensions such as maternal cognitive stimulation or emotional support which might influence children's block building performance.

Sigel and colleagues have examined the relation of children's cognitive skills to one type of parental cognitive stimulation, cognitive distancing – the degree of representational thought required to carry out a collaboration related to objects or events (see reviews in McGillicuddy-DeLisi & Sigel, 1991; Sigel, 1990, 1993). Although the relation of children's cognitive functioning to specific levels of such parental cognitive stimulation varies across samples, in general, the greater the parental use of statements that challenge children to use representational thought, the better children's cognitive performance. In contrast, the greater the parental use of statements requiring only referential thought or including no challenge for thinking, the lower children's cognitive performance (Pellegrini et al., 1985; Roberts & Barnes, 1992). Mothers' statements when their children were 3 years of age that provided conceptual links between objects, activities, locations, persons, emotions, or other topics predicted both verbal and nonverbal cognitive skills when children were 5 years of age (Smith et al., 2000).

Several theoretical approaches endorse the importance of parental emotional support or positive affect in the development of cognitive functioning. From an attachment perspective, parental emotional support is part of the sensitive, responsive parenting (Bretherton, 1985; Roggman, Langlois, & Hubbs-Tait, 1987) that fosters security and competent exploration for cognitive development (Matas, Arend, & Sroufe, 1978).

From Vygotsky's sociocultural perspective (Vygotsky, 1987, p. 282), affect is one of a number of motivators of thought: "the affective and volitional tendency stands behind thought." Within the same perspective, Rogoff (1990, p. 201) introduced the concept of parents' allowing children "the freedom to err," to refer to parental affect promoting cognitive competence. In Vygotsky's theory it is emotional support during problem-solving that provides the context for learning (Ratner & Stettner, 1991; Rogoff, 1990). Furthermore, in research investigations of Vygotsky's theory, parental emotional support during parental guidance of problem solving is viewed as most important to children's cognitive performance (Barocas et al., 1991; Diaz, Neal, & Vachio, 1991). In order to fully examine the influence of maternal behavior on the ability of the child to build complex block constructions or to show other aspects of spatial competence, maternal cognitive stimulation or emotional support, as a specific dimension of maternal behavior, could be measured.

Second, theoretical expectation was that the development of children would be influenced by the interlinked system of microsystems such as the family and the school which are semi- open and interacting. Therefore, the influence of

the mother and the home environment should be associated with the ability of the child to build complex block constructions. However, it was not verified.

The current study was undertaken to identify which factors of maternal behavior and home environment were related specifically to the complexity of children's block buildings under the premise of the Bronfenbrenner's ecological model and the related literature findings. In the literature that specifically addresses the cognitive competence of young children, the importance of maternal behavior and home environment has been recognized (e.g., Crane, 1996; Carlson & Corcoran, 2001; Hubbs-Tait, Culp, Culp & Miller, 2002; Bakel & Riksen-Walraven; 2002). Clearly, more research is needed to fully understand how characteristics of the child, parent and context combine to influence the ability of children's complex block constructions or other aspects of spatial competence.

As additional findings, nonparametric correlational analyses were done to determine the extent of associations between childrearing context variables and the demographic variables. The demographic variables included mothers' education, marital status, and presence of siblings. Childrearing context variables included total maternal behavior as an indicator of social childrearing context, physical home environment as an indicator of physical childrearing setting, and total childrearing context as a combined variable of social and physical childrearing context. The results are presented in Table 6.

Four significant correlations between the total childrearing context variables and the demographic variables were found. Mothers' education was

Table 6

Relations between Childrearing Context Variables and the Demographic Variables

	Total Childrearing Context (PBC + HOME)	Total Maternal Behavior (PBC)	Physical Home Environment (HOME)
Mothers' Education	.30*	.31*	.23
Marital Status	-.02	-.03	.03
Presence of Sibling(s)	-.30*	-.17	-.32*

Note.
Mothers' education was coded as follows: 0 = some high school or graduate high school, 1 = associate degree or higher
Marital status was coded as follows: 0 = spouse/partner not present, 1 = present
Presence of sibling(s) was coded as follows: 0 = sibling not present, 1 = present

* $p < .05$

significantly positively related to total childrearing context and total maternal behavior, while no significant association was found between mothers' education and physical home environment. As expected, mothers who had higher levels of education provided a better quality of the total childrearing context. Moreover, the mothers' education was significantly related to total maternal behavior when the total childrearing context was analyzed separately as the social and physical childrearing contexts. These findings are consistent with findings from other studies (Baekel & Riksen-Walraven, 2002; Harrington, 2001; Hwang, 2001; Masud, 1993). Mothers' level of education was significantly

related to childrearing context scores of the mothers. It is difficult to explain why mothers' education and the quality of the childrearing context are significantly associated. There could be several possible explanations. Education introduces prospective parents to new information and new ways of acquiring knowledge. Thus education broadens the parents' data base and helps the parents develop skills that will serve them well when they need to acquire new information. As level of education gets higher, there is greater emphasis on dealing with complex matters. Generally, information is not presented in simple terms, and there are opportunities to think of the simultaneous effects of several variables on outcomes (Luster, 1985).

The factor of mothers' intelligence cannot be ignored either. Harrington (2001) examined the roles that parent intelligence plays in predicting the quality of home environment for young children growing up with limited sources. Intelligence was one of the factors found to make a significant contribution to the variance in home environment. Hwang (2001) and Bakel and Riksen-Walraven (2002) also found a link between parental intelligence and young children's cognitive development. Intelligence is typically positively related to level of educational attainment, and intelligence may also influence the quality of child rearing contexts. Given that parental intelligence is related to the quality of parenting (Baharudin & Luster, 1998; Pope, & Bradley, 1996; Whiteside-Mansell), higher educated parents can therefore be expected to provide better quality care than lower educated parents.

The presence of sibling(s) was significantly negatively related to total childrearing context and the quality of physical home environment. The mothers who had fewer children were more likely to provide a better the quality of childrearing context.

As another attempt to more closely examine the extent of associations between the demographic variables and the childrearing context variables, the components of childrearing context were analyzed with the demographic variables. The childrearing context was composed of five components: 1) Nurturing, 2) Discipline, 3) Expectations, 4) Playfulness, and 5) Physical Home Environment. Nonparametric and parametric correlational analyses were done to determine the extent of associations between the components of childrearing context variables and the demographic variables.

The analyses of the data showed that there were several significant associations between the demographic variables and the components of childrearing context (see Table 7). Among the four subscales of total maternal behavior, maternal nurturing, discipline and playful behavior were highly correlated with mothers' education, while there was no relationship between maternal expectations and mothers' education. More highly educated mothers tended to report more nurturing, discipline and playful behaviors. They are more likely than other mothers to value positive childrearing behaviors and educational activities that are supportive of environmental exploration or conversation, and thus are likely to present the maternal behaviors in more supportive ways. However, the finding that discipline is positively related to mothers' education is

Table 7

Relations among the Components of Total Childrearing Context and the Demographic Variables

	Maternal Nurturing	Maternal Discipline	Maternal Expectations	Maternal Playfulness	Physical Home Environment	Maternal Education	Marital Status	Presence of Siblings
Maternal Nurturing	1.00							
Maternal Discipline	-.02	1.00						
Maternal Expectations	.31	-.24	1.00					
Maternal Playfulness	.79**	-.12	.32	1.00				
Physical Home Environment	.36*	.14	.08	.22	1.00			
Maternal Education	.42*	.43*	-.06	.36*	.35*	1.00		
Marital Status	.11	.22	-.23	.16	.03	.47**	1.00	
Presence of Siblings	-.21	.15	-.24	-.33*	-.32*	-.05	-.15	1.00

Note. Marital status was coded as follows: 0 = spouse/partner not present, 1 = present
Presence of sibling(s) was coded as follows: 0 = sibling not present, 1 = present

* $p < .05$ ** $p < .01$

inconsistent with the literature. According to Fox, Platz and Bentley's study (1995), maternal discipline is frequently associated with the mothers who were younger, had more than one child living at home, were unmarried, had lower income, and had less education. Fox et al. (1995) measured discipline by

assessing parental responses to children's problem behaviors, with the PBC as was done in the current study.

Contrary to expectations, no significant association was found between marital status and total maternal behavior. It was hypothesized that the mothers who had a spouse or partner at home were likely to present more positive total maternal behavior. This hypothesis was derived from Fox, Platz, and Bentley's study (1995). They found that marital status was frequently associated with positive parenting, whereas single parenthood was not. The hypothesis is not supported. Interestingly, however, marital status was significantly and positively related to mothers' education. More educated mothers were more likely to have a spouse or male partner present in the home. It could be interpreted that the mothers having a spouse or partner may have more opportunities to pursue their educational goal due to their spouse or partner's support.

The presence of sibling(s) was negatively related to the quality of physical childrearing context and maternal playful behavior. The mothers who had fewer children were more likely to provide a better quality of physical childrearing context and more playful behavior. This finding is consistent with other studies that found a negative effect of number of children on the quality of home environment (Baharudin, 1992; Masud, 1993; Menaghan & Parcel, 1991) and maternal behavior (Fox, Platz, & Bentley, 1995). However, there was no relationship between the presence of sibling(s) and the rest of the total maternal behavior subscales: nurturing, discipline and expectations.

Limitations

The present study is limited in its population generalizability by the small numbers of participants included. In addition, this study is also limited in its focus on low-income families but more than half of the sample (62.8%) is highly educated having an Associate Degree or higher. Regarding the common characteristics of a Head Start group such as SES or parents' education, the Head Start group participating in this study had a unique characteristic. Some of the Head Start group came from a nearby university where participating parents were experiencing short - term poverty and may not have had the same population characteristics that would be found in another urban setting. The families' diverse background may also influence the results. Because the HOME and PBC instruments were developed in the United States, some items might not be suitable or comfortable for parents raised in other cultures. Moreover, because of cultural differences in childrearing or the ways of interacting with children, it could be difficult to generalize the findings to most low-income families in the United States.

Because the complexity scores of children's block structures were used in this study as the child outcome instead of measuring the competence of children's spatial understanding, the relations between the childrearing context and the development of children's spatial understanding may have been attenuated. The dependent variable may not have been an ideal indicator of the conceptual construct.

Recommendations for Future Research

In future research, the effect of the childrearing context on the complexity of block constructions needs to be fully examined to answer the question of what kinds of ecological factors are associated with the ability of children to build complex block constructions or to demonstrate other aspects of spatial competence. Furthermore, it will be important to more explicitly examine specific dimensions of maternal behavior especially supporting children to build complex block constructions to determine more precisely whether and how maternal behavior and physical home environment may affect the capability of children to build complex block structures. More specifically, the maternal behavior and physical home environment should be measured with more specific items regarding the presence of construction materials in the home or otherwise available for children to use.

Future research should also take into account the complexity of parenting, which often includes both verbal and non-verbal behaviors. The measurement of verbal and nonverbal maternal behavior would be more specific than the general measures used in this study to examine whether or how these maternal behaviors affect outcomes in children's complex block building competence.

Since the sample of the present study was composed of only mothers, the effect of father's behaviors especially focused on paternal language and play may be investigated in future research. The question of what kinds of paternal behaviors are associated with the ability of children to build complex block

constructions or to demonstrate other aspects of spatial competence could be examined.

Other predictor variables, for example, parents' intelligence and levels of knowledge and attitudes toward the development of child's spatial understanding, may be included in future research. In addition, based on the Bronfenbrenner's ecological perspective research is needed to fully understand how characteristics of the child, parent and context combine to influence children's complex block constructions or other aspects of spatial competence.

Finally, the present study used only quantitative measures to study the interactions among mothers and children, and the complexity of children's block structures. Qualitative research may increase the ability to explain individual differences in parenting behavior and the development of child's spatial understanding. It could give a more comprehensive and deeper insight as well as fuller understanding of the effects of maternal behavior and physical home environment on children's block building capabilities.

APPENDICES

APPENDIX A

Parent Behavior Checklist (PBC)

The PBC includes 100 statements about how parents raise young children. For each statement, mark the letter A if the statement ALMOST ALWAYS OR ALWAYS applies to how you raise your child. Mark the letter F if the statement FREQUENTLY applies. Mark the letter S if the statement SOMETIMES applies. Mark the letter N if the statement ALMOST NEVER OR NEVER applies.

1. I read to my child at bedtime.
2. My child should be able to use the toilet without help.
3. I spank my child at least once a week.
4. My child should be old enough to drink from a cup without help.
5. My child and I play together on the floor.
6. If my child would hit, kick, bite, or scratch someone, I would spank him/her.
7. My child should know three colors.
8. My child should be able to feed him/herself.
9. If my child hit me in anger, I would hit or spank my child.
10. I get books for my child (from the library or store) at least once a month.
11. My child takes naps.
12. When my child doesn't do what I tell him/her to do I spank him/her.

13. My child should be old enough to take a bath without being watched.

14. My child should be old enough to walk up stairs using a railing.

15. If my child is overactive, I involve him/her in quiet activities.

16. My child should be able to catch a bounced ball.

17. Before we go anywhere, I take my child to the bathroom.

18. I tell my child that his/her bad behavior will make God sad.

19. My child would just scribble if given a crayon and piece of paper.

20. I yell at my child for whining.

21. I play make-believe with my child.

22. My child should be old enough to walk down stairs.

23. I tell my child he/she should be ashamed of him/herself for soiled pants (bowel movement).

24. My child should tell me if her/his diapers or pants are wet.

25. I let my boy play with dolls or my girl play with trucks.

26. If my child is overactive, I yell at him/her.

27. My child should tell me when he/she has to go the bathroom.

28. My child should able to understand taking turns during games.

29. If my child cries after being put to bed, I spank him/her.

30. I plan surprises for my child (birthday parties, gifts).

31. I send my child to a room or corner in the house as punishment.

32. To toilet train my child, I make him/her sit on the toilet for over 15 minutes.

33. My child should be able to ride a tricycle.

34. My child should be quiet when Pm on the phone.

35. I find it useful to talk to other parents about raising children.

36. My child uses a bottle for drinking.

37. My child should know that matches are dangerous.

38. I spank my child for refusing to eat.

39. My child should be quiet when I'm talking to another adult.

40. I would spank my child in public for bad behavior.

41. I spend at least one hour a day playing with or reading to my child.

42. I pick up my child's toys.

43. I yell at my child for being too noisy at home.

44. I expect to have to do most things for my child.

45. I read to my child at least once a week.

46. I scold my child for soiling in his/her pants.

47. My child should be old enough to share toys.

48. My child should be able to follow three-part directions ("pick up your toys, wash your hands, and come to supper").

49. I threaten to tell my spouse/partner about my child's bad behavior.

50. When I need help or advice about my child, I talk to my friends.

51. My child should be able to solve problems he/she has with other children.

52. I tell my child that he/she is bad.

53. My child should be able to draw a circle.

54. My child should be able to play well with other children.

55. I allow messy play (finger painting, play dough).

56. My child should be able to say his/her first name when asked.

57. My child should be able to use a spoon without making a mess.

58. I scold my child for playing with his/her private parts.

59. My child should be able to understand what I tell him/her to do.

60. I tell my child to behave so that my spouse/partner won't get mad.

61. I take walks with my child once a week.

62. My child should be able to stay within lines when coloring.

63. If my child cries after being put to bed, I yell at him/her.

64. My child should have good table manners.

65. I talk to or hold my child when he/she is scared.

66. I yell at my child for spilling food.

67. I expect my child to do what I say, right away.

68. My child should be able to play alone for 30 minutes.

69. I get so angry with my child I spank him/her on the bottom.

70. I arrange activities for my child to play such as coloring, painting, or toy play.

71. My child should be able to use a fork and spoon.

72. I punish my child for wetting the bed.

73. My child should be able to name at least one body part (mouth; nose).

74. My child should be able to draw a square.

75. I praise my child for learning new things.

76. My child is sent to his/her room for not obeying me.

77. My child should know to stay away from hot things (oven, iron).

78. I make my child stay at the table until all of his/her food is gone.

79. My child should be old enough to understand the rules in simple games (Candyland, Tag, Old Maid).

80. I would spank my child for wetting his/her pants.

81. I encourage my child to spend time with my spouse/partner or other relatives.

82. I answer my child's questions about sex (such as how babies are born).

83. I would slap my child for being sassy or back talking.

84. I expect my child to help with some household chores (dusting; dishes).

85. When I need help or advice about my child, I read books or magazines about parenting.

86. I threaten to punish my child but then I don't.

87. My child should put away his/her toys.

88. My child should be old enough to speak in clear sentences.

89. I hit my child with an object (such as a spoon or belt).

90. My child has a regular bedtime routine (such as wash up, put on pajamas, read a story, say prayers).

91. My child should be able to name a penny, a nickel, and a dime.

92. I tell my child God doesn't like children who lie.

93. My child wears diapers at bedtime.

94. My child should be able to select his/her own clothes to wear.

95. I take my child to the park, playground, movies, library, or ballgames.

96. My child should be able to wash and dry his/her own hands.

97. My child should be able to stay dry during the day.

98. When my child has a temper tantrum, I spank him/her.

99. My child should be able to stay dry during the night.

100. I send my child to bed as a punishment.

APPENDIX B

The Measurement of Maternal Playful Behavior

Eight items to construct Maternal Playful Behavior were selected from the PBC subscales on nurturing. The selected items are the following:

5. My child and I play together on the floor.

21. I play make-believe with my child.

25. I let my boy play with dolls or my girl play with trucks.

41. I spend at least one hour a day playing with or reading to my child.

55. I allow messy play (finger painting, play dough).

70. I arrange activities for my child to play such as coloring, painting, or toy play.

75. I praise my child for learning new things.

95. I take my child to the park, playground, movies, library, or ballgames.

APPENDIX C

Home Observation for the Measurement of the Environment (Preschool)

There are 55 items on the HOME Inventory. Each is scored yes or no. A total score is computed by adding together the number of items scored "yes".

I. LEARNING STIMULATION

1. Child has toys which teach color, size, shape.

2. Child has three or more puzzles.

3. Child has record player and at least five children's records.

4. Child has toys permitting free expression.

5. Child has toys or games requiring refined movements.

6. Child has toys or games which help teach numbers.

7. Child has at least 10 children's books.

8. At least 10 books are visible in the apartment.

9. Family buys and reads a daily newspaper.

10. Family subscribes to at least one magazine.

11. Child is encouraged to learn shapes.

II. LANGUAGE STIMULATION

12. Child has toys that help teach the names of animals.

13. Child is encouraged to learn the alphabet.

14. Parent teaches child simple] verbal manners (please, thank you).

15. Mother uses correct grammar and pronunciation.

16. Parent encourages child to talk and takes time to listen.

17. Parent's voice conveys positive feeling to child.

18. Child is permitted choice in breakfast or lunch menu

III. PHYSICAL ENVIRONMENT

19. Building appears safe.

20. Outside play environment appears safe.

21. Interior of apartment not dark or perceptually monotonous

22. Neighborhood is esthetically pleasing.

23. House has 100 square feet of living space per person.

24. Rooms are not overcrowded with furniture.

25. House is reasonably clean and minimally cluttered.

IV. WARMTH AND ACCEPTANCE

26. Parent holds child close 10-15 minutes per day.

27. Parent converses with child at least twice during visit.

28. Parent answers child's questions or requests verbally.

29. Parent usually responds verbally to child's speech.

30. Parent praises child's qualities twice during visit.

31. Parent caresses, kisses, or cuddles child during visit.

32. Parent helps child demonstrate some achievement during visit.

V. ACADEMIC STIMULATION

33. Child is encouraged to learn colors.

34. Child is encouraged to learn patterned speech (songs, etc.).

35. Child is encouraged to learn spatial relationships.

36. Child is encouraged to learn numbers.

37. Child is encouraged to learn to read a few words.

VI. MODELING

38. Some delay of food gratification is expected.

39. TV is used judiciously.

40. Parent introduces visitor to child.

41. Child can express negative feelings without reprisal.

42. Child can hit parent without harsh reprisal.

VII. VARIETY IN EXPERIENCE

43. Child has real or toy musical instrument.

44. Child is taken on outing by family member at least every other week.

45. Child has been on trip more than fifty miles during last year.

46. Child has been taken to a museum during past year.

47. Parent encourages child to put away toys without help.

48. Parent uses complex sentence structure and vocabulary.

49. Child's art work is displayed some place in house.

50. Child eats at least one meal per day with mother and father.

51. Parent lets child choose some foods or brands at grocery store.

VIII. ACCEPTANCE

52. Parent does not scold or derogate child more than once.

53. Parent does not use physical restraint during visit.

54. Parent neither slaps nor spanks child during visit.

55. No more than one instance of physical punishment during past week.

Comments_____

_____

_____

_____

APPENDIX D

The Measurement of Physical Childrearing Context

Sixteen items to measure physical childrearing context were selected from the HOME subscales. The selected items are the following:

1. Child has toys which teach color, size, shape.

2. Child has three or more puzzles.

3. Child has record player and at least five children's records.

4. Child has toys permitting free expression.

5. Child has toys or games requiring refined movements.

6. Child has toys or games which help teach numbers.

7. Child has at least 10 children's books.

8. At least 10 books are visible in the apartment.

12. Child has toys that help teach the names of animals.

19. Building appears safe.

20. Outside play environment appears safe.

21. Interior of apartment not dark or perceptually monotonous

22. Neighborhood is esthetically pleasing.

23. House has 100 square feet of living space per person.

24. Rooms are not overcrowded with furniture.

25. House is reasonably clean and minimally cluttered.

APPENDIX E

The Scales of the Complexity of Block Structures

Stages Complexity	
Tower	Blocks one on top of other in vertical fashion
Row	Row of blocks, one next to another
Row-Tower	Combination of tower and row; also flooring and walls
Enclosure	Blocks form an enclosure with "walls" on all sides
Covered Enclosure	A roof is added to the enclosure
Covered Enclosure with Tower	Constructs tower on top of covered enclosure

Arches Complexity	
Arch-level One	Two blocks parallel with third block on top of both
Arch-level Two	Two or more arches side by side or on top of each other or a tunnel
Arch-level Three	Three arches with at least one on top of another
Arch-level Four	More than three arches on top of each other or in a variety of combinations

Dimensionality Complexity	
Zero Dimension	Single block – or scattered blocks forming single points
One Dimension	At least two blocks forming one line
Two Dimension	At least three blocks forming two lines OR forming one plane (To picture this, imagine a piece of paper placed over a space that may be a plane. If it fits, it is likely a plane, it not, it probably is a line)
Three Dimension	More than three blocks forming one line AND one plane

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