

THESIS

MATERNAL KNOWLEDGE AND THE RELATIONSHIP BETWEEN HOME
ENVIRONMENT AND CHILD DEVELOPMENT

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ABSTRACT

MATERNAL KNOWLEDGE AND THE RELATIONSHIP BETWEEN HOME ENVIRONMENT AND CHILD DEVELOPMENT

Research has identified parenting abilities and the home environment as two of the most important contributors to a child's kindergarten abilities. However, little is understood about how these predictors, which contribute to school readiness, are formed, and even less is understood about how they interact with each other. This study explores the relation between socioeconomic status (SES) and maternal knowledge of child development; the relation between maternal knowledge of child development and age-appropriate stimulation in the home; if the relation between SES and cognitive stimulation in the home is mediated by mothers' accurate knowledge of development; and whether cognitive stimulation in the home mediates the relation between accurate developmental knowledge and child cognitive developmental level. Data collected from 1,387 families who participated in the Early Head Start study, from 1996 to 2010, were used. For the present study, each of these families' scores from the 14-month KIDI, 36-month Bayley MDI, 36-month PPVT, and 24-month HOME were used. Each mother was tested. Propensity scores were examined to account for attrition. Mediation was tested using multiple regression analysis.

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CHAPTER I

INTRODUCTION

Not all children enter school with the same readiness to learn or at the same developmental level. These differences contribute to how well children adapt to the challenges of school. Unfortunately, such differences are likely to place children on different academic, social, and behavioral trajectories that persist throughout their school experience (Athanasίου, 2006; Bradley, Corwyn, Burchinal, Pipes McAdoo, & García Coll, 2001; McLelland, Acock, & Morrison, 2006). Given that children's long-term academic trajectories often are established by the middle of first grade (Alexander, Entwisle, & Kabbani, 2001), in large part due to parental expectations (Benasich & Brooks-Gunn, 1996; Palacios, Gonzalez, & Moreno, 1992), it is important to understand what family processes help to prepare preschoolers for success in the early grades. A review by Ramey and Ramey (2006) found that two of the largest contributors to the level of language and intellectual skills children possess when they enter kindergarten are parenting abilities and the home learning environment. In an effort to better understand parenting processes that contribute to children's school readiness, the purpose of this proposed study is to determine whether maternal knowledge of child development is related to the provision of age-appropriate cognitive stimulation, which is consistently related to children's cognitive development and early academic skills (Ayoub, 2006; Benasich & Brooks-Gunn, 1996; Chazan-Cohen et al., 2009; Gottfried, 1984; Harden & Whitaker, 2011; Miller, 1986).

The following review will focus on two processes that influence child development trajectories: the home environment and, more distally, maternal knowledge of child development. Socioeconomic status can shape the level of developmental understanding a

mother has, so SES and variables directly influenced by SES will be briefly examined as well. It is important to note that SES is comprised of multiple variables so it is difficult to determine what relationships exist between which aspects of SES and outcome variables. For the purposes of this review, maternal knowledge is defined as the understanding and awareness a parent has of developmental milestones and the different normative, developmental processes children go through (Benasich & Brooks-Gunn, 1996). Such knowledge has also been termed developmental timetables (Goodnow & Collins, 1990). Accurate knowledge of preschool developmental milestones and processes is what will be measured in the study. The term home environment refers to appropriate play materials, quality of maternal parenting behaviors, and opportunities available within the home that promote cognitive development (Miller, 1988; Palacios et al., 1992).

Throughout the review, these two factors will be considered in the context of how they relate to child development both separately and together, as there is a great deal of interaction between the two. Studies have found that maternal parenting behaviors are closely related to the developmental beliefs mothers hold about their child and children in general (e.g., McGillicuddy-DeLisi, 1982; Miller, 1986). These developmental beliefs affect the way mothers view their roles in their children's lives (Goodnow & Collins, 1990; McGillicuddy-DeLisi, 1982; Miller, 1988). Parents, particularly mothers, have a crucial role in creating the primary environment their children are exposed to in the children's early years, so it is imperative they view their role as important (Votruba-Drzal, 2003). By guiding children towards engaging activities and providing learning opportunities, they establish a foundation for their children's later success (Goodnow & Collins, 1990; McGillicuddy-DeLisi, 1982; Votruba-Drzal, 2003). The idea that quality mothering promotes healthy development among young children is

supported by extensive research and theory, although less is understood about what informs quality mothering (Goodnow & Collins, 1990; Hannan & Luster, 1991; McGillicuddy-DeLisi, 1982; Votruba-Drzal, 2003).

When a mother's behaviors are developmentally appropriate and responsive to a child's behaviors, she positively influences his or her development (Ayoub, 2006; Bornstein & Lansford, 2010; Damast, Tamis-LeMonda, & Bornstein, 1996). When mothers are responsive to a child's behavior, they create an environment that is more centered on the needs of the child and they help the child to feel secure and confident. A way mothers know how to appropriately respond to children's behavior is by knowing about their individual child's specific developmental needs and also what developmental level children should be achieving based on normative child development (McGillicuddy-DeLisi, 1982; Miller, 1988; Tamis-LeMonda, Shannon, & Spellmann, 2002). Also, if a mother is aware of what a child needs for developmental stimulation, the home environment is more likely to be structured in a way that promotes development. A few ways this improved structure can be seen is through a greater amount of literacy opportunities or the mother employing a style of interaction that promotes linguistic skills in the child.

CHAPTER II

LITERATURE REVIEW

Constructivist Theory

One basis for the proposed study is that parents create a home environment that is influenced in part by their beliefs about children in general and about their own children specifically (Benasich & Brooks-Gunn, 1996; Goodnow & Collins, 1990; Sameroff & Feil, 1985; Sameroff & Fiese, 1992). This perspective is consistent with constructivist theory, which asserts that individuals are active creators of their learning and, for learning to occur, people need to interact with others and their environment (Kelly, 1955). Through these interactions, people create their ideas, or constructs, about the world. Constructs help people make sense of their world (Kelly, 1955). Because people do not react the same way to the same experience, not all people who experience the same event will create the same construct (Kelly, 1955). However, some of the constructs that are more universally held are societally created and not molded by individual experience (Goodnow & Collins, 1990; Murphey, 1992; Sameroff & Fiese, 1992). Because experiences shape people's constructs, how situations are viewed is open to change throughout life (McGillicuddy-DeLisi, 1982).

These constructs are also how people determine which behavioral choices to make (Kelly, 1955). According to constructivist theory, manifested behavior is the result of the interaction between individuals' cognitive processes and how they believe they are supposed to respond to a particular environment or situation, based on their experiences and how they view them. Behavior is guided by these constructs and behaviors, and constructs are retained if they prove to be accurate (Kelly, 1955; McGillicuddy De-Lisi, 1982). If a behavior does not produce the intended reaction, a person may decide to create a new construct to justify their behavior

rather than changing the behavior (Murphey, 1992). For instance, a parent may think that spanking a child is a good way to get them to follow the rules. However, although this may produce the intended short-term result, there are likely to be negative consequences further down the road in the child's behavioral and academic domains (Gershoff, 2002). At first the results will support the parents' beliefs, but if the parents realize that spanking is not as beneficial as they believed, it is likely that they will change their constructs regarding spanking and possibly how they view punishment in general.

Much of what parents do, how they behave toward their children, and what they believe about parenting, comes from constructs they have created through their own experiences. These constructs could also be referred to as parents' codes (Sameroff & Fiese, 1992). The way parents respond to their children is often influenced by the parents' experiences and attachment styles they had with their own parents (Sameroff & Fiese, 1992). If individuals grow up with harsh, unresponsive parents, they may raise their own children in that way unless they learn that that type of parenting has detrimental effects on children (Bradley et al., 2001; Culp, Hubbs-Tait, Culp, & Starost, 2000; Tamis-LeMonda et al., 2002). Depending on how much they believe in their behavior (i.e., the strength of their construct), parents may choose to only seek information that confirms their beliefs and behaviors (Goodnow & Collins, 1990). If they believe harsh parenting is the best way to parent, they will look for information that confirms their thoughts, rather than notice anything that is contradictory.

In addition to their own childhoods, it is important to remember that all parents' codes are embedded within the cultural context they experienced. Cultural beliefs provide people with a sense of what is considered normal (Sameroff & Fiese, 1992). If people grow up in a neighborhood where it is the norm for children to watch television all the time, parents may

allow their own child to do the same thing. Even if parents are aware this might not be the most auspicious way to raise a child, they might not know another way, or it might be difficult for them to acknowledge there is a better way to parent. It could be difficult for an individual to change the framework that all his or her experiences are based on (Goodnow & Collins, 1990). As parenting behavior is examined, it is important to remember that behavior is guided by parent constructs about child development, which are created from what they have been taught and what they have experienced (McGillicuddy De-Lisi, 1982).

Optimal Stimulation Hypothesis

The optimal stimulation hypothesis is the principal theory informing the current study. This theory was first suggested by Hunt (1961) as an expansion of the “equilibration” concept proposed by Piaget, a constructivist theorist. Piaget focused on cognitive development in the early years and his theory suggested that children progressed through sequential developmental stages and that cognitive development is enhanced when the needs of immediate situations demand a higher cognitive skill (Piaget, 1985). Hunt believed that Piaget’s original theory did not consider how much motivational and emotional components contribute to the way an individual reacts to a situation (Hunt & Paraskevopoulos, 1980). Unlike Piaget’s theory, the optimal stimulation hypothesis argues that a learning situation cannot just be more difficult, but must fall near the range of a child’s current abilities (Wachs, 1977).

If a learning activity is too difficult, the child is more likely to feel emotionally overwhelmed and lack motivation to attempt the task more than once. The idea that optimal learning occurs when a child’s ability is stimulated by a task that is more difficult, but still within reach, is a principal idea behind the optimal stimulation hypothesis (Hunt & Paraskevopoulos, 1980). Optimal stimulation can be considered to occur if there is only a moderate degree of

difference between an individual's ability and the complexity of the stimuli presented (Wachs, 1977). If the stimulus is at the correct level of discrepancy, it is considered "match" stimulation (Wachs, 1977). For parents to create cognitively enhancing experiences for their children, it is important they are familiar with the idea of optimal stimulation and match.

Scaffolding

Closely related to the idea of the "match" is the zone of proximal development (ZPD) and scaffolding, introduced by Lev Vygotsky. Vygotsky (1978) proposed that all children go through many different zones of learning capability. The ZPD is comprised of the distance between the point where the child needs assistance for task completion and the point where they are able to complete the task unaided. Vygotsky believed this zone is where maximal learning occurs. When children move to a new zone, they initially need the assistance of an adult to help them complete the tasks at that level, also referred to as scaffolding. For scaffolding to occur, the amount of support the child receives from the more knowledgeable person must change throughout the teaching, largely based on the child's success or failure. If the scaffolding is effective, children will gain mastery over the tasks in that zone and be able to move to a more advanced ZPD, where they will again need assistance with more challenging tasks (Vygotsky, 1978). Parents are often responsible for scaffolding early learning experiences for their children, so it is important they understand what is typical for children at a particular age as well as have age-appropriate expectations of their own child.

Cognitive Stimulation and Children's Intellectual Development

Before children begin formal schooling, a large portion, if not the majority, of their time is spent in the home environment, environments created by their caregivers (Bornstein & Lansford, 2010). Harden and Whittaker (2011) found that, for young children, the level of

cognitive stimulation and level of emotional support present in the home was significantly related to later development, with especially strong correlations to cognitive and language functioning in preschool. High correlations have also been documented between academic and language stimulation opportunities available in young children's homes and their performance on intelligence tests (Gottfried, 1984; Molfese, DiLalla, & Lovelace, 1996). Essentially, the more opportunities there are within the home that expose children to cognitive stimulation, the more likely it is that children will achieve higher cognitive and language scores (Gottfried, 1984), as well as exhibit fewer behavioral problems (Harden & Whittaker, 2011). Further work still needs to explore what parental characteristics are associated with the amount of developmental opportunities available in the home.

Not only does a stimulating home environment contribute to a child's cognitive advancement, but it also makes them more confident of their abilities. A relationship has been found between numbers of literacy opportunities available in homes and how children rate their own cognitive skill and interest in learning (Baker & Scher, 2002; Culp et al., 2000; Weigel, Martin, & Bennett, 2006). One possible explanation for this might be that children who have been more exposed to academic environments feel more at ease and competent in cognitively challenging situations.

Although it is clear that the availability of mentally stimulating opportunities in home environments are crucial to children's cognitive development, interactions between parents, particularly mothers, and children are also strongly related to later cognitive outcomes (Kelly, Morisset, Barnard, Hammond, & Booth, 1996). What can be deduced from these findings is that positively stimulating home learning environments are essential to later cognitive skills.

Exposure to learning stimulation also improves every aspect of a child's development, regardless of the child's socioeconomic background, in addition to cognitive skills (Bradley et al., 2001).

Factors Related to Maternal Knowledge of Child Development

The proposed study will focus on how maternal knowledge of child development is related to overall child development, as mediated by the cognitive stimulation available in the home. Because socioeconomic status (SES) has been found to be a strong contributor to knowledge of development as well as home stimulation (Chazan-Cohen et al., 2009; Crosnoe et al., 2010; Gottfried, 1984), it is also important to determine whether knowledge of development mediates the association between SES and cognitive stimulation in the home. The majority of research has focused on the relationship between SES and parenting practices and beliefs, or how SES affects child environments, without considering maternal knowledge of development as a potential mediator. By studying the mediating relationship of maternal knowledge of child development, it can be seen if there are ways to compensate for the detrimental effects that low SES can have on children's home environments and consequently child development.

For example, the hypothesized pathway between SES and cognitive stimulation in the home, mediated by parental knowledge, suggests that knowledge of development may be an important proximal process by which the family macrosystem (e.g., SES) affects the child's microsystem, the home environment (Wachs, 2010). High noise levels, crowding, and lack of routines and structure in the home, all proximal processes in the family microsystem, are detrimental to children's development and are not uncommon features of low-SES family environments (Bradley & Caldwell, 1984; Evans, 2006; Garrett, Ng'andu, & Ferron, 1994; Harden & Whittaker, 2011). To better understand how multiple stimuli, especially at the macrosystem level, directly affect children's environments and influence their development,

Bronfenbrenner and Morris (1998) proposed the person, process, context, and time theory (PPCT). In the PPCT model, process refers to how individuals interact with the other people and objects in their environment. According to Bronfenbrenner and Morris, these interactions greatly affect the developmental trajectory of an individual. The person component refers to the characteristics of an individual within the environment. Context refers to the physical and social environments people live in that have some direct, or indirect, influence on their development. Finally, the time component refers to the individual's age or historical era he or she was raised in, and takes into account how these different aspects of time can affect an individual's development.

To better understand development in the family structure, Wachs (2010) applied the PPCT model to the family microsystem, focusing on the person and process aspects of the theory. He argued that family microsystem features, such as lack of routines, that are created by the macrosystem in which the family is embedded (e.g., SES), could be moderated by characteristics of the individuals within the family. For children growing up in low SES, their developmental level is adversely affected if negative environmental influences, associated with this demographic, are not moderated (Harden & Whittaker, 2011; Wachs, 2010). Wachs argued that positive parenting behaviors are one important process through which negative environmental effects can be mitigated. As mentioned earlier, and will be explored further, parenting behaviors are often associated with parental developmental knowledge. For example, parents who know more about development are also more likely to know that high noise levels negatively affect children's cognitive development and will probably act to decrease noise levels in the home. Furthermore, parents who are more knowledgeable are likely to display more structuring behaviors and understand the importance of routines for children and therefore try to

implement regular routines and structure in their children's lives (Bornstein, Cote, Haynes, Hahn, & Park, 2010; Reich, 2005). Hence, the existing literature on SES and maternal knowledge of development needs to be reviewed to further explore if knowledge could indeed be a mediator of SES and child development, particularly cognitive outcomes associated with low SES.

Mothers rearing their children in poverty may have less time and opportunity to focus on learning developmental knowledge because they are more occupied by jobs and other responsibilities than their higher SES counterparts (Hannan & Luster, 1991). Mothers with time and money are more likely to gain their developmental knowledge through programs or courses offered by the community that will provide them with accurate information (Reich, 2005). These developmental education programs are often offered through local colleges or formal parent education programs, which are probably more difficult for women from lower SES to enroll in. Rather than formal instruction, low-SES mothers often have only friends or family and personal experience to inform them about what is developmentally appropriate for children (Reich, 2005). These types of resources, while perhaps emotionally supportive, may not provide accurate information important for creating optimal child-rearing environments. According to Rothbaum, Martland, and Janssen (2008), in addition to gaining information through classes or friends, mothers have also begun to rely more on the Web as a resource to gain information about their children. High-SES mothers are likely to have an advantage here as well, as they are likely to be more familiar with searching the Web. Low-SES mothers may also have difficulty finding a way to access the Internet on a regular basis for when they have a developmental question or if they forget something.

In addition to less time, many low-SES mothers are less likely to have graduated high school than mothers from high-SES backgrounds (Ayoub, 2006). As described above, mothers with greater levels of education often have access to more resources that provide more accurate developmental information. Indeed, studies have found that maternal education level, a component of SES, is predictive of how much child development knowledge mothers possess (Bornstein et al., 2010; Dearing & Taylor, 2007; McGillicuddy-DeLisi, 1982; Votruba-Drzal, 2003); education level also is associated with a better home environment as determined by the Home Observation for Measurement of the Environment (HOME) Inventory (Benasich & Brooks-Gunn, 1996).

Maternal educational level is also correlated to the beliefs mothers hold about their children's development, or what they believe is important for children to learn and what they believe is not so important (McGillicuddy-DeLisi, 1982). Mothers with more education engage their children in more academically or cognitively oriented activities than do mothers with less education (Bradley, Corwyn, Pipes McAdoo, & Garcia Coll, 2001; Weigel et al., 2006). This is consistent with the finding that mothers with higher levels of education tend to regard education as more important and will create cognitively stimulating home environments that reflect this value (Benasich & Brooks-Gunn, 1996; Laosa, 1980). Conversely, Palacios et al. (1992) found that mothers with lower levels of education are likely to expect less developmentally appropriate behavior from their children. In fact, one of the indices used to determine which children start school less ready to learn is having parents with low levels of education (Dearing & Taylor, 2007; Votruba-Drzal, 2003) or low expectations for their children's success in school (e.g., Alexander, Entwisle, & Kabbani, 2001).

It is important to note that some studies have not found education level to be predictive of the quality of the home learning environment (Hannan & Luster, 1991; Martin & Johnson, 1992). Rather, they found that the intelligence of the mother, as determined by IQ tests, is more strongly related to how the home environment is structured (Hannan & Luster, 1991). Researchers from this perspective argue that intelligent mothers share genes with their offspring, so children of intelligent mothers may be biologically predisposed to do well on measures of intelligence (Hunt & Paraskevopoulos, 1980). As maternal understanding of child development is examined in relation to cognitive stimulation in the home, it is important to remember how SES can be predictive of the amount of maternal knowledge of child development a mother possesses.

Results of Unrealistic Expectations

When parents do not have a conceptual guide of when children should be meeting developmental milestones, they are likely to have an inaccurate picture of what and when their children should be attaining different developmental markers (Bornstein et al., 2010; Reich, 2005). Studies have found that a large portion of parents tend to incorrectly estimate, for every developmental domain, what their children are able to do (Goodnow, 2002; Miller, 1986). Although the opinion of both parents affects children, research has found mother underestimations or overestimations, compared to accurate knowledge, of a child's ability can be detrimental to the child's cognitive development (Huang, O'Brien Caughy, Genevro, & Miller, 2005; Miller, 1988). If a mother believes her child should be able to do something and he or she is unable to, it is not unreasonable to imagine the mother would be disappointed by the child's "lack" of ability. This disappointment can sometimes lead to maternal disapproval or anger towards the child. Culp et al. (2000) found that maternal disapproval at two and a half years was

negatively correlated with children's later math scores. They also found that teachers of children, who experienced disapproval from their mothers, were more likely to report those children as having learning problems. There may be several explanations for why the mother's estimations are especially related, but one explanation may be because most of the existing research on parent-child relationships has focused on households where the mothers are the primary caregivers (Magnuson, Davis-Kean, & Huston, 2009; Martin & Johnson, 1992; Reich, 2005; Tamis-LeMonda et al., 2002).

In addition to the negative effects mentioned above, mothers who lack an understanding of the timing of developmental tasks (developmental timetables) are, in general, less likely to behave in ways that are developmentally supportive (Stevens, 1984). This might be because these mothers are not as aware of what children need at particular stages and thus are not able to help them in the way the children need to be helped (Bornstein et al., 2010). The high levels of support, characteristic of developmentally knowledgeable mothers, have been found to relate to better school outcomes for children (Chazan-Cohen et al., 2009). Limited developmental knowledge can cause some mothers to unintentionally overstimulate and overwhelm their children (Palacios et al., 1992) and, in other cases, to provide insufficient stimulation to promote cognitive and socioemotional growth. Mothers who possess a more accurate understanding of child development are more responsive, or sensitive, to their children (Damast et al., 1996; Tamis-LeMonda et al., 2002). Thus, if the children become overwhelmed or frustrated by an activity, knowledgeable mothers are more likely to reduce the difficulty of the task through scaffolding (Bornstein & Lansford, 2010; Damast et al., 1996). Overall, knowing what to expect from children and when to expect it, as determined by the typically developing population, is likely to be associated with more satisfactory and supportive parenting.

Factors Related to Maximizing Cognitive Stimulation

Environments that are optimal for increasing cognitive stimulation for young, developing children are those where increasingly complex learning opportunities are available and accessible (Chazan-Cohen et al., 2009). Mothers who incorrectly gauge the capabilities of their children may provide environments that are not as developmentally beneficial as those provided by mothers who can accurately predict their children's ability levels (Huang et al., 2005; Hunt & Paraskevopoulos, 1980; Palacios et al., 1992). Miller (1986) found that mothers who were more accurate in their estimations of their children's abilities had children who scored better on developmental tests. One possible explanation provided for these findings is that, as predicted by Hunt's optimal stimulation hypothesis, these mothers are able to structure interactions with their children in ways that best support the children's developmental needs. Mothers with more accurate knowledge of child development are not only good at providing these environments, but they are also more likely to recognize and take advantage of opportunities that support children's cognitive development (Ayoub, 2006).

Mothers' knowledge of play development, defined as the levels of play difficulty that all children developmentally reach and progress through, is also strongly related to the developmental benefit children gain from their home environment. Mothers with a more comprehensive understanding of play development are likely to suggest more sophisticated types of play to their children, thus helping the children move beyond the level where they are currently playing (Damast et al., 1996). According to Hunt's optimal stimulation hypothesis, by increasing the level of play, the mothers are creating a play environment that offers children the most developmentally appropriate stimulation and that provides them with opportunities for the most positive developmental growth outcomes (Hunt, 1980).

When mothers have a working knowledge of their children's developmental levels, they are able to create safe learning environments in their homes. Culp et al. (2000) found that having an awareness of the developmental abilities of children assists mothers in creating a positive learning environment, where they are able to continuously increase the difficulty of tasks while simultaneously ensuring the children feel safe enough to try new undertakings. Also, if mothers are regularly changing the level of activities in which their children engage and providing them with new experiences, the children's attention to the activities may be held and they may continue to be interested in learning, both in the short and long term (Hunt & Paraskevopoulos, 1980). Consequently, to best maximize children's cognitive abilities and desire to learn, it is most helpful if mothers are aware of the children's developmental needs. The proposed study will address how developmental knowledge is correlated with the children's cognitive learning experiences. With more awareness of how this knowledge is transferred into child outcomes, we will be able to improve interventions to more effectively optimize cognitively stimulating opportunities available to children.

Factors Related to Environmental Opportunities

The more knowledge mothers have regarding child development, the greater the likelihood that they will provide a developmentally stimulating environment for their children (Benasich & Brooks-Gunn, 1996; Palacios et al., 1992). There are many ways mothers can create a beneficial environment, one that is cognitively stimulating and developmentally appropriate, such as providing interactive playthings or engaging their children in conversations (Tomopoulos et al., 2006). Depending on mothers' beliefs about their children's development, they are more or less likely to structure the environment with toys and books (Miller, 1988). For instance, if mothers do not believe a 2 year old is capable of understanding or benefitting from a

book, they may consider it unimportant to spend time reading to children or filling the home with books for children to read.

An additional consideration is the quantity of stimulating toys, books, and activities available in the home. Crosnoe et al. (2010) found that the number of these materials available to children is significantly related to the benefit that children gain from their environment (Tomopoulos et al., 2006). Children from low-socioeconomic backgrounds are less likely to have physical resources that encourage developmental growth (Chazan-Cohen et al., 2009; Dearing & Taylor, 2007; Votruba-Drzal, 2003). One possible explanation for this discrepancy is that low-income families have to spend the entirety of the family income on essentials and there is no additional money for toys for the children. This explanation is supported by the Dearing and Taylor (2007) study, where an increase in income among low-income families improved the amount of learning resources in the home. Overall, poverty decreases the likelihood that a child will be exposed to environments in the home and outside of the home that will improve their development (Bradley et al., 2001). By considering this population and examining the relationships between SES, maternal knowledge, home environment, and child development in the following study, it is hoped to discover new ways to help low-income families better maximize their resources.

In addition to structuring the home environment with more stimulating materials, mothers with a strong understanding of child development are more likely to provide and employ interaction techniques that are developmentally beneficial and will promote language skills (Stevens, 1984). In at-risk groups, positive mother-child interactions are correlated with later developmental outcomes as well as scores on standardized IQ measures (Kelly et al., 1996). When an environment is linguistically rich, children, especially those from high-risk

backgrounds, have better developmental outcomes than children from backgrounds with limited linguistic experiences (Harden & Whittaker, 2011).

Chazan-Cohen et al. (2009) found that children from higher-SES families were exposed to many more conversations in their early years than children of low-SES backgrounds. The conversations that did occur between low-SES mothers and children did not have as many meaningful conversations, meaning there was less adaptability and responsiveness to the other's cues, in comparison to those that occurred among high-SES mothers and their children (Bradley et al., 2001; Kelly et al., 1996; Magnuson et al., 2009). This may be because low-income mothers are more likely to be preoccupied with taking care of basic needs or struggling with depression due to economic stress (Ayoub, 2006; Berger, 2009; Hannan & Luster, 1991). These feelings may spill over into their interactions with their children, resulting in less sensitive and more hostile exchanges (Ayoub, 2006). When mothers are more aware of children's developmental levels, they can focus their resources, even if they are on a limited budget, on activities that promote optimal cognitive growth. Developmentally cognizant mothers can also make sure interactions with their children are maximized in the most beneficial way so they are helping their children, even if they have limited time with them (Bornstein et al., 2010).

Hypotheses

Given the increasing importance researchers (e.g., Chazan-Cohen et al., 2009; Hirsch-Pasek, Kochanoff, Newcombe, & de Villiers, 2005; McWayne & Cheung, 2009; Pianta, Cox, & Snow, 2007) and policy makers (Child Trends, 2000; National Governor's Association, 2005) have placed on school readiness, there is a clear need to better understand the processes that contribute to children's preparation for the academic demands of school. One critical influence is the home environment, specifically age-appropriate cognitive stimulation, which in turn may

have its origins in accurate maternal knowledge of child development. Importantly, knowledge of child development may be one proximal process (Bronfenbrenner & Morris, 2006; Reich, 2005) that accounts for social class differences in home stimulation (Ayoub, 2006; Crosnoe et al., 2010; Rothbaum et al., 2008) and thus school readiness. However, this pathway to school readiness has received limited research attention (Magnuson et al., 2009).

Although research has examined how maternal developmental knowledge is related to the way mothers treat their children, continued research needs to be done to better understand how developmental knowledge contributes to the environments they provide for their children (Damast et al., 1996; Tamis-LeMonda et al., 2002; Weigel et al., 2006). Research has looked at the relationship between maternal developmental knowledge and child development as well as environmental contributions to child development. However, more still needs to be understood about the interactive relationship between these three variables. Can mothers create positive environments with limited developmental knowledge? Can mothers have an accurate understanding of developmental needs but still create home environments that fail to promote children's development? Which contributor matters more? The following study will provide information that will contribute to a better grasp of how these important factors are related. By better understanding the associations among knowledge, home environments, and child development, it can be hoped that better programs can be implemented to support all children's school readiness. Given that children from low-SES backgrounds are at greatest risk for starting school behind, this population can especially benefit from programs for parents that promote developmental knowledge as well as guidance on how to create an optimally stimulating home environment (Snyder & Hoffman, 2002).

This study tests four postulates. First, I hypothesize that SES is positively correlated with mothers' accurate knowledge of child development. Second, I hypothesize that maternal knowledge of child development is positively correlated with the amount of age-appropriate stimulation in the home environment, as assessed by the HOME Inventory. Third, I hypothesize that maternal knowledge of development mediates the pathway between SES and age-appropriate stimulation in the home. Fourth, I hypothesize that age-appropriate stimulation mediates the association between maternal accurate knowledge of child development and their children's level of cognitive development.

CHAPTER III

METHOD

Participants

For the present study, data from the longitudinal Early Head Start Research and Evaluation Study was used (Administration for Children and Families, 2010). Data were collected from 17 Head Start Centers across the country. Participants from these centers were involved in the study from 1996-2010. The centers chosen had all agreed to participate in research studies and had to meet three different criteria to be eligible for the Early Head Start (EHS) study: (1) The EHS programs all had to have a research partner, e.g., a university; (2) a diverse population that was considered representative of EHS programs in general; and (3) they needed to be able to recruit double the number of families they could actually serve at their centers, in order to include a control group.

According to the Administration for Children and Families (2010), participants at each center were low-income families with children 12 months and younger at the time the study enrollment took place. From the 17 centers, 3,001 families enrolled in the study. They were then randomly assigned to the control or intervention group. After random assignment, there were 1,513 families in the program group and 1,488 families in the control group. Families in the program group immediately began receiving Early Head Start services while members of the control group could not begin receiving services until their children reached 3 years of age.

Measures

Demographic information was collected from families' Early Head Start application and enrollment forms (Administration for Children and Families, 2010). Several variables related to SES were asked at baseline. Parents were asked if they received food stamps, WIC, Medicaid,

public housing assistance, and TANF (welfare), and if they had adequate money or transportation. Also coded was where their income fell in relation to the poverty threshold. Because all of these variables are indicative of poverty level, they were combined into one poverty variable ($\alpha = .59$). Additionally, parents were asked five questions that indicated potential risk factors for poor child outcomes: if the family received welfare, if they had less than a high school diploma/GED, if the birth mother was less than 20 at first child's birth, if the parents were not married or cohabitating, and if the parents were not employed, not in school, and/or not receiving any type of job training. These questions were combined together to form a composite risk score. Because many of the risk factors are related to socioeconomic status, a composite score based on the risk index and poverty variable, which were correlated $r = .40$, will be used to represent SES in later analyses. Preliminary analysis was done to check for multicollinearity between the composite variables used to measure SES, poverty and risk factors, and the KIDI, HOME, PPVT, and the Bayley MDI.

HOME Assessment. The Home Observation for Measurement of the Environment (HOME; Caldwell & Bradley, 1984) was used to measure home environments, both physical and social. The goal of the measure is to identify sources in the home environment that promote cognitive development and items that delay cognitive development. The infants and toddler version, for ages birth to 3, was used in the EHS study (Administration for Children and Families, 2010). The HOME Infants and Toddlers version consists of 45 items spanning six subscales (Caldwell & Bradley, 1984). Most of the information was collected through observation of the parent, child, and environment, with about a third of the results coming from parent report (Caldwell & Bradley, 1984). The inventory was administered in the home by trained observers and took about an hour.

Research done with the HOME has found it to have moderate to high stability for test-retest reliabilities, as well as acceptable internal consistency reliabilities (Caldwell & Bradley, 1984). Scores on the HOME have also been consistently correlated with intellectual development and cognitive outcomes, with a .72 correlation between 24-month HOME scores and 36-month Stanford-Binet scores (Caldwell & Bradley, 1984). The ability of 6-month HOME scores to correctly identify children who showed cognitively delayed scores on the Stanford-Binet at 36-months indicated good predictive validity. For the HOME, construct validity was established from research showing that the HOME detected differences between homes where the children grew to have language and cognitive delays (Caldwell & Bradley, 1984).

Knowledge of Infant Development Inventory. The Knowledge of Infant Development Inventory (KIDI; MacPhee, 1981) was used to assess what parents know about child-rearing strategies, developmental milestones, and general child development. The original version is a 58-item scale. Each item of the inventory describes what could be normative behavior of children, as well as what could influence the growth and behavior of the children (MacPhee, 1981). The parents then indicate whether they agree, disagree, or are not sure of the right choice. In the instructions for completing the KIDI, it is specified that the parents should consider each item in terms of general child development and what is normative behavior for the majority of children.

For this study, an abbreviated 14-item KIDI was administered to mothers when their children were 14 months of age (Administration for Children and Families, 2010). Because validity and reliability results are not available for this specific version, the validity and reliability of the original KIDI will be presented. To ensure content validity, the KIDI items

were taken from empirical studies and texts regarding child development, infant care, and pediatrics. For a normative sample, the KIDI's alpha is .82 and the test-retest coefficient is .92 for the sum score (MacPhee, 1981). In terms of construct validity, informal channels of information, like friends or personal experience, are uncorrelated or are negatively correlated with accurate child development knowledge scores on the KIDI (MacPhee, 1981). Accuracy on the KIDI is more correlated with formal education experiences, like reading textbooks or taking courses on child development.

Bayley Scales of Infant Development. The Bayley Scales are considered one of the most often used comprehensive measures of infant development (Bayley, 1969). The original measure consisted of a scale measuring mental development with 163 items (the Mental Development Index, or MDI), an 81-item scale tracking motor development, and an Infant Behavior Record where personality measures, endurance, and other traits were kept track of. Items in both scales are grouped by age. For this study, the Bayley Scales of Infant Development, second edition, was used to assess the motor and mental development of the children at 36 months (Administration for Children and Families, 2010; Bayley, 1993). Only the MDI will be used in this study. The second edition is similar to the first, with slight modifications to the two scales and behavior record (Bayley, 1993).

Reliability and validity for the second edition of the Bayley scales was established from a sample of 1,700 children and infants aging 1 to 42 months (Bayley, 1993). The researchers considered the sample to be representative of the United States in terms of ethnicity, parent education characteristics and region. The Mental scale, Motor scale, and Behavior Rating scale were found to have high internal reliability (Bayley, 1993). Because the Bayley has been shown

to correlate with other assessments that examine preschool cognitive function, there is evidence of criterion validity (Bayley, 1993).

Peabody Picture Vocabulary Test. The Peabody Picture Vocabulary Test (PPVT) is a 154-page picture booklet that contains a word on one side and four images on the other. When the test administrator speaks the word out loud, the children are instructed to indicate the picture they believe best represents the word they heard (Dunn, 1959). The PPVT is usually given in 15 minutes or less and covers 150 items. The items are arranged by difficulty and cover items 2.5- to 90+ year olds would know (Dunn & Dunn, 2007).

Standardization of the original PPVT came from a sample of 4,012 White children and youth ranging from 2.5 years to 18 years (Dunn, 1959). On the newest version of the PPVT, split-half and alpha reliabilities have been found to be about .95 across ages, grades, and season of year (Dunn & Dunn, 2007). There are also strong test-retest reliabilities, with a range of .92-.96 reliability (Dunn & Dunn, 2007). In terms of validity, the PPVT has been found to correlate moderately with reading achievement.

Procedure

Participants in the Early Head Start Research and Evaluation Study were studied longitudinally from 1996 to 2010. Baseline data were collected through the Early Head Start application and enrollment forms participants had to complete to be involved in the study. After baseline information was obtained, different types of data collection were done on two separate schedules. Parent interviews regarding services received in and out of Early Head Start, family economic progress, and family and child health were conducted 6, 15, and 26 months after participants had been placed into the control or program group. Parents' perspectives on their child's development were obtained through interviews when the children were 14, 24, and 36

months. Parental knowledge of child development was determined with the KIDI. Assessments of children's cognitive, language, and social development were conducted when the children were 14, 24, and 36 months. Different assessments were used including the Bayley Scales of Infant Development at 14, 24, and 36 months, and the Peabody Picture Vocabulary Test-III at 36 months. For one mediation model being tested in this study, SES will be used as a predictor variable and the 24-month HOME will be a criterion variable. The 14-month KIDI will serve as the mediator. For the fourth hypothesis of this study, the 14-month KIDI was used as the predictor variable and the 36-month Bayley MDI as well as 36-month PPVT will be used as the criterion variables. The Home Observation for Measurement of the Environment (HOME) Inventory was also used to assess parents' warmth and the learning environment available in the home. For the present study, the 24-month HOME will serve as the mediating variable. Of the 3,001 families in the original study, 1,387 had complete data on the family and child variables through 36 months.

CHAPTER IV

PLAN OF ANALYSIS

Before testing the four hypotheses, intervention group differences were examined for the KIDI, HOME, Bayley MDI, and PPVT using independent samples *t* tests. Next, biased attrition was examined at 14 months and 24 months using *t* tests and chi square. For items where biased attrition existed, propensity scores were computed. Scatterplots for 14-month KIDI scores and 24-month HOME scores, and 36-month Bayley MDI and PPVT, were examined to see if the relationship between variables was linear. If there were linear relationships, bivariate correlations could then be used. Finally, to complete preliminary analyses, correlations were examined between all variables to identify potential multicollinearity issues that might influence the regression equations.

The first two hypotheses were tested using bivariate correlations. The last two hypothesized mediation models were tested using hierarchical regressions. Hierarchical regression analysis was selected because this mediation analysis method allows covariates to be entered into separate steps of the equation. When covariates are entered in a regression analysis, a more accurate indication of the unique variance explained by predictor variables, when other predictors are entered, is provided.

The hierarchical regression analyses were conducted to test for mediation according to the steps recommended by Baron and Kenny (1986) and Dearing and Hamilton (2006). The first two criteria for mediation are (1) the criterion is significant when regressed on the predictor, and (2) the criterion is significant when regressed on the mediator. If both of these conditions were met, the third criterion was assessed, that the predictor is no longer significantly related to the criterion variable when both the predictor and mediator are entered into a hierarchical regression

equation. If the first three criteria were met, Sobel tests were conducted to check for full or partial mediation.

CHAPTER V

RESULTS

Preliminary Analyses

Preliminary analyses were conducted to examine differences between the treatment and control groups to determine if the groups could be combined in later analyses. Independent samples *t* tests were conducted between the program and control group for the 14-month KIDI, 24-month HOME, 36-month Bayley MDI, and 36-month PPVT. The only significant difference between the two groups was found for the 24-month HOME at $p = .016$. Because there was a significant difference found for program group, this variable will be included in both propensity scores (described below). It is somewhat unsurprising that there are no major differences between the two groups because participants from both groups had very similar scores when they were tested at baseline.

Next, *t* test and chi square analyses were computed to check for biased attrition at 14 and 24 months. Prior to computing *t* tests and chi square tests, descriptive statistics were checked to ensure that the baseline variables in the missing versus nonmissing groups were normally distributed. Once this was satisfied, *t* tests were computed for depression, poverty, the composite risk index, and number of moves for the missing vs. nonmissing participants at 14 months and 24 months. Poverty ($p = .004$), the risk index ($p < .0001$), and number of times moved ($p < .0001$) were all found to be significant predictors of attrition at 14 months. The risk index ($p < .0001$) was the only continuous variable predictive of 24-month attrition. Chi square tests then were conducted to examine differences in nominal predictors of 14-month and 24-month attrition, these being program group, if the participants were in the treatment or control group, and ethnicity. Both variables were nonsignificant at 14 months. For 24-month attrition, program

group ($p = .017$) and ethnicity ($p = .008$) were both significant predictors. Next, the variables that had been found significant at 14 months were entered into a logistic regression, with missingness as the criterion variable. A second logistic regression was computed using variables that were significant predictors of missingness at 24 months. Because multiple variables from both regression equations were found to still be significantly predictive of attrition at 14 and 24 months, when examined as a set, standardized propensity (lambda) scores were computed using procedures described by Miller and Wright (1995). Both propensity scores were included as covariates in testing for mediation.

Scatterplots between the 14-month KIDI and 24-month HOME and the 36-month Bayley MDI and 36-month PPVT were checked for linearity. The regression lines conformed to linear relationships, meaning one of the assumptions for multiple regression was met and bivariate correlations could be conducted. Finally, bivariate correlations were computed to check for potential multicollinearity problems between the composite variables being used to measure SES, poverty and risk factors, and the KIDI, HOME, PPVT, and the Bayley MDI. All correlations were found to be significant except the 36-month Bayley MDI and poverty. Because poverty and risk factors were significantly related at a level that could cause multicollinearity issues ($r = .40, p < .0001$), they were reverse coded, standardized, and then combined into a single SES variable.

Hypotheses Testing

In order to test the first two hypotheses, that SES is positively correlated with mothers' accurate knowledge of development, and maternal knowledge of development is also positively correlated with the level of age-appropriate stimulation in the home, bivariate correlations were computed among SES, with a range of 0-8, the 14-month KIDI, with a distribution of 1.71-4, the

24-month HOME, and the 36-month indicators of child development, the Bayley MDI and the PPVT. The first hypothesis, that SES is positively correlated with mother’s accurate knowledge of child development, was supported (see Table 1), although the effect size was small. The second hypothesis, that maternal knowledge of child development is positively correlated with the amount of age-appropriate stimulation in the home environment, also was supported (see Table 1); the correlation represents a small effect size.

Table 1

Intercorrelations, Means, and Standard Deviations for SES and Scores on the 14-month KIDI, 24-month HOME, 36-month Bayley MDI, and 36-month PPVT.

Measure	1	2	3	4	5
1. SES	---				
2. 14-month KIDI	.15*	---			
3. 24-month HOME	.25*	.25*	---		
4. 36-month BAYLEY	.12*	.24*	.32*	---	
5. 36-month PPVT	.17*	.24*	.30*	.57*	---
<i>M</i>	3.46	3.14	26.72	91.39	83.01
<i>SD</i>	1.27	.38	3.37	12.40	15.56

* $p < .001$

SES, maternal knowledge of development, and age-appropriate stimulation in the home. The next hypothesis tested was that maternal knowledge of development mediates the pathway between SES and age-appropriate stimulation in the home. No propensity scores included as covariates because two of the variables used in the propensity scores were also used to create the composite predictor variable SES, one of the variables being tested in the first mediational model. Prior to computing the regression analyses, all variables were centered. Next, two bivariate regressions were computed to ensure that the first two conditions for mediation were met. The first condition for mediation (Baron & Kenny, 1986; Dearing & Hamilton, 2006) is that the relationship between the predictor and criterion variable is significant. This criterion was satisfied: In a bivariate regression, the beta weight for SES was

.220, $p < .01$. The second condition is that the mediator and criterion are significant when entered into a bivariate regression. This condition was also satisfied, with the beta weight for the KIDI being .311, $p < .001$. Because both of these criteria were satisfied, the predictor, mediator, and criterion were entered into a hierarchical regression. The model accounted for 13.2% of the variance in the 24-month HOME score, $F(2,1779) = 136.51, p < .0001$. As shown in Table 2, SES was still a significant predictor of 24-month HOME scores even with the 14-month KIDI in the regression equation. However, the beta weight for SES, the predictor variable, decreased from .220 in the bivariate regression to .191 in the hierarchical regression involving both the predictor and mediator variables, suggesting the partial mediation was obtained. To test for partial mediation, the Sobel test was computed; the resulting value of 4.83 ($p < .0001$) indicated that partial mediation was present, with a medium effect size, supporting hypothesis three.

Table 2

Accurate Knowledge of Development Mediates the Relation between SES and Age-Appropriate Stimulation in the Home

	<i>Step & Variable</i>	β	<i>t</i>	<i>p</i>	R^2_{Δ}	<i>Adjusted R²</i>
1	SES	.220	8.60	< .001	.048	
2	KIDI	.293	13.23	< .001	.085	.132

Accurate knowledge of development, age-appropriate stimulation in the home, and cognitive development. Finally, I tested whether age-appropriate stimulation mediated the association between maternal accurate knowledge of child development and their children’s level of cognitive development. Because two measures of cognitive development were used, the Bayley MDI and the PPVT, two separate models were used to test this pathway. Also, both the 14- and 24-month propensity scores were entered into the models as covariates.

First, mediation was examined for the Bayley MDI. When a bivariate regression was conducted to test for the association between the KIDI (the predictor) and the Bayley MDI (the

criterion), the beta weight of .191 was significant, $p < .001$, satisfying the first criterion. The second criterion was also met because the relation between the HOME and Bayley MDI was found to be significant, with a beta weight of .290, $p < .001$. When the predictor and mediator were both entered into the model, after first controlling for the two propensity scores, 14.3% of the variance in the Bayley MDI was accounted for, $F(4,1255) = 53.38, p < .0001$. As shown in Table 3, the KIDI was still a significant predictor of Bayley MDI scores even with the mediator in the equation. However, the standardized beta for the predictor variable decreased from .191 in the bivariate regression to .097 when the mediator was included in the regression equation, indicating partial mediation. A Sobel test was then conducted and partial mediation was supported by a Sobel score of 7.84, $p < .0001$, and a medium effect size.

A similar test of mediation was computed using the KIDI as the predictor and the HOME as the mediator, but with the PPVT as the criterion variable. When a bivariate regression was conducted, the KIDI explained significant variance in the PPVT, $\beta = .187, p < .001$, satisfying the first criterion. The HOME also was a significant predictor of the PPVT in a bivariate regression, $\beta = .254, p < .001$, satisfying the second criterion for mediation according to Baron and Kenny (1986). After controlling for the two propensity scores, the predictor and mediator were both entered into the model. The variables accounted for 15.2% of variance in the PPVT, $F(4,1091) = 49.94, p < .0001$. Although the KIDI was still a significant predictor of the PPVT with the mediator entered in the equation (see Table 3), the standardized beta for the KIDI did decrease from when the PPVT was initially regressed on the KIDI without the HOME (.187) to when the KIDI and HOME were both entered into the hierarchical regression (.112). A Sobel test was then conducted and partial mediation was supported by a Sobel score of 7.04, $p < .0001$. Thus, findings from the Bayley MDI and PPVT regression models indicate that the amount of

age-appropriate stimulation in the home environment partially mediates the relation between accurate maternal knowledge of development and cognitive development, with a medium effect size.

Table 3

Age-Appropriate Stimulation in the Home Mediates the Relation between Accurate Knowledge of Development and Cognitive Development, as measured by the Bayley MDI and PPVT

<i>Step & Variable</i>	β	<i>t</i>	<i>p</i>	R^2_{Δ}	<i>Adjusted R²</i>
<i>Criterion: Bayley MDI</i>					
1 14-month propensity score		-.62	.53		
24-month propensity score		-2.87	<.001		
KIDI	.191	3.39	<.001	.056	
2 HOME	.275	9.72	<.001	.089	.143
<i>Criterion: PPVT</i>					
1 14-month propensity score		1.96	.05		
24-month propensity score		-5.72	<.001		
KIDI	.187	3.75	<.001	.078	
2 HOME	.244	8.21	<.001	.077	.152

CHAPTER VI

DISCUSSION

The main purpose of this study was to gain a greater understanding of the relations among variables that relate to preschool children's cognitive abilities, or later school readiness. Based upon the literature, the variables identified as potential contributors to preschoolers' cognitive abilities were socioeconomic status (SES), maternal knowledge of development, and age-appropriate stimulation in the home (Ayoub, 2006; Chazan-Cohen et al., 2009; Harden & Whitaker, 2011; Ramey & Ramey, 2006). In this study, a positive relation was found between SES and mother's knowledge of development, and also between maternal knowledge of development and age-appropriate stimulation in the home. It was also found that accurate knowledge of development partially mediated the relation between SES and age-appropriate stimulation in the home, and age-appropriate stimulation in the home partially mediated the relation between accurate knowledge of development and children's cognitive developmental levels. As these findings and the implications are discussed, it is important to remember that this is one of the few studies that has examined these variables longitudinally using a low-income sample.

Correlations among SES, Knowledge of Development, and Stimulation in the Home

One purpose of this study was to gain a better understanding of the relation between socioeconomic status and accurate maternal knowledge of development. Although there is a substantial amount of literature on how SES is related to child-rearing practices, there is little research on SES in relation to parental cognitions, specifically knowledge of normative development. In prior research, SES has been found to be related with less optimal parenting (Chazan-Cohen et al., 2009; Crosnoe et al., 2010). In turn, less optimal parenting behaviors and

beliefs are often correlated with inaccurate expectations and beliefs about children, which can have negative consequences for later development (e.g., Culp et al., 2000). Mothers with limited education and resources are less likely to have accurate information about development (e.g., Bornstein et al., 2010; Votruba-Drzal, 2003), possibly because of their limited access to formal experiences such as college classes in child development that convey accurate knowledge of developmental norms and processes. Therefore, it is likely that less optimal parenting occurs more often when mothers have limited knowledge of child development. These inferences about the relation between SES and parental knowledge of development warranted additional research to determine what that relation might be.

Based on what has been found in previous research, it was hypothesized that there is a positive relation between SES and accurate knowledge of child development. In this sample of families enrolled in the national evaluation of Early Head Start, the correlation between the two variables examined was small but significant. As mentioned above, although no prior literature had directly addressed this relationship, research done with SES found that SES was strongly related to many other outcomes including stimulation provided in the home environment (e.g., Huang et al., 2005); therefore, the small correlation between SES and accurate knowledge of development was somewhat surprising.

One reason there may have been a weaker relation than expected is because SES had a restricted range in this sample. If a more diverse sample had been used, there might be a stronger relation. Although the correlation was not as strong as predicted, the evidence does support a direct pathway between SES and knowledge of development. This provides support for the PPCT theory (Wachs, 2010) that modifying components of microsystems, such as parents' developmental knowledge or home environments, can help compensate for more stable

social address variables like socioeconomic status. Because it is easier to influence an aspect of an individual's microsystem than to target variables such as poverty at the macrosystem level, knowing that knowledge of development is related to SES could lead to program innovations that could effectively target this proximal process and potentially overcome some of the negative child cognitive outcomes associated with low SES. It is easier to provide parent education programs that effectively teach parents developmental milestones than it is to provide an entire family with income support or job training.

Another purpose of this study was to assess the relation between mothers' accurate knowledge of development and age-appropriate stimulation in the home. Research has found that mothers with more developmental knowledge are likely to provide stimulating environments for their children (e.g., Benasich & Brooks-Gunn, 1996). An example of how developmental knowledge might directly relate to how the environment is structured is number of literacy opportunities in the home. If mothers are knowledgeable about development, they will know that literacy opportunities are related to how children perceive their own cognitive abilities (Culp et al., 2000). They will then be more likely to fill the children's environments with books. Hence the types of environments parents provide for their children may be related to their knowledge of development

This study focused on the relation between maternal knowledge of development and the home environment because the literature suggests that knowledge of development may be strongly related to the home environment. The home environment has been identified as a primary contributor to school readiness (Ramey & Ramey, 2006), so it is important to identify potential developmental cascades that contribute to the home environment, which in turn might provide insights that could guide intervention programs. It was found that there was a small,

positive relation between knowledge of development and amount of age-appropriate stimulation in the home. This correlation was weaker than anticipated. Based on the few studies in the literature on this topic, it seemed that knowledge of development would be one of the primary variables related to age-appropriate stimulation in the home. However, because the sample consisted of low-income families, accurate knowledge of development may have been less strongly related to age-appropriate stimulation in the home than it might have been in a study that included a broader range of SES. Because the home environment is strongly related to school readiness, evidence of a relationship between knowledge of development and age-appropriate stimulation in the home does add to the research by identifying another potential avenue that could be used to improve later cognitive ability.

Knowledge of Development Mediates the Association between SES and Age-Appropriate Stimulation

In order to attain insights into the linkage between SES, age-appropriate stimulation in the home, and accurate knowledge of development, a mediational analysis was conducted. In previous research, SES had been related to several aspects of the home environment such as noise levels, lack of routines and structure (e.g., Harden & Whitaker, 2011), and fewer age-appropriate toys and games (Gottfried, 1984). The home environment consists of opportunities inside the home environment that stimulate children's cognitive ability, the quality of parenting behaviors, and play materials. Maternal parenting behaviors are often related to the beliefs mothers have concerning development (e.g. McGillicuddy-DeLisi, 1982). When maternal behaviors are developmentally appropriate, they are likely to positively influence children's development (Damast et al., 1996). Mothers know how to respond developmentally appropriately when they are aware of normative development and what developmental level their

children are operating in (e.g., McGillicuddy-DeLisi, 1982). Because many factors contribute to the home environment, it is important to examine what proximal processes might account for the relation between SES and age-appropriate stimulation in the home.

The correlational results showed that SES is related to accurate knowledge of development, and accurate knowledge of development is related to age-appropriate stimulation in the home. Based on findings from the present study as well previous research (e.g., McGillicuddy-DeLisi, 1982; Miller, 1988), it was hypothesized that accurate knowledge of development might mediate the relation between SES and home stimulation. The findings supported the hypothesis of mediation; although it was expected that there would be full mediation, partial mediation was supported.

Partial mediation suggests that other proximal processes such as the family budget might also account for the relation between SES and age-appropriate stimulation in the home. If a family is low SES, but chooses to make providing toys and books for the child a priority, that might partially account for a direct relation between SES and age-appropriate stimulation in the home. Another process that might partially explain the relationship between SES and the home environment is the amount of language a child is exposed to in his or her home environment. As mentioned previously, the amount of language exposure a child experiences has been related to later cognitive ability (Gottfried, 1984). Unfortunately, this study was unable to examine all the potential mediating processes that might help account for the pathway between SES and age-appropriate stimulation in the home. This study did provide a first step towards identifying additional processes to account for the connection between SES and age-appropriate stimulation in the home.

Age-Appropriate Stimulation Mediates the Association between Knowledge of Development and Later Cognitive Development

Finally, this study sought to gain insights into whether age-appropriate stimulation in the home mediates the relation between accurate maternal knowledge of development and children's later cognitive development. According to the literature, mothers can maximize cognitive stimulation for their children when they are aware of their developmental needs (e.g., Palacios et al., 1992). When they are aware of their children's developmental needs, it is likely that mothers will structure activities that are more challenging than what the children can do on their own, but not too difficult that they become frustrated (Culp et al., 2000). According to Hunt (1980), this is the zone where optimal learning occurs. Also, when mothers are able to provide developmentally appropriate activities that foster cognitive stimulation, the children are able to engage in learning and are likely to create a positive association with cognitively engaging activities. This interest and enjoyment in learning may persist long term (Hunt & Paraskevopoulos, 1980), which would make them more successful students.

Based on the literature, it was hypothesized that age-appropriate stimulation mediates the relation between accurate maternal knowledge of child development and child cognitive development. The mediational analyses revealed that age-appropriate stimulation did partially mediate that relation between maternal knowledge of development and child cognitive ability. Because the home environment had been identified in previous literature as a primary contributor to school readiness (Ramey & Ramey, 2006), it was anticipated that age-appropriate stimulation in the home would account for the relation between accurate knowledge of development and child cognitive ability.

Other potential factors that may have also accounted for this pathway could have been SES, because of its relation to age-appropriate stimulation in the home. There are also many variables associated with low SES that this study did not examine. For example, high levels of stress in the home could influence the amount of time and attention the mother is able to give to her child. If the mother did not spend much time with her child, but possessed accurate knowledge of development, the lack of time would help explain the pathway between accurate knowledge of development and child cognitive development. Along with that idea is amount of time the child spent in preschool. If a mother has low knowledge of development, but the child spends a large portion of time in quality childcare that might account for the relationship between knowledge of development and child cognitive outcomes. Although this study was not able to explore all the possible explanations of the relation between accurate knowledge of development and child cognitive development, a variable that partially explains this pathway was identified. Any additional understanding of processes that contribute to cognitive development can only serve to improve the effectiveness of programs and policies directed towards the issue of improving child cognitive ability.

Limitations

Although there were several strengths of the current study, including a large sample of low-income families, the validity of the measures, and a longitudinal design, there were some limitations. The current study sought to answer questions about trajectories to school readiness and kindergarten abilities without measuring participants through kindergarten. This limited the breadth and type of analyses that could be conducted. Consequently the information that could be gained by the current study about school readiness per se was reduced.

As well, all the participants of the study were low income. Because the sample was restricted to low-income families, it is harder to generalize the findings of this study. Also, because a homogeneous sample was used, the ranges on the measures were probably more restricted than they otherwise would have been. The restricted range might have underestimated the strength of the correlations. However, despite the limitations associated with a sample consisting of only one socioeconomic class, this population has been so seldom studied, in relation to parental knowledge of development, that it is important to examine, especially because low SES has been identified as a risk factor for maladaptive child outcomes (e.g., Evans, 2006).

Future Directions

Although the present study was able to address some of the questions not answered by previous literature, there are still many questions that remain unanswered. One potential way to expand upon the current study would be to compare how the significance of variables differed between children who did attend preschool before kindergarten and those who did not attend any preschool prior to kindergarten. When children are in preschool, they spend less time in the home so the pathways examined in this study, particularly between accurate knowledge of development, age-appropriate stimulation in the home, and cognitive development, might be different. The influence of accurate maternal knowledge of development might not be as important among children who did attend preschool because they are spending a significant portion of their time under the guidance of adults who likely possess accurate developmental knowledge as well as have more resources to provide in terms of books and developmentally appropriate play materials.

An additional possibility for future research would be to observe how the relations among the predictor variables in this study and child cognitive development change over time. Perhaps what was strongly related to cognitive development at 36 months becomes less significant at entry to kindergarten. Besides expanding the time period studied, it would also be of interest to observe the relations and differences among a heterogeneous sample. As mentioned, one limitation of the study is that only one socioeconomic group was studied. Comparing longitudinal information across several socioeconomic demographics could yield school readiness implications that would be more generalizable than what was found by the current study. Relations between variables would also likely be different depending on the socioeconomic status of the families. Because low SES is often associated with less stimulating home environments (e.g., Harden & Whitaker, 2011), it might be that there is a much stronger correlation between age-appropriate stimulation in the home environment for children from low SES backgrounds compared to children from higher SES backgrounds.

Conclusion

As a result of this study, there is now an increased understanding of the relations between variables that potentially contribute to school readiness. More is understood about the developmental cascades (Masten et al., 2005) from SES and maternal knowledge of child development to age-appropriate stimulation in the home and, subsequently, young children's cognitive development. Prior to this study, research found that overall child development outcomes are related to SES and the home environment (e.g., Chazan-Cohen et al., 2009; Ramey & Ramey, 2006). Both SES and the home environment are related to several proximal variables, including maternal knowledge of development. Because there are so many factors that relate to children's present and future cognitive abilities, more needs to be known about what these

specific factors are and how to use that knowledge to help children from all socioeconomic levels prepare for school. Cognitive development, or school readiness, is a crucial issue facing our country. School readiness is influenced by many variables (Sheridan, Marvin, Knoche, & Edwards, 2008) and without continued research of what and how variables distinguish between being prepared for school and not being ready, it will continue to be a prominent issue.

Although this study did help fill in some of the gaps regarding contributors to school readiness, these pathways and interactions need to continue to be explored in ways that inform interventions and policies that help families to prepare their children for kindergarten.

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