Dimensions of Preschool Play Activities: Relations with Academic Readiness

by

Priscilla M. Goble

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Graduate Supervisory Committee:

Laura D. Hanish, Co-Chair
Carol Lynn Martin, Co-Chair
Sandra D. Simpkins-Chaput

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ABSTRACT

In preschool, learning often occurs within the context of children's play activities with various toys and materials. Although much theoretical speculation has occurred, relatively little empirical research has examined how preschoolers' play activities foster children's learning and academic skill development. The current study extended previous research on dimensions of adolescent activity involvement to young children in preschool by assessing dimensions of activity involvement across and within curriculum-based and gender-based activity domains. In a longitudinal design, I explored the relation between these dimensions of activity involvement in the fall semester of children's preschool year and children's academic outcomes at the end of their preschool year. Participants included preschool children (n = 279; M age = 52 months, 47% girls, 70% Mexican or Mexican-American) from lower socioeconomic status families. Children's activity involvement was observed, and academic abilities were assessed through child interviews and teacher reports. The results provided little evidence to support the hypotheses that children's dimensions of activity involvement in the fall semester of their preschool year contributed to their academic abilities in literacy and mathematics at the end of their preschool year. Findings were discussed in terms of the strengths and limitations of the present study. Potentially important steps remain for research on the relation between preschool activity involvement and academic abilities.

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INTRODUCTION

The skills and knowledge children have acquired by the beginning of formal school have been shown to be predictive of later academic achievement (Mashburn & Pianta, 2006). Accordingly, researchers, educators, and policy-makers have turned their attention towards children's preschool experiences and the extent to which children are prepared for early formal school success. Current policies such as *No Child Left Behind* suggest that the emphasis in early education should be on preparing children to meet state standards on formal tests of academic achievement in reading and math. Thus, the purpose of the current study was to shed light on possible predictors of young children's early academic readiness (i.e., children's cognitive abilities in literacy and mathematics at the end of preschool).

For many children, the skills and competencies that underlie academic readiness are developed and expanded upon during preschool. In preschool, learning often occurs within the context of children's play activities with various toys and materials. Although relatively little empirical research has examined how preschoolers' play activities foster children's learning and academic skill development, theoretical writings suggest that such research is needed. For example, research testing Piaget's ideas emphasized that children's cognitive development depends on the amount of time that children spend playing with objects and on the ways in which children use objects during play activities

(Renner, Stafford, Lawson, McKinnon, Friot, & Kellogg, 1976). Additionally, Vygotsky's research suggests that cognition develops through guidance in socially-structured play activities with adults and peers (Vygotsky, 1978). Finally, Experiential Learning Theory (ELT) principles suggest that children are active learners who draw on direct physical and social experiences such as those provided through play with various people and activities in preschool environments (Kolb & Kolb, 2009). Together, these theoretical approaches speak to the potential importance of preschool play activities in contributing to early academic skills.

Preschool environments typically provide children with opportunities to play with a variety of developmentally appropriate toys and materials, including blocks, art equipment, dramatic play objects (e.g., kitchen materials, dress up), toys, games, books, writing materials, math and science materials, sensory materials, computers, musical instruments and more (Bredekamp & Copple, 1997; Dodge, Colker, & Heroman, 2002). To help organize toys and activities, preschool teachers often organize and group activities together to promote specific skills according to the classroom curriculum. Such curriculum-based activity domains may include art, dramatic play, library, toys and games, discovery, and outdoors and large motor (Dodge, Colker, & Heroman 2002). Children may select their activities using this categorization system as a guide. Children's activity choices are also often guided by preferences for gender-typed toys (Ruble & Martin, 1998). For example, preschool boys typically choose to

play with activities such as blocks and transportation toys; in contrast, girls choose to play with activities such as dolls and dress-up clothes (for a full review of children's gender-typed toy preferences see Ruble, Martin, & Berenbaum, 2006). Thus, preschoolers may orient their toy and activity play along either curricular or gender-typed (i.e., feminine, masculine, and neutral) domains. It is unclear, however, whether classification of activities used by teachers (i.e., curriculum-based) or the classification of activities used by children (i.e., gender-typed) provides a better framework for assessing how activity involvement impacts early academic skills. The current study aimed to address this lack of knowledge by exploring children's activity involvement using both curriculum-based and gender-typed domain classifications.

In preschool classrooms, free play periods are a time when children are free to engage in any activity in the classroom. The activities in which children spend the majority of their free play time are likely influenced by children's preferences for specific types of play activities (i.e., curriculum-based or gender-typed). From the perspective of promoting academic readiness, children's curriculum-based and gender-typed activity preferences are important because specific activities likely promote learning of specific skills. For example, consistent engagement in outdoor and large motor activities (e.g., riding bikes, kicking balls, digging in sand) and lack of engagement in other curriculum-based activities (e.g., art, library, discovery) may expose children to opportunities to promote motor skill development but may be limiting in opportunities for

academic skill development (FjØrtoft, 2001; Hanley, Cammilleri, Tiger, & Ingvarrson, 2007). Similarly, consistent engagement in masculine activities may expose children (often boys) to a narrow range of academic experiences that are associated with masculine activities (e.g., spatial skill development), potentially limiting academic skill development thought to be associated with feminine or gender-neutral activities (e.g., language skill development; Serbin &Connor, 1979; Green, Bigler, & Di Catherwood, 2004; Powlishta, Serbin, & Moller, 2004). Unfortunately, very little research has been conducted examining the direct relation between preschool activity involvement and academic skill development. The current study aimed to address this gap in the literature using a short-term longitudinal study to explore how involvement in types of activities related to children's early math and literacy skill development.

Additionally, the little research that has been conducted on preschool children's activity involvement has relied on methods that examined involvement using either single assessments of general activity preference at one time point or mean levels of observed play aggregated over time (Carpenter & Huston-Stein, 1980; Golombok & Rust, 1993; Martin & Fabes, 2001). However, such global measures mask potentially important dimensions of activity involvement. Recent research on adolescent activity involvement provides a unique framework to think about how dimensions of activity involvement should be measured (Eccles & Barber, 1999; Fredricks & Eccles, 2006; Rose-Krasnor, Busseri, Willoughby, & Chalmers, 2006; Busseri, Rose-Krasnor, Willoughby, & Chalmers, 2006;

Simpkins, Eccles, & Becnel, 2008). Researchers have begun to identify several important ways to measure adolescents' activity involvement, including: total number of activities, duration of involvement, intensity of involvement and breadth of activity involvement. Furthermore, each of these dimensions of activity involvement relate differently to adolescent academic outcomes. For example, adolescents' breadth of activity involvement across a range of activity domains predicted positive outcomes in both cross-sectional and longitudinal analyses above and beyond total number of activities, duration of activity involvement, and intensity of activity involvement (Fredricks & Eccles, 2006). This research suggests, that engagement in a limited number of activities (e.g., feminine only) may limit skill development relative to what could be gained from engagement in a broader range of activities (e.g., feminine, masculine, and neutral). Drawing on recent adolescent research as a guide, the current study applied methods developed to study adolescents' involvement in extracurricular activities to the study of preschoolers' involvement in activities during free play (i.e., total number of activities; intensity of activity involvement, breadth involvement across- and within activity domains).

The current study extended previous research on dimensions of adolescent activity involvement to preschool by assessing dimensions of activity involvement (i.e., total number of activities, intensity of activity involvement, breadth of activity involvement) across and within both curriculum-based activity domains (i.e., art, dramatic play, library, toys and games, discovery, and outdoors

and large motor) and gender-based activity domains (i.e., feminine, masculine, neutral). Furthermore, the current study longitudinally explored the relation between these dimensions of activity involvement in the fall semester of children's preschool year and children's academic outcomes at the end of their preschool year. Specifically, the aims of the study were threefold: (1) to determine if the total number of activities in which children tend to participate (regardless of activity domain) early in the preschool year is associated with children's literacy and mathematics scores at the end of the preschool year; (2) to explore the relative utility of curriculum-based and gender-based activity categories using children's intensity of involvement in each as predictors of children's academic abilities and; (3) to explore the breadth of activity involvement across and within these domains as predictors of children's academic abilities. It was expected that the more activities in which children participate (regardless of activity domain), the more opportunities they will have to practice and develop academic skills, thus resulting in higher literacy and mathematics scores at the end of the preschool year. Furthermore, I hypothesized several direct relations between intensity of involvement in curriculum-based and gender-typed activity categories and later academic abilities based on the existing preschool activity involvement literature. Finally, drawing on the adolescent activity involvement research, I hypothesized that breadth of activity involvement both across- and within-activity domain in the fall semester of preschool would be associated with children's math and literacy scores in the spring.

The findings to be generated in this research will have important implications for early childhood education practitioners and for future research on early academic readiness. Research has shown that when teachers sit at a specific activity during free play (e.g., writing table), children tend to migrate towards that activity (Serbin, Connor, & Citron, 1981; Oettingen, 1985; Tomes, 1995; Hanley, Tiger, Ingvarsson, & Cammilleri, 2009). Results from this study will inform practitioners about which specific activities (curriculum-based and/or gender-based) directly predict children's math and literacy skills. With this information, preschool educators will be able to focus children's attention on specific types of activities in order to promote academic readiness.

In the following sections, theory suggesting the importance of preschool as a developmental period in which children learn skills through engagement with toys and activities will be reviewed. Next, the relation between preschool play activities and academic correlates will be discussed. In the following section, aspects of adolescent research on dimensions of activity involvement will be highlighted. Finally, there will be a discussion of how the adolescent research on activity engagement provided a framework for designing the present study.

Chapter 2

LITERATURE REVIEW

Empirical research and theory suggest that the preschool years are an important time in the life of a developing child. For many children, preschool is the earliest exposure to same-age peers, classroom environments, and interactions with teachers. Theorists and researchers have suggested that preschool play experiences provide an important vehicle for children's social, emotional, and cognitive development. Central components of children's experiences with peers and teachers within the preschool classroom include the types of learning activities, toys, and objects on which children focus play during their interactions. However, few studies have examined the relations between preschool play activities and children's early school readiness (although some research has considered how children's interactions with peers in preschool impact early academic skills; Ladd & Price, 1987).The goal of this literature review is to present the empirical and theoretical work that supports the importance of exploring preschool children's activity involvement and academic correlates. It should be noted here that the majority of work on the relations between activity involvement and academic outcomes has been done with adolescents. Although it is beyond the scope of this paper to provide an in-depth coverage of the adolescent activity involvement research, aspects of this research will be reviewed to provide a framework from which to think about activity involvement in preschool age children.

Theories on Activity Involvement in Early Childhood

The idea that preschool play activities are important for children's development can be supported by two major developmental theorists whose ideas are directly relevant to children's learning processes: Jean Piaget and Lev Vygotsky. In addition to their developmental theories, a theory with roots in education also provides support for the relation between children's preschool play activities and early academic success: Experiential Learning Theory. These theories will be discussed in the following sections with a specific emphasis on explaining how preschool play activities are thought to be theoretically important for children's development.

Piaget and Vygotsky: the importance of play in preschool. Preschool play is an important context for children's development (Lytle, 1998). Two developmental theorists have suggested ways that play in preschool is directly relevant to children's learning processes: Piaget and Vygotsky. Piaget identified the preschool years as a time when children actively construct knowledge and begin forming logical thought processes by engaging in preschool activities in which they are provided opportunities to manipulate objects of different sizes, shapes, and colors, and in which they begin to sort, classify, compare and sequence objects (Dodge, Colker, & Heroman, 2002). Vygotsky regarded the preschool years as a naïve stage: a time when language acquisition and abstract thinking about objects and experiences begin to bridge the sociocultural world and children's mental functioning (Vygotsky, 1967). Aspects of each of these

theories will be briefly reviewed in order to highlight the importance of play experiences in preschool and to describe how toys and activities are theorized to be important for cognitive development.

Jean Piaget's Views on the Importance of Play. Jean Piaget created a constructivist theory of cognition that divides development into four irreversible stages in which a person qualitatively adapts to the environment (Renner, et al., 1976). These four stages of cognitive development include: sensorimotor, preoperational, concrete operational and formal operations. The period of most importance for the purpose of this paper is the preoperational period, which lasts throughout the preschool years. The preoperational period is the time when children rapidly develop spoken language useful for social interactions and the time when children notice and act on properties of objects they have opportunities to explore (Wadsworth, 1978). Although a complete review of Piaget's developmental theory is beyond the scope of this proposal, some Piagetian concepts are worth review in order to understand how children's preschool play experiences (specifically engagement with toys and activities) are seen to shape children's cognitive development.

Preschool aged children spend a significant amount of time engaged in play activities. Piaget regarded play with objects and toys as the purest form of assimilation, or means through which preoperational children practice newly formed cognitive skills (Berk & Winsler, 1995). Specifically, Piaget suggested that new cognitive skills are developed in young children through a process called

equilibration (Goldhaber, 2002). According to Piaget, one way in which equilibration occurs is through children's interactions with objects in their environment. As children interact over time with objects such as toys, materials, and activities, they experience inconsistencies and contradictions as they attempt to make sense of objects and activities based on their current level of cognition; these actions place them in a state of disequilibrium (Renner et al., 1976). According to Piaget, when children enter a state of disequilibrium, they explore the properties of objects in new ways, try to make sense of new information, and emerge with higher levels of mental organization. Through their interactions with objects and the environment children are able to gain a deeper understanding of their worlds by developing new cognitive structures, and these processes then allow children to return to a stable state of equilibrium once again (Renner et al., 1976). For example, a preoperational child playing with manipulatives (e.g., plastic chips of various shapes, colors, and sizes) in a preschool classroom would find sorting by color an easy activity; however, if the teacher requested that child sort along two dimensions (e.g., shape and color) the child would be in a state of disequilibrium because it is difficult for them to understand that one object may belong to multiple categories. Over time, depending on the individual child's exposure to classification activities and their process of equilibration, and through play with similar manipulatives, the child's cognitive understanding of this concept would eventually develop.

A critical component of Piaget's theory is that children refine their logic and construct an understanding of the world by manipulating and exploring concrete objects (Dodge, Colker, & Heroman, 2002). During the preoperational period, the primary context in which children are given opportunities to act on objects is through preschool play. Through active engagement with materials in their preschool environment children experiment, make discoveries, and modify their earlier way of thinking. Piaget's work with preschool children provided a foundation for understanding how play with objects and toys is important in helping children construct knowledge through their direct experiences. This highlights the importance of preschool experiences in which support for children's cognitive development is enhanced by providing opportunities to engage in age appropriate activities, thereby facilitating children's progression from preoperational thinking to concrete operational logic.

Lev Vygotsky's View on the Importance of Playy. Lev Vygotsky developed a sociohistorical theory that focused on the social and cultural component of children's cognitive development. As part of this theory, Vygotsky (1967) suggested that play with toys and activities is important for preschool children, and his theory provides guidance about which specific activities might be important in guiding children's learning experiences. Vygotsky viewed children's play as the context that supports the highest level of development; play as described by Vygostky is where children move forward (cognitively) through interactions with toys and activities in the environment **(**Vygotsky, 1967).

According to Vygotsky (1978), children begin to learn through engagement with toys and activities long before they enter preschool; however, preschool is a particularly salient period when toys and activities are utilized to facilitate learning and development. Of the play activities in preschools today, Vygotsky identified pretend play (in which children engage in make-believe scenarios) and literacy activities (in which children interact with books and writing materials) as most important (Berk & Winsler, 1995; Vyotsky, 1978).

The role of development through pretend play is two-fold: first, through pretend play, children learn social norms of their culture; second, children learn to symbolically represent objects and events (Berk & Winsler, 1995). According to Vygotsky, by enacting rules during make-believe scenarios, children come to better understand and internalize social expectations and strive to behave in ways that uphold societal norms (Berk & Winsler, 1995). It is through the process of following social rules that children develop cognitive functions such as self-restraint and self-regulation (Vygotsky, 1978). Additionally, as children make substitutions that characterize make-believe (e.g., using a cardboard box to represent a bus), children gain the cognitive ability to separate the meaning of an object from the concrete object. It is through this process, during the preschool years, when children cognitively transition from representations of concrete objects and events to more abstract representational processes (Vygotsky, 1978). Along with pretend play, Vygotsky's theory also emphasized the importance of literacy activities in preschool as a means for children to internalize and gain

understanding about the culturally mediated sign systems of their culture (Berk, 2006; Daniels 1996; Vygotsky, 1978). Within this theory, interactions with symbols and signs, which represent the spoken language of children's culture, prompt children's cognitive shifts to higher levels of thinking.

Experiential Learning Theory. In the previous section, the theories of Piaget and Vygotsky were discussed to highlight how the preschool years are an important developmental period during which activity play can have a significant impact on cognitive skills. In addition to these fundamental theories, Experiential Learning theory, which is grounded in education, suggests that those activities in which children spend most of their time will have the most impact on children's learned skills.

In 1984, David Kolb published a relatively modern theory for how children learn called the Experiential Learning Theory (ELT). Kolb acknowledged that his theory was based on John Dewey's philosophy of education, which suggests that children learn best through their experiences (Kolb, 1984). The term "experiential" is used to combine both the intellectual origins of the theorists associated with the theory as well as the central role that 'experience' plays in this theory (Kolb, 1984). Along with John Dewey, theorists including Erik Erikison, Kurt Lewin, Jean Piaget, and Abraham Maslow have been associated with ELT. The philosophical, psychosocial-developmental, social psychological, and cognitive-developmental perspectives from these theorists

blend in this model to provide an interesting and distinctive perspective on children's learning and development.

According to ELT, learning and knowledge acquisition "results from the combination of grasping and transforming experience"(Kolb 1984, p. 41). The experiential learning process described by Kolb in 1984 had a four-stage learning cycle, where learning occurred through experiencing, reflecting, thinking, and acting. This four-stage learning cycle is useful when considering the impact of engagement in preschool activities on children's overall development. According to this model, the experiential learning process begins with concrete experiences, for example playing with an activity in the preschool classroom (e.g., blocks). Those experiences serve as the basis for observations and reflections and are then refined into abstract concepts. In other words, the concrete experiences children have with activities in the preschool classroom serve as the basis for learning abstract concepts, which are important as children develop and move into formal schooling. Within the original model, there are two modes for grasping experience: Concrete Experience (CE) and Abstract Conceptualization (AC). There are also two modes for transforming experience: Reflective Observation (RO) and Active Experimentation (AE). In 2009, Kolb and Kolb (p. 3) proposed "a holistic model that views play and learning as a unified and integral process of human learning and development." In this new model, the concept of *lucid learning space* was introduced.

As can be seen in Figure 1, the new holistic model integrates theories of play with ELT to provide a framework for understanding development and learning through play. The outer ring of this model is defined as the *lucid space boundary*. Space boundaries provide the social context in which play can take place. Space boundaries can be thought of as the preschool classroom, activity areas within the classroom, and the unspoken rules that regulate the flow and structure of play. The second ring of this model is the *lucid learning space*. The learning space is comprised of the interconnectedness of factors such as voluntary participation, uncertainty, creativity, and integrity, which allow for individual children to experience and learn from play. The inner circle is the original four-stage learning cycle from ELT. By combining the original learning cycle with the safe environment provided by the lucid learning space and lucid space boundaries, it is here where concrete experiences are the basis for observations and reflections. The reflections are then refined and turned into abstract concepts. From the abstract concepts, new implications are drawn and these are actively tested and serve as guides in creating new experiences.

Although this theory has rarely been applied to research on young children, the combination of the lucid learning space and experiential learning process provide an excellent framework when considering the impact of engagement in preschool activities on children's overall development. In the lucid learning space, an emphasis is placed on learning environments characterized as safe and supporting but also challenging, where learners are in charge of their

own learning and provided with opportunities for repetitive practice that develops expertise. This type of learning environment is commonly found in preschool classrooms; in fact "free play" is the time during preschoolers' day when children actively choose their activities, social relationships and involvement with teachers (Bredekamp & Copple, 1997).

In ELT, an emphasis is placed on learning through the process of experience, reflecting and thinking about that experience, and acting in new experiences. More importantly, ELT suggests that children's early experiences are cumulative, whether positive or negative; if an experience happens frequently it will likely have more powerful and long lasting effects than those experiences that only occur occasionally. Accordingly, this theory supports the idea that the more time children spend with specific activities in preschool environments, the more the children will learn from those specific experiences and the more skills the children will build.

Play Activities and Toys in Early Childhood

From an early age, children are exposed to a variety of toys and activities. Beginning in infancy, parents purchase toys and materials to stimulate children's minds and promote development. As infants and toddlers became more mobile and able to grasp and manipulate objects, toys become even more salient in children's lives. As children enter preschool, they are often exposed to a larger variety of toys and activities than ever before, their styles of play become more complex, and play with activities becomes the main mechanism through which

children learn. Children's preschool classroom environment and research on children's toy preferences during this age will now be explored.

Preschool children are embedded in learning environments with a large number of activity choices. In most preschool classrooms children have opportunities to play with blocks, art equipment, dramatic play objects (e.g., kitchen materials, dress up), toys, games, books, writing materials, math and science materials, sensory materials, computers, musical instruments and more (Bredekamp & Copple, 1997; Dodge, Colker, & Heroman, 2002). Different play activities in the preschool environment have been thought to afford different learning opportunities and foster different developmental skills. For example, playing with blocks provides opportunities for children to learn about sizes, shapes, numbers, order, area, length, patterns and weight. Similarly, through art activities children experiment with colors, size, texture, cause and effect, and trial and error. At any given moment, children must make choices about which activities to engage in, and their activity choices may lead them down paths that channel their skill development by providing greater opportunities to practice some skills and fewer opportunities to practice other skills (Hanley, Cammilleri, Tiger, & Ingvarrson, 2007).

To target specific skills through play, preschool teachers often organize classrooms in thoughtful ways. It is common for preschool teachers to create small spaces within the larger classroom that target different learning experiences and skills based on a specified curriculum. For instance, a majority of Head Start

preschool programs in the state of Arizona, as well across the nation, choose to implement the *Creative Curriculum,* a scientifically-based curriculum. In this preschool curriculum, children's activities are organized by interest area with each area intended to afford different experiences and to promote developmentally appropriate skills through play (Dodge, Colker, & Heroman 2002). Interest areas can be defined as the spaces in a preschool classroom in which activities are organized and available during "free play."

In Creative Curriculum classrooms all play activities are divided into 11 interest areas including blocks, dramatic play, toys and games, art, library, discovery, sand and water, music and movement, cooking, computers, and outdoor activities. Although the majority of research on children's curriculum-based activity preferences focuses on one interest area at a time (e.g., dramatic play), research that examines all activities at once has shown that children tend to engage in some interest areas more than others. For example, a recent descriptive study of one preschool classroom's free play patterns showed that children's curriculum-based activity preferences and engagement were high for activities such as dramatic play, computers, blocks, games, and art but low for activities such as library and discovery (Hanley, Cammilleri, Tiger, & Ingvarsson, 2007).

In addition, individual difference variables have been shown to impact children's preferences for specific activities in early childhood – perhaps the most important of these is children's gender. Researchers have consistently reported that some gender-typed activity preferences begin to emerge between 12 and 24

months (O'Brien & Huston, 1985; Caldera, Huston, & O'Brien, 1989; Ruble & Martin, 1998). Toddler boys typically choose to play with blocks and balls, whereas toddler girls tend to play with dolls and doll clothes (Ruble, Martin, & Berenbaum, 2006). During the preschool developmental period (children aged 3 to 5 years) children's gender-typed activity preferences become even more pronounced. Several studies have demonstrated that activity preferences in preschoolers become more gender-typed and include a larger variety of activities than found in toddlers (Servin, Bohlin, & Berlin, 1999). In particular, preschool boys typically choose to play with balls, bikes, blocks, and transportation toys and preschool girls choose to play with art activities, dolls, kitchen items, and dress-up clothes (Conner & Serbin, 1977; Eisenberg, Tryon, & Cameron, 1984; Levy, 1994; Caldera, Huston, O'Brien, 1999; Green, Bigler, & Di Catherwood, 2004; Powlishta, Serbin, & Moller, 2004; Ruble, Martin, & Berenbaum, 2006).

The Importance of Preschool Play Activities for Early Academic Success

Existing empirical work has demonstrated that children's early academic success throughout elementary and secondary school is related to the play-based learning environments of preschool (Jimerson, Egeland, Sroufe, & Carlson, 2000). A majority of children's time in preschool is spent engaged in free play with toys and activities. Each individual activity and grouping of activities are thought to afford different learning opportunities, however, a comprehensive assessment of the influence of preschool play activities on children's early academic success does not exist. In the current study, two dimensions of

categorizing activities are considered. Activities are categorized into curriculum-based and gender-typed activity categories. On one hand, teachers organize children's play activities according to specific classroom curricula, however, that does not necessarily mean that children make activity choices based on this organization and research is lacking to answer this question. Moreover, if children do not make choices based on this organization, activity play may have less impact on the development of skills than what is likely assumed by teachers. On the other hand, we know that children choose activities on the basis of their sex (e.g., gender-typical activities are preferred) but we know less about how impactful gender-based activity choices are on skill development. Thus it is essential to consider how both types of activity categorization strategies function to explain the relation between activity choices and skill development. The unique relations for each classification system are outlined below.

Curriculum-based activity categories and academic outcomes. In preschool classrooms, specific academic and developmental skills are often targeted by organizing toys and activities that are thought to promote similar academic skills together in interest areas of the classroom. For example, a teacher might put a writing table with the books in a library area to promote literacy skills. Such an organization usually is consistent with the preschool curriculum (e.g., Creative Curriculum). Although empirical evidence is limited, children's specific curriculum-based play activities have been shown to be related to academic skills. Exposure to books and writing materials in the library area has

been shown to promote early literacy skills (Neuman, 1995). Further, according to Piaget and Vygotsky, dramatic play (e.g., pretend play with dress-up props, in kitchens, with figurines) promotes language development in young children and it has been argued that the emergence and development of language promotes literacy for children (Snow, 1999). In terms of mathematics, engagement in discovery activities (e.g., sensory table, math and science activities, computer games) is thought to afford children opportunities to learn about measurement, practice number concepts, and carry out problem solving skills (Dodge, Colker, & Heroman, 2002). Additionally, children's engagement with toys and games (e.g., small manipulatives, blocks, puzzles) affords opportunities for children to learn about math concepts: sizes, shapes, numbers, order, area, length, patterns and weight (Bredekamp & Copple, 1997). Furthermore, engagement in art activities provides children opportunities to experiment with colors, size, texture, patterns, cause and effect, and trial and error (Dodge, Colker, & Heroman, 2002). These are skills thought to be important for the development of math skills.

Although preschool children are embedded in learning environments filled with a large variety of activity choices, the relation between activity play and early academic skills is not well understood. Most studies in this area focus on the relation between one preschool play activity (e.g., books) and conceptually related developmental and academic skills (e.g., literacy). To my knowledge, no study jointly considers the various play activities available in preschool and children's related academic outcomes. Given that each curriculum-based activity

category is thought to afford different opportunities for academic skill development, it is assumed that variety of engagement in activities within any given category and across a set of categories would provide children with maximal opportunities for skill development. It is unknown however if limited amounts of engagement in every activity allows enough time or repetition for skills, thought to be associated with the specific activity, to fully develop. Thus, research is needed to determine if engagement in all types of activities (i.e., art, dramatic play, toys and games, library, discovery, outdoors and large motor) is truly better for children's skill development or if focused engagement in only a few activities is more beneficial.

Gender-typed activity categories and academic outcomes. A second way of conceptualizing children's activity involvement is by children's preferences. As discussed previously, children exhibit gender-typed activity preferences at early ages and these preferences are especially strong in preschool. Thus, preschool toys and activities can also be grouped according to whether girls or boys show preferences for them, that is, along gender-typed dimensions. Children's gender-typed activity preferences have garnered particular attention among gender development researchers because consistent engagement with only preferred or gender-typed activities (e.g., only masculine activities for boys) is hypothesized to limit children's academic skill development and interests (Serbin & Connor, 1979; De Lorimier, 1995; Bredekamp & Copple, 1997; Pellegrini & Smith, 1998). Although few studies have been conducted to examine this issue,

activities that are stereotypically categorized as feminine (e.g., dress-up) and masculine (e.g., transportation toys and) have been shown to be qualitatively different in terms of predicting several areas of children's development.

Engagement with specific gender-typed activities in early childhood has been associated with children's academic skills. Serbin and Connor (1979) found that, for preschool aged children, high levels of play in masculine activities and low levels of play in feminine activities related to the development of spatial abilities, whereas low levels of play in masculine activities and high levels of play in feminine activities related to the development of verbal abilities. Given that spatial abilities may underlie math skills and verbal abilities relate to literacy, this may partially explain the significant gender differences in children's mathematical and literacy skills (Linn & Petersen, 1985; Snow, 1999). However, similar to the lack of research on curriculum –based activities, it is still unclear how variations in play with both masculine and feminine activities in early childhood directly impacts boys' and girls' early academic skills.

It is important that potential links between preschool play activities and early school success be identified. In preschool, a majority of children's time is spent engaged with toys and activities during free play. Although preschool is considered very valuable in preparing children academically for formal schooling; very little research exists on how toys and activities actually contribute to this early academic readiness. Research is needed that considers the relation between curriculum-based and gender-typed activity domains and academic skill

development. Additionally, this research should also consider different dimensions of preschool activity involvement. Specifically, research is needed to determine if engagement in all types of activity domains (i.e., art, dramatic play, library, toys and games, discovery, and outdoors and large motor; feminine, masculine, neutral) is best for children's development, or if extensive engagement in only one activity category (e.g., masculine) is sufficient for skill development.

Dimensions of Adolescent Activity Involvement

Research which focuses on adolescents' extracurricular activities provides an empirical and conceptual framework for studying activity participation which may be applicable to the study of activity involvement for preschoolers. Several adolescent researchers have shown that various dimensions of children's participation in extracurricular activities serve as a protective factor in terms of academic outcomes (Eccles & Barber, 1999; Barber, Eccles, & Stone, 2001; Bartko & Eccles, 2003). This concept could be readily translated to the preschool age period because, just as after school activities in adolescence are voluntary activity choices, free play activities in preschool are also voluntary activity choices. The adolescent literature presented in this section provides a good example of which aspects of activity involvement seem to be important (e.g., activity domains versus individual activities and dimensions of involvement) and suggests methods for exploring activity involvement that could be applied to the study of preschool children's activity involvement.

Adolescent activity domains. Eccles and Barber (1999) were the first developmental researchers to identify activity domains for categorizing adolescents' extracurricular time use and to examine adolescent's differential involvement in these activity domains. Prior to this initial study, research on adolescents' activity involvement was mainly conducted in sociology and leisure studies disciplines (Landers & Landers, 1978; Kleiber, Larson, & Csikszentmihalyi, 1986). Additionally, this prior research examined adolescent's engagement in individual activities (e.g., basketball, soccer, band) rather than exploring differential relations based on engagement in types of activity domains (e.g., sports, performing arts). Eccles and Barber (1999) identified 5 types of constructive leisure activities: prosocial (e.g., volunteer activities), team sports (e.g., school basketball team), school involvement (e.g., student council), performing arts (e.g., drama club), and academic clubs (e.g., science club). Drawing from a sample of 1,259 adolescents, the researchers examined the potential risks and benefits of engaging in different types of extracurricular activities. General findings suggested that engagement in different activity domains predicted different outcomes for both cross-sectional and longitudinal samples. For example, adolescents who participated in prosocial activities had low rates of involvement in risky behavior, whereas athletes (i.e., adolescents who participated on sports teams) had high levels of involvement in one risky behavior, drinking alcohol.

As developmental researchers began to recognize the need for examining the types of activities in which adolescents are involved, additional studies of activity involvement were conducted. A primary goal of these studies was to consider various methods for identifying and categorizing activity involvement. One method of classifying activities involved statistical clustering. In 2003, Bartko and Eccles used cluster analyses to identify 6 unique activity domains from 11 activity indicators, which consisted of both passive leisure as well as constructive leisure activities. One domain identified by these researchers was the *Sports* cluster, which was characterized by high involvement in sports and higher levels of time spent with friends as compared to the other clusters. Five other clusters emerged, including: the *School* cluster (i.e., high rates of involvement in school-based clubs, homework, and reading for pleasure), the *Uninvolved* cluster (i.e., low rates of involvement in all activities), the *Volunteer* cluster (i.e., high reports of involvement in volunteer activities), the *High Involved* cluster (i.e., high rates of involvement in several activities, particularly community based clubs) and the *Work* cluster (i.e., high involvement in paid work and low participation in other activities).

Researchers have also created categories of activity domains by distinguishing between structured and unstructured extracurricular activities (Rose-Kransor, Busseri, Willoughby, & Chalmers, 2006; Bohnert, Richards, Kolmodin, & Lakin, 2008). For example, basketball would fall under the activity domain *Sports* according to most categorizations, however, with the distinction

between structured activities (i.e., activities that are facilitated by an organization that provides general guidelines for its participants) and unstructured activities (i.e., activities without formal guidelines and not facilitated by an organization), a game of basketball on the high school team and a game of neighborhood basketball would be categorized in different activity domains (Bohnert, Richards, Kolmodin, & Lakin, 2008). Whether researchers adopted the activity domain categories created by Eccles and Barber (1999), created different activity domains based on their level of structure, or categorized activities in other ways; adolescent's engagement in activity domains in general is a relatively new area of research that has gained significant attention from adolescent developmental researchers.

As illustrated above, there are a number of ways to categorize types of adolescent activities; however none have been accepted as the gold standard. It seems that most adolescent researchers categorize individual activities (e.g., drama club, soccer, shopping) into some type of activity domain category (e.g., performing arts, sports, uninvolved). It varies across researchers in this field whether these activity domains are created within or across the broader categories of structured/constructive or unstructured/passive. Nonetheless, as will be discussed in the next section, researchers have begun to show that adolescents' engagement in different activity domains (e.g., sports versus performing arts) provide different learning experiences. Additionally, researchers have found

unique implications of adolescent activity engagement by examining activities grouped into domains rather than individual activities.

Adolescent activity involvement and social, psychological, and academic correlates. There is an extensive literature linking adolescents' activity involvement with social, psychological, and academic developmental factors (Eccles & Barber, 1999; Barber, Eccles, & Stone, 2001; Bartko & Eccles, 2003). Additionally, the strength and the direction of associations between engagement in activities and correlates vary depending on the type of activity involvement and the specific correlate. Thus, some activities are associated with positive and adaptive correlates while others are associated with more negative and maladaptive correlates.

Several studies have documented a positive association between adolescents' activity involvement and social and psychological development, including high self-esteem and interpersonal competence. For example, in a longitudinal study of approximately 900 adolescents, Barber, Eccles, and Stone (2001) found that adolescents engaged in prosocial activities (e.g., community service) reported higher levels of self-esteem than adolescents who were not engaged in prosocial activities. Additionally, results from this study showed that adolescents engaged in sports reported lower levels of social isolation than nonathletes. In further support of the positive relations between specific activity domains and social outcomes, a longitudinal study found that adolescent participation in high school clubs and sports positively predicted adolescent

adjustment such as school belonging, psychological resilience, and positive peer relationships two years later (Fredricks & Eccles, 2006).

Considerable empirical support also exists for the link between adolescents' activity involvement and academic outcomes, including school engagement, educational aspirations, and educational attainment. In their foundational study, Eccles and Barber (1999) found that, for adolescents in 10th grade, engagement in prosocial activities, team sports, performing arts, school-involvement activities, and academic clubs positively related to adolescents' school liking in 10th grade, GPA in 12th grade, and full time college attendance at age 21. Moreover, adolescents who were clustered into the *School* and *High Involvement* activity domains in the Bartko and Eccles (2003) study showed the highest mean involvement in homework and school-based clubs and reported higher GPA than did the *Uninvolved* adolescents.

However, it is important to note that engagement in any type of activity is not necessarily related to positive social, psychological, and academic skill development. Associations also exist between activity participation and negative outcomes, including high levels of risky behavior, depression, and behavior problems. For example, as noted earlier, Eccles and Barber (1999) showed that adolescent athletes in 10h grade were more likely to use alcohol in 12th grade than all other adolescents. A later study by these authors supported this finding and suggested that, in addition to athletes, adolescents who actively participated in performing arts were also more likely to engage in alcohol use (Barber, Eccles, &

Stone, 2001). In addition to risky behaviors, Barber, Eccles, and Stone (2001) showed that adolescents who engaged in performing arts worried more, had more suicide attempts, and were more likely to visit a psychologist than their non-performing arts peers. Furthermore, Bartko and Eccles (2003) showed that *Uninvolved* adolescents reported higher depressive symptomatology and were rated as having more externalizing and internalizing behavior problems by their parents than did the *Sports* and *High-Involved* adolescents.

Measurement of adolescent activity involvement. Research that explores the differential effects of adolescent activity domains on developmental outcomes has gained momentum in the past ten years. A recent development in this area of research has been a shift from measuring activity involvement as a dichotomous variable (i.e., involved vs. not involved) to examining a variety of dimensions of activity involvement, including: total number of activities, duration of activity involvement, intensity of activity involvement, and breadth of activity involvement (Eccles & Barber, 1999; Fredricks & Eccles, 2006; Rose-Krasnor, Busseri, Willoughby, & Chalmers, 2006; Busseri, Rose-Krasnor, Willoughby, & Chalmers, 2006; Simpkins, Eccles, & Becnel, 2008). This change may have resulted from researchers recognizing that assessing whether or not adolescents were involved in an activity (e.g., basketball) or activity domain (e.g., sports) using dichotomous variables does not fully capture the nature of their involvement. For example, some adolescents may participate in only one activity (e.g., basketball) during all of their free time, whereas others may use their time to

participate in several activities either within one activity domain (e.g., basketball, soccer, baseball, football) or across several activity domains (e.g., basketball, science club, community service, band). Researchers' efforts to measure the nature of adolescents' involvement in activities has resulted in four definable dimensions of activity involvement: total number of activities, duration of activity involvement, intensity of activity involvement, and breadth of activity involvement. Each dimension will be discussed in length below.

***Total number of activities*.** The total number of activities adolescents engage in can be calculated by summing participation in all activities in all domains. For example, Eccles and Barber (1999) computed total number of activities by summing all of the clubs and activities (in all of the domains) in which adolescents indicated participation. Descriptive statistics for their study indicated that females participated in a greater number of total activities than males, and 31% of the sample did not participate in any activities (Eccles & Barber, 1999). In a more recent study, Fredricks and Eccles (2006) explored the relation between children's activity participation in junior high and early years of high school and their psychological and social well being two years later. Results from this study showed that total number of activities in which adolescents were engaged was positively associated with school belonging, psychological resilience, and involvement with academic peers and was negatively associated with psychological distress and involvement with risky peers.

Intensity of activity involvement. Intensity of activity involvement involves measuring the frequency of involvement in a particular activity domain by asking "how often" adolescents participate in a particular activity domain over a specified time period. For example, Busseri, Rose-Krasnor, Willoughby, and Chalmers (2006) calculated an average intensity of activity involvement score for each activity domain by summing the frequency of involvement (range of 0 "never" to 4 "every day") in each activity based on activities in which respondents indicated at least some degree of involvement. In their study of 7,430 adolescents, these researchers showed that greater intensity of activity involvement was associated with less risky behavior, more positive well-being and stronger academic orientation in cross-sectional analyses; however, intensity did not predict positive well-being and stronger academic orientation when longitudinal data were explored (Busseri et al., 2006). On the contrary, when examined longitudinally, time one intensity scores significantly predicted higher risk behavior involvement and lower interpersonal functioning at time two. The authors provided two possible rationales for these surprising findings. One possible interpretation is that greater intensity of activity involvement over time may have costs in terms of time left to create bonds with friends, family and peers. A second interpretation provided was that youth who are troubled or unhappy with their lives may compensate by throwing themselves into extracurricular activities.

Duration of activity involvement. In longitudinal studies, duration of activity involvement is measured by tracking how long the adolescents report engagement in activities over time. For example, Fredrick and Eccles (2006) computed duration of activity involvement by creating a four-level variable representing adolescents' activity involvement across three waves of data collection, from children in grades 7 to 12: (a) no participation in any activities at any wave; (b) involvement in an activity at one wave; (c) engagement in an activity at two waves; and (d) involvement in an activity at all three waves. Results using this measure revealed that the relation between duration of participation and adolescent outcomes varied by activity domain (Fredrick & Eccles, 2006). Specifically, concurrent positive relations were found between duration of activity involvement in school clubs and positive grades, psychological resilience, and academic peer context and concurrent inverse relations were found with risky peer context. Additionally, positive concurrent relations were found between duration of participation in organized sports and adolescents' school belonging and alcohol use.

Breadth of activity involvement. Breadth of activity involvement can be measured in two ways: breadth across activity domains and breadth within activity domains. Most researchers interested in adolescent activity involvement only analyze across-activity domain breadth; across-activity domain breadth scores represent the variety of adolescents' participation in activities (e.g., basketball, soccer, dance, drama club) across activity domains (e.g., sports,

performing arts). For instance, basketball and soccer would represent one domain (sports) and dance and drama club would represent another (performing arts). To illustrate, Simpkins, Eccles, and Becnel (2008) created an across-activity breadth score by first categorizing all activities (e.g., dance) into 6 activity domains (e.g., performing arts) and then creating 6 dichotomous variables for each activity domain: 0 = *no participation* and 1 = *any participation*. These dichotomous variables were then summed to create one across activity domain breadth score ranging from 1-6. Based on these categorizations, descriptive statistics for gender revealed that girls reported greater breadth of across-activity domain involvement than boys (Simpkins et al., 2008). Simpkins et al. (2008) primarily used breadth of activity involvement as a moderator; however, direct paths were found between activity breadth scores for 8^{th}, 9^{th}, and 11^{th} graders and friendship characteristics one year later. Specifically, higher breadth scores predicted more friends with positive characteristics and fewer friends with negative characteristics.

Research on across-activity domain breadth suggests that across domain, breadth of activity involvement has predictive value above and beyond other dimensions of activity involvement. In a cross-sectional study of both breadth and intensity of adolescent activity involvement, Rose-Krasnor et al. (2006) found that, although participants who reported high levels of activity breadth (i.e., involvement in a large number of activity domains) also reported greater levels of intensity (i.e., frequency of involvement in each activity domain), the breadth of involvement measure had more robust associations with each of the

developmental indicators than the intensity measure. Interestingly, in a second study, these authors examined both cross-sectional and longitudinal effects of intensity and breadth of activity involvement on developmental outcomes such as positive well being and academic orientation. Specifically, Busseri et al. (2006) reported that greater across-activity domain breadth was significantly associated with more positive well being and stronger academic orientation in analyses of both cross-sectional and longitudinal data. Additionally, when breadth was examined jointly with intensity in the longitudinal analyses, only breadth of activity involvement proved to be a significant predictor of later developmental outcomes. In further support of the unique contributions of breadth of activity involvement, Fredricks and Eccles (2006) reported that, for their sample of 508 adolescents ranging from 7^{th} to 12^{th} grade, across-activity domain breadth scores contributed above and beyond duration of engagement in activities and total number of activities to adolescents' positive outcomes. These convergent findings highlight the importance of studying across-activity domain breadth scores in addition to more traditional dimensions of activity involvement (e.g., total number, duration of involvement, and intensity of involvement).

Although none of the above mentioned studies assessed within-activity domain breadth, these scores could conceivably be created and would represent the variety of activity participation (e.g., soccer, softball, tennis) within an activity domain (e.g., sports). One study provides support for examining across and within activity domain breadth separately. Eccles and Barber (1999) assessed across-

activity domain breadth (e.g., participation in several different sports only counted as one type of activity domain) and reported that females participated in a wider range of activities than males. The authors then examined the range of activities within the sports domain because of adolescents' high levels of involvement in sports. Although the authors did not label it as within-activity domain breadth, when they examined participation across only sports activities they were examining within-activity domain breadth for sports. The findings for the analyses revealed that males participated in a wider range of athletic teams than females. Thus, although females had higher across-activity domain breadth scores, males had higher within-activity domain breadth scores for sports. This study highlights the importance of examining both types of breadth scores.

Translating measures of adolescent activity involvement to preschool-aged children. Only one study has translated the dimensions of adolescent activity involvement to a younger sample. Jacobs, Vernon, and Eccles (2005) examined longitudinal data from the Childhood and Beyond (CAB) study on approximately 500 children's participation in activities as rated by parents each year for grades 1 through 6. These researchers explored three dimensions of children's activity involvement during middle childhood: total number of activities, within-activity domain breadth, and across-activity domain breadth. Descriptive statistics showed no difference between boys and girls in their involvement in total number of activities. However, girls had higher across-activity domain breadth scores and boys had higher within-activity domain

breadth scores for team sports. Specifically, girls were more likely to participate in individual sports, hobbies (e.g., crafts), music/drama activities, and organized group activities (e.g., day camps) whereas boys were more likely to participate in a variety of team sports only. These findings suggest that although there is no difference in the number of activities in which girls and boys participate, girls participate in a more diverse array of activities across activity domains and boys participate in a diverse array of activities concentrated within activity domains. These findings mirror related research findings with an adolescent sample (Eccles & Barber, 1999).

Differences in across- and within-activity domain breadth scores are substantively important early in childhood. Results from the Jacobs, Vernon, and Eccles (2005) study revealed that greater concentration of activities within one domain during middle childhood positively predicted activity participation and self-perceived competence in those domains 4 years later (during adolescence), independent of initial values and competence. These findings suggest that high levels of within-activity domain breadth were predictive of their later involvement and self-perceptions in that domain (e.g., sports); however, it is unclear from this study what else might be happening for young children with varying levels of within-activity domain breadth and across-activity domain breadth. Specifically, perhaps higher levels of across-activity domain breadth (e.g., participation in sports, clubs, and performing arts) might be important for young children's other

outcomes such as later social and academic skills as was shown in other studies discussed previously (Busseri et al., 2006; Rose-Krasnor et al., 2006).

Studies examining specific dimensions of elementary school children's activity involvement are relatively sparse, however, no studies exist which examine preschoolers' activities using the methods described above. Substantively as well as methodologically, the research on activity involvement has historically been different for older children than for preschool aged children. Specifically, research studies on children's activity involvement during middle and later childhood have been focused on recreational activity participation (e.g., video games, shopping, sports, community service) and using a variety fine grained methods for examining activity involvement (e.g., activity domains versus individual activities and dimensions of involvement). Research on early childhood activity participation, however, has focused on children's engagement with specific toys and activities (e.g., balls, trucks, dolls, dramatic play) categorized into different domains (i.e., curriculum-based, gender-typed) and includes methods that examined children's activity involvement using either single assessments of general activity preference or mean levels of observed play aggregated over time (Carpenter & Huston-Stein, 1980; Golombok & Rust, 1993; Martin & Fabes, 2001).Unfortunately, this discrepancy in studying activity participation across developmental periods has prevented researchers from utilizing comparative methods for measuring activity participation across these age groups.

Chapter 3

CURRENT STUDY

In an effort to gain a more precise picture of the relation between children's engagement in preschool play activities and their early academic success, the goals for this study were threefold. The first goal was to determine if the total number of activities in which children tend to participate (regardless of activity domain) early in the preschool year is associated with children's literacy and mathematics scores at the end of the preschool year. The second goal was to explore the relative utility of curriculum-based and gender-based activity categories using children's intensity of involvement in each as predictors of children's academic abilities. The third goal was to explore the breadth of activity involvement across and within these domains as predictors of children's academic abilities. To address the second and third goals of this study, a number of hypotheses were developed for both curriculum-based and gender-based activity domains. Each set of hypotheses explores the degree to which children's intensity of activity involvement and breadth of activity involvement (across- and within-activity domain) early in the academic year predict their mathematics and literacy skills at the end of the academic year. It should be noted here that, drawing on the experiential learning theory, all hypotheses were made with the assumption that increased engagement in a given activity during preschool provides more time to practice the skills assumed to be acquired through engagement with that specific activity.

Total Number of Activities

Research on adolescents' activity participation has revealed that the total number of activities in which adolescents were engaged was positively associated with academic outcomes two years later (Fredricks & Eccles, 2006). Fredricks and Eccles suggested that each additional activity provided a unique opportunity for children to interact with peers and teachers and to practice skills. This explanation implies that there is a cumulative positive effect for participation in activities for adolescents. It is not clear if this relationship exists for preschoolers or if the relationship is in the same direction because no studies have examined the effects of total number of activities on academic outcomes for preschool children. Accordingly, to address the first goal, the total number of preschool play activities in which children participate in rates above what would be expected by chance in the fall was hypothesized to be positively related to both mathematics and literacy outcomes in the spring.

Intensity of Activity Involvement

Correlational research on adolescents has shown that greater intensity of activity involvement in various domains was associated with stronger academic orientation (Busseri, Rose-Krasnor, Willoughby, and Chalmers, 2006). Given these findings, it is of interest here to explore how intensity of activity involvement in various preschool activity domains during the fall semester relates to children's academic outcomes (literacy, mathematics) in the spring semester. As mentioned previously, research that examines the direct link between specific

curriculum-based or gender-based activities and academic outcomes is less than robust. Due to this lack of robust empirical research from which to draw hypotheses, theory and *Creative Curriculum* teaching materials were utilized to support some hypotheses regarding the relation between intensity of involvement in different preschool activities and specific outcomes. These hypotheses are as follows.

Curriculum-based activity domain. A number of hypotheses were made regarding the direct relations between intensity of involvement in curriculum-based activities and in the fall and children's academic outcomes in the spring, see Figure 2 for a model of the hypothesized relations. Exposure to books and writing materials in the library area has been shown to promote early literacy skills (Neuman, 1995). Accordingly, it was hypothesized that there would be a positive relation between children's intensity of involvement in *library* in the fall and children's literacy skills in the spring. Additionally, engagement in discovery activities such as the sensory table, math and science activities, and computer games provides children opportunities to learn about measurement, practice number concepts, and carry out problem solving skills (Dodge, Colker, & Heroman, 2002). With this in mind, it was also hypothesized that there would be a positive relation between children's intensity of involvement in *discovery* in the fall and children's mathematics scores in the spring.

According to Piaget and Vygotsky, symbolic or dramatic play promotes language development in young children. It has been argued that the emergence

and development of language promotes literacy for children (Snow, 1999). Thus, it was hypothesized that there would be a positive relation between children's intensity of involvement in *dramatic play* in the fall and their literacy skills in the spring. Playing with toys and games including blocks, manipulatives, and puzzles provides opportunities for children to learn about sizes, shapes, numbers, order, area, length, patterns and weight (Dodge, Colker, & Heroman, 2002). Additionally, children's engagement with toys and games has been shown to support development of visual-spatial skills (Serbin & Connor, 1979). Thus, it was hypothesized that intensity of involvement in *toys and games* in the fall would positively predict mathematics scores in the spring. Engagement in art activities provides children opportunities to experiment with colors, size, texture, patterns, cause and effect, and trial and error (Dodge, Colker, & Heroman, 2002). These are skills thought to be important for the development of math skills. Accordingly, it was hypothesized that intensity of involvement in *art* in the fall would also positively predict mathematics scores in the spring.

Finally, it was hypothesized that there would be a negative relation between intensity of involvement in *outdoors and large motor* activities in the fall and children's scores in both literacy and mathematics in the spring. Although activities in this domain (e.g., balls, bikes, digging) are important for some aspects of development (e.g., large motor), time spent in these activities likely results in less time spent in activities that may be more directly predictive of academic abilities.

Gender-based activity domain. An extensive literature exists which suggests that boys and girls tend to spend the majority of their time engaged in different, gender-based, activities. Serbin and Connor's (1979) study of the relation between children's gender-typed activity preferences and their cognitive performance on spatial and verbal tasks are especially important for the hypotheses in the current study. As described earlier, boys tend to play with masculine activities such as transportation toys, bikes, balls, and blocks, which have typically been associated with spatial and math abilities (Serbin & Connor, 1979). Girls tend to play with feminine activities such as reading, writing, art, and pretend play, which have been shown to promote language and literacy skills (Serbin & Connor, 1979). Additionally, Serbin and Conner (1979) showed that children who engage in high levels of one type of activity (e.g. feminine) tend to engage in low levels of play in the other activities (e.g., masculine and neutral).

Given these findings, the hypotheses for the relation between intensity of gender-based activity involvement in the fall and academic abilities in the spring are straightforward. See Figure 3 for a model of the hypothesized relations for intensity of activity involvement in gender-based activity domains in the fall and academic outcomes in the spring. It was hypothesized that intensity of involvement in *masculine* activities would positively predict children's mathematic abilities and negatively predict children's literacy abilities. The opposite was hypothesized for feminine activities; specifically, intensity of involvement in *feminine* activities was expected to positively predict children's

literacy skills and negatively predict children's mathematic skills. It should be noted, given the nature of the data to be used, high levels of engagement in one activity domain (e.g., masculine activities) indicates lower levels of engagement in other domains (e.g., feminine and neutral activities), thus, potentially resulting in lost opportunities for specific skill development associated with low engagement activities. Thus, it was not hypothesized that engagement in masculine activities would disturb children's literacy abilities but rather that high levels of engagement in masculine activities likely results in low levels of engagement in feminine activities resulting in less time to practice skills hypothesized to be associated with engagement in feminine activities. The same rationale was used for making the hypothesis for the negative relation between engagement in feminine activities and math outcomes. Intensity of involvement in neutral activities during the fall was not hypothesized to predict academic outcomes in the spring.

Across-Activity Domain Breadth

The following set of hypotheses was made for across-activity domain breadth for both curriculum-based and gender-based activity domains. Several studies on adolescent activity involvement have supported the importance of measuring across-activity domain breadth above and beyond more traditional dimensions of activity involvement. Adolescents' across-activity domain breadth scores predicted above and beyond their total number of activities, duration of activity involvement, and intensity of activity involvement for adolescent positive

outcomes in both cross-sectional and longitudinal analyses (Fredricks & Eccles, 2006). Researchers of adolescent activity participation who have begun to explore across-activity domain breadth have suggested that across-activity domain breadth, above and beyond total number of activities, provides children with more opportunities to learn new skills and interact with different peers. Given the adolescent research that suggests that greater diversity in experiences translates to better outcomes, across-activity domain breadth for both gender-based activities and curriculum-based activities was expected to be positively related to both literacy and mathematic abilities. Additionally, across-activity domain breath was hypothesized to predict both literacy and mathematics abilities above and beyond the influence of total number of activities and intensity of activity involvement.

Within-Activity Domain Breadth

Research on the topic of within-activity domain breadth in adolescents has been limited. Only two studies have examined within-activity domain breadth and neither study identified their analyses as examining within-activity domain breadth even though they explicitly examined across-activity domain breadth. Within-activity domain breadth seems to differ by sex for adolescents, however it is unknown how varying levels of within-activity domain breadth relate to academic outcomes for these youth. Given this lack of prior research on which to base hypotheses, for the current study, separate exploratory models for curriculum-based and gender-based activity domains were conducted in which all

possible paths predicted between scores for within-activity domain breadth in the fall and academic scores for math and literacy in the spring.

Chapter 4

METHODOLOGY

The current study takes advantage of my work on a large NICHD funded five-year longitudinal study (Co-PIs Carol Martin, Richard Fabes, and Laura Hanish). This project utilizes a unique observational method (Martin & Fabes, 2001) that provides extensive data on children's engagement in preschool play activities. These data, which are collected daily over the course of the children's fall semester, along with teacher reports and child assessments of children's academic achievement at the end of preschool, will serve as the primary sources of data for examining the hypotheses suggested above.

Participants

Participants were preschool children enrolled in 18 classrooms in an urban southwestern city. Classrooms were selected in collaboration with Phoenix and Maricopa County Head Start Programs, and families were recruited 2-3 weeks into the start of the academic school year at pre-arranged parent meetings. Recruitment took place at these parent meetings and in-person at pick-up and drop-off times. Consent rates were 99% at recruitment (N= 308 out of a possible 311). Children who were chronically absent or who left in the fall semester were dropped from the analyses (n = 29). This was determined by their availability for classroom observations (discussed in more detail in the procedures and measures section). Additionally, data were collected in three waves over three years. Children who repeated preschool during years 2 and 3 of data collection (n = 16)

had data collected twice; only data from the second year was used in analyses to prevent dependencies.

The final sample consisted of $N = 279$ preschoolers (M age = 52 months at beginning of the fall term; range: 37 – 60 months). Almost half of the participants were girls (47%), the ratio of girls to boys per classroom ranged from 31-62% girls, and 11 of 13 (85%) teachers were female. The sample was relatively homogenous in ethnicity and socioeconomic status. The majority of participants (70%) were Mexican or Mexican-American; 59% of the participants primarily spoke Spanish. Relatively few of the participants were Anglo-American (8%), African-American (7%), or Native-American (1%). Race/ethnicity was other or unknown for the remaining 14% of the sample. Participants were predominately of low socioeconomic status (82% below $30,000). Over half of the children (59%) came from two-parent families, and the rest of the children (41%) were from various types of single parent homes.

Procedures and Measures

Measurement of activity involvement. As part of a larger investigation, data were collected using a scan observation protocol (Martin & Fabes, 2001) in which children were observed indoors and outdoors during free-play (e.g., children freely decide what to do, with whom, and where to do it), semi-structured (e.g., a limited choice between activities), structured small group (e.g., no choice of activity, children are broken out in small groups by teacher), and structured large group (e.g., no choice of activity, all kids are engaged with teacher) class

activities several times per week, in 10-second scans, multiple times a day, two to three times a week over the fall and spring semesters. Only those observations that occurred during free-play and semi-structured class activities were included in the analyses to assure that activity participation was the choice of the child. For the 279 children participating in the present study, a total of approximately 18,000 10-sec observations were collected during free play and semi-structured activities over the fall semester in 3 years of data collection (M = 91.6 observations per child, SD = 31.11; range = 20-197). The large range in observations recorded for each child was due to differences in attendance and availability of the children. As mentioned previously, children with fewer than 20 observations were dropped from analyses to control for chronic absenteeism or because they left the school (n = 29).

During each scan observation, trained classroom observers (8-10 per year) followed a randomized list of children (the list was reordered mid-semester to prevent biases). Observers would begin at the top of the list each day, complete the entire list and then begin at the top again. Additionally, prior to recording data, observers noted whether the child was present and available for coding, present but unavailable for coding, or absent. For example, coders would record a child as present but unavailable for coding when children were using the restroom, napping, or were otherwise occupied (e.g., out of the room). If present and available for coding, the observer would then record the following codes: child's identification number, the behavior the child was engaged in (e.g.,

onlooking), the primary activity the child was playing (e.g., blocks), the complexity of object play (e.g., constructive), the language the child was using (e.g., English), the number of peer partners and sex of peer partners (e.g., single boy playmate), whether or not a teacher was present, the child's activity level (e.g. moderate activity), and the degree of each positive and negative emotion and anger (e.g., minimal). Only the data for children's primary activity were used for this study. Coders recorded children's primary activity using a checklist of 30 available activities (e.g., balls, bikes, blocks). Four of the 30 activities were dropped from analyses because they are not considered play activities (snack, talk, other) or because children were never observed playing in the activity (television); this resulted in a total of 26 activities. To determine reliability, two observers independently coded the same child's behavior. During reliabilities, coders rotated through the class list to ensure that reliabilities were conducted for each child. Based on 6,481 simultaneous observations (15% of all observations across the whole school year), kappas ranged from .7 to 1.0 for activity codes.

Categorization of activities along curriculum-based and gender-based dimensions. The 26 observed activities were subsequently categorized using two different classification schemes. The first was based on curriculum-based activity categories and the second on gender-typing of activities.

Classification of curriculum-based activity domains. Using the *Creative Curriculum* interest areas (blocks, dramatic play, toys and games, art, library, discovery, sand and water, music, computers, and outdoors) as a basis for

organization, the 26 observed activities were separately categorized into curriculum-based domains (Dodge, Colker, & Heroman 2002). Interest areas were grouped to create curriculum-based domains based on each area's targeted skills, resulting in 5 curriculum-based domains Specifically, the interest areas of art and music were combined to create an *art* domain, interest areas of dramatic play and library were left alone to create the *dramatic play and library* domains, interest area of blocks was added to the interest area toys and games to create a *toys and games* domain, interest areas of discovery and sand and water were combined to create the *discovery* domain and finally outdoors was left alone to create the *outdoors and large motor* domain. Activities were combined to reduce the number of categories created and to ensure that the 26 observed activities were categorized in groups and no single coded activity (e.g., blocks) was considered an activity domain of its own. Of the 26 observed activities, three activities were categorized as art (crayons, clay, music), six activities were categorized as dramatic play (phone, dress-up, kitchen, pretend feminine, pretend masculine, pretend neutral), two activities were categorized as library (books, writing), eight activities were categorized as toys and games (board games, blocks, toy vehicles, toy animals, puzzles, figure play feminine, figure play masculine, figure play neutral), three activities were categorizes as discovery (math/science, computer, sensory), and four activities were categorized as outdoors and large motor (bikes, balls, digging, and large motor).

Classification of gender-based activity domains. To classify activities along gender-based domains (i.e., feminine, masculine, and neutral), sex differences were examined by conducting independent-samples *t*-tests for each of the 26 individual activities, as was done in Goble, Martin, Hanish, and Fabes (2010). The activities in which girls and boys significantly differed were categorized as feminine or masculine, depending on whether girls or boys were more likely to engage in the activity. All activities that did not differ significantly by gender were categorized as neutral (see Table 1). This method has greater stability than the alternative method of grouping play activities based on cultural norms of sex-typed activities (Connor & Serbin, 1977). Although the categories derived from the t-test are very similar to theoretical gender-typed activities, an advantage of this method is that play categories are derived directly from the sample. As a result, ten activities were categorized as feminine (crayons, books, dress-up, writing, puzzles, kitchen, pretend feminine, pretend neutral, figure play feminine, phone), *t*s(159.58-239.91) ranged from -8.07 to -2.02, *p*s < .05, and nine activities were categorized as masculine (balls, bikes, blocks, computer, toy animals, toy vehicles, pretend masculine, figure play masculine, figure play neutral), *t*s(169.01-276.98) ranged from 2.34 to 7.66, *p*s < .05. The remaining seven activities were categorized as neutral (clay, board games, digging, music, large motor, math/science activities, sensory), *t*s(237.47-276.55) ranged from -1.56 to 1.14, all *ns.* Note: the assumption of homogeneity of variance was not met for this set of t-tests and thus modified degrees of freedom are reported.

Calculation of activity scores. Four types of scores were created for each of the categorization schemes (curriculum-based activities and gender-based activities) to test the hypotheses of this study, and the methods for calculating these are described below. These are total number of activities, intensity of activity involvement, across-domain breadth, and within-domain breadth. As a first step, however, preferred activity scores were created to identify the individual activities in which children were observed engaging more often than would be expected by chance. Preferred activity scores were only used as a basis for creating the following scores: total number of activities and across- and within-activity domain breadth. Preferred activity scores were never used alone in analyses.

Preferred activity scores. Observational data show that children within a preschool classroom typically interact with every activity throughout the course of the fall semester. For this reason, it is important to only count the activities in which children are observed interacting more often than expected by chance. Thus, I conceptualized preferred activities as one child's behaviorally exhibited preference for an activity relative to the total amount of interactions in which the child was observed in any activity in the classroom, calculated as follows:

$$aij = 1 \leftrightarrow \frac{oij}{oi} > \frac{1}{N-1}$$

Preferred activities (*aij*) were coded as 1.0 if the number of times child *i* was observed with activity *j* (*oij*), divided by the number of times child *i* was observed with any activity (*oi*), exceeded the proportion expected by chance (1/

N-1, where *N* equals the number of activities in the classroom). Thus, a dichotomized variable indicating preferred/not preferred activities was created: to be coded as a preferred activity a child had to be observed interacting with that particular activity beyond what would be expected by chance from simply being exposed to all of the activities in the classroom. This variable was then used as a basis for calculating total number of activities, and across- and within-activity domain breadth scores.

***Total number of activities*.** A total number of activities score was created by summing preferred activity scores (0 or 1.0) across all 26 activities. This score represents the total number of activities that children engaged in (above and beyond what would be expected by chance) across all domains. The range of the total number of activities score was 1-26.

Intensity of activity involvement. Intensity of activity involvement scores are simply proportion scores for frequency of involvement in an activity domain (e.g., feminine) divided by total observations across all activities plus unoccupied play. Unoccupied play is the only context during which an activity was not recorded. Interactions during unoccupied play were included in the denominator to ensure that the sum of the activity domains did not equal 1. Proportion scores were used in order to standardize the intensity of involvement scores to account for low number of observations due to absences. Specifically, proportion scores for each activity domain (feminine, masculine, neutral, art, dramatic play, library, toys and games, discovery, outdoors and large motor) were created for each child

by totaling the number of interactions for each play activity (e.g., crayons + kitchen + puzzles, etc.) in each domain (e.g., feminine) and dividing by the total number of observations for each child (i.e., feminine + masculine + neutral + unoccupied play). Take the curriculum-based activity art for example, to create each child's intensity of involvement scores for art, the child's total number of interactions in crayons, clay, and music were summed and divided by the child's total number of observations during free play and semi-structured time across the whole semester.

***Across-activity domain breadth*.** For the current study, separate across-activity category breadth scores were created for the gender-based activities and the curriculum-based activities. Across activity breadth scores were created in two steps. First, each activity domain was recoded into a dichotomous variable representing preferred activity scores (as described previously): 0 = *no participation* and 1.0 = *any participation*. If any number of the activities within an activity domain were preferred activities, then the activity domain would be coded 1.0. For example, art would be coded 1.0 for a child if any of the activities crayons, music, or clay were preferred activities. Second, to create the across activity breadth scores, these dichotomous variables were summed. For the curriculum-based across activity breadth score the dichotomous art, dramatic play, library, toys and games, discovery, and outdoors and large motor variables were summed and for the gender-based across activity breadth score the dichotomous feminine, masculine, and neutral variables were summed. Thus, the

range of across activity breadth scores for curriculum-based activities was 1-5 and the range of across activity breadth scores for the gender-based activities was 1-3.

***Within-activity domain breadth*.** For the purposes of this study, within activity breadth scores for each activity domain (feminine, masculine, neutral, art, dramatic play, library, toys and games, discovery, large motor) were created by totaling the number of preferred activities (e.g., crayons + kitchen + puzzles, etc.) in each domain (e.g., feminine) and dividing by the total number of activities within that domain. For example, to calculate the within-activity breadth score for the curriculum domain art, children's preferred activity scores (0 or 1.0) for each activity within art (crayons, clay, music) were summed and then divided by the total number of activities in art (3).

Measurement of early academic success. ***Academic achievement*.** A selection of subscales from the WJ-III Tests of Achievement (Mather, Wendling, & Woodcock, 2001; Spanish equivalent, *Batería-III*, Muñoz-Sandoval, Woodcock, McGrew, & Mather, 2005) was used to assess children's academic achievement in the spring semester of preschool (children were tested in their preferred language; English or Spanish). Subscales include Letter-Word Identification (e.g., naming letters and reading words aloud from a list), Passage Comprehension (e.g., orally supplying the missing word removed from a sentence or very brief paragraph), and Applied Problems (e.g., mathematic word problems). These scales were selected because they were the most appropriate for the age of the children tested. For all other scales in the WJ-III, a floor could not

be established with the preschool children. The WJ-III subscales provided two types of scores, the Standard Score (*SS*) and the W Score (*W*). *W* scores were chosen two reasons. Primarily because patterns of correlations between *W* scores and other related measures revealed more external validity than did *SS* scores. Additionally, the subscales of the WJ-III used in this study were administered in English and Spanish, because *W* scores (converted raw scores) are a special transformation of the Rasch ability scale they are compatible across both versions of the test. The Rasch model for transformation make the *W* scores well suited for interpretation of test performance on an equal-interval measurement scale.

***Developmental profile*.** Children's early academic success was also rated by teachers in the spring semesters of children's preschool years. Children's preschool teachers completed a measure of their academic competence that tapped two dimensions: Logic and Numbers ("this child shows interest in an understanding of the properties of change," 10 item scale, alphas ranged from .85-.95 across each of the three cohorts) and Reading and Writing ("this child recognizes most upper and lower case letters and knows most of their sounds," 9 item scale, alphas ranged from .89-.95 across the three cohorts; Fabes, Martin, Hanish, Anders, & Madden-Derdrich, 2003). Response choices were *not yet* (1), *early stage* (2), *intermediate stage* (3), and *proficient* (4). Scores from each subscale were averaged to create a composite score for each child on each competence measure.

Peabody Picture Vocabulary Test (PPVT). Children's initial verbal ability was assessed with the revised Peabody Picture Vocabulary Test (PPVT-R) and its Spanish equivalent (TVIP; Dunn & Dunn, 1981). These tests measure vocabulary knowledge in children and give an indication of mental age. While based on the PPVT-R, the TVIP was developed using the most appropriate items for the Spanish population. Although some items are different between versions, most questions are identical, and the total numbers of questions are the same across measures. For the purpose of this study, raw scores of the PPVT-R and TVIP will be used. Standardized scores for PPVT-R and TVIP were normed on separate populations in different languages and thus are not comparable. An independent sample *t*-test was conducted to examine differences on the raw PPVT scores between the two versions of the test.

Chapter 5

RESULTS

The relations between dimensions (i.e., total number of activities, intensity of involvement, within and across activity domain breadth) of preschooler's activity involvement during the fall semester and children's academic readiness in the spring was investigated using curriculum-based (art, dramatic play, toys and games, library, discovery, outdoors and large motor) and gender-based (feminine, masculine, neutral) activity domains. Although associations between individual activities (e.g., balls, books) have been studied in relation to academic outcomes, the current study attempted to uncover plausible joint influences of these individual activities by separately exploring two categorization systems. Additionally, the current study is the first to explore various dimensions of involvement in these domains for preschool children.

Preliminary Statistics

Preliminary analyses were conducted to examine the descriptive statistics, skew and kurtosis of all activity variables (total number of activities, curriculum-based and gender-based intensity scores, across activity domain breadth scores, curriculum-based and gender-based within activity domain breadth variables). Then, independent-samples t-tests were conducted to examine sex differences on the study variables. Next, Pearson product moment correlations were conducted to examine the relations between children's age, initial verbal abilities and family income and the study variables.

Descriptive statistics. For all created activity variables, skew was less than three and kurtosis was less than eight, indicating all variables were normally distributed and were included in analyses (Tabachnick & Fidel, 2006). Means and standard deviations for predictor and outcome variables are shown in Table 3. A few of these deserve specific mention. Overall, children in this sample played with approximately 7 total activities above and beyond what would be expected by chance. Moreover, these activities were distributed across both the curriculum and gender categories. That is, both the curriculum-based and gender-based across-activity-domain breadth scores were high on average suggesting that the children tend to engage in a number of activities across these domains at greater than chance rates. Scale scores for teacher-rated literacy and math suggest that, on average, children were performing at the early to intermediate stage on these skills at the end of preschool.

Sex effects. Independent-samples *t*-tests examining sex differences revealed that girls and boys did not significantly differ on the total number of activities in which they engaged. However, girls and boys significantly differed on all intensity variables, *t*s(247.25 – 276) ranged from -18.22 to 17.21, *p*s < .05 (see Table 3). For the gender-based intensity variables, girls were observed engaging in more feminine and neutral activities than boys, and boys were observed engaging in more masculine activities than girls. For the curriculum-based intensity variables, girls were observed engaging in more art, library, and dramatic play activities than were boys, whereas boys were observed engaging in

more toys and games, and discovery activities than were girls. Intensity of engagement in outdoor and large motor activities did not significantly differ by child sex.

Significant sex differences were also found for within-activity-domain breadth of gender-based variables, *t*s(239.41 – 274.62) ranged from -2.76 to 13.41, *p*s < .01. Consistent with the intensity variables, for the variables involving assessments of breadth within gender-based activities, girls showed greater within-activity breadth for feminine and neutral activities than boys did, and boys showed greater within-activity breadth for masculine activities than did girls. There were also sex differences for the variables involving assessments of breadth within curriculum-based activities. Findings showed greater within-activity breadth for dramatic play, library, and art favoring girls, and for discovery and toys and games favoring boys, $t(206.92) = -4.68$ and $t(251.63) = 4.39$, *ps* < .001, respectively. There were no significant sex differences for breadth of activity choices within the curriculum-based activity domains of outdoors and large motor.

Girls and boys did not significantly differ in breadth of activity choices across gender-based domains, however, there was a significant sex difference favoring girls in breadth of activity choices across the curriculum-based domains, $t(276.89) = -3.16$, $p < .01$. Finally, there was a significant sex difference on all academic outcome variables favoring girls, *t*s(238.27 – 254.96) ranged from -4.84 to -2.14, *p*s < .05. Given that sex differences were found on a number of the

study variables, sex was controlled in all analyses testing the main study hypotheses.

Relations with control variables. Pearson product moment correlations were conducted to examine if children's age, receptive language abilities (PPVT-R, Dunn & Dunn, 1981), and family income were related to the study predictors and outcomes and if they should be considered as control variables. For this study, family income was used as an indicator of child's socioeconomic status (SES), thus these terms, family income and SES, will be used interchangeably. Results of the correlations are presented in Table 4.

Children's age was related to several predictors as well as outcome measures. Specifically, results from the correlations indicate that children's age was negatively related to scores for intensity and within-activity breadth for both feminine and library activities and across-activity breadth for the curriculum categories. Additionally, age was positively correlated with the within-activity breadth for masculine activities as well as the outcome measures reading and writing, logic and numbers, and applied problem solving. Children's scores for receptive language abilities (PPVT) were significantly correlated with all outcome measures. Furthermore, children's SES was significantly correlated with all outcome measures with the exceptions of letter word identification. Given that age, PPVT, and SES were each related to a number of outcome measures, all three variables were used as controls in the analyses testing the main study hypotheses.

Relations between predictor variables. Pearson product moment correlations were conducted within the curriculum-based and gender-based activity categories between intensity variables and between within-activity-breadth variables, as these predictors were entered together in the main study analyses. As can be seen in Table 5, several of the curriculum-based intensity variables were significantly correlated with each other, although the magnitude of correlations was modest. Specifically, intensity of involvement in outdoors and large motor activities was negatively related to intensity of involvement in art, dramatic play, toys and games, and library activities. Intensity of involvement in art was also negatively related to intensity of involvement in toys and games and discovery activities. Lastly, intensity of involvement in dramatic play was negatively related to involvement in toys and games. A number of the curriculum-based within-activity-breadth variables were also related to one another, again at modest levels. Mainly, breadth of activity involvement within outdoors and large motor was negatively to breadth of involvement within both are and dramatic play domains. There was a positive correlation between breadth of involvement within dramatic play activities and library activities. In terms of correlations between gender-based predictor variables, as can be seen in Table 6, feminine and masculine intensity variables and within-activity-breadth variables were significantly negatively related.

Hypotheses Testing

In order to test the hypotheses of the current study, hierarchical multiple regressions were conducted using the activity involvement variables to predict children's academic outcomes. Separate regressions were conducted for each hypothesis and for each outcome measure assessing literacy (i.e., reading and writing, letter word identification, and passage comprehension) and mathematic abilities (i.e., logic and numbers and applied problem solving). In all analyses, the control variables for children's sex, age, receptive language abilities (PPVT), and family income (SES) were included in the first step and the predictor or set of predictors were included in the second step. In the first step of all analyses for literacy, the teacher rated score for literacy (reading and writing) was positively predicted by child sex, age, and SES and child assessments for literacy (letter word identification and passage comprehension) were positively predicted by child sex (passage comprehension only) and receptive language abilities (PPVT). In all analyses for mathematics, the teacher rated score for math (logic and numbers) was positively predicted by all 4 control variables (sex, age, PPVT, SES) and child assessment for math (applied problem solving) was positively predicted by child sex and scores on the PPVT, in the first step. Given that the same control variables are used for all analyses, only results from the second step will be reported in the following sections.

Because there were a number of significant correlations between predictor variables, tolerance statistics were examined in order to determine if

multicollinearity imposed a threat for the interpretation of these analyses. Tolerance statistics are a commonly used indicator to measure the degree of multicollinearity (Cohen, Cohen, West, & Aiken, 2003). Tolerance values of less than .10 provide evidence for serious multicollinearity. The tolerance values of the regression analyses in this study ranged between 0.61 and 0.98. These results suggest that multicollinearity did not present a significant problem for the analyses. Note: All significance tests are one-tailed unless otherwise specified.

Total Number of Activities

It was hypothesized that the total number of preschool play activities in which children participate in rates above what would be expected by chance in the fall would be positively related to both literacy and mathematic outcomes in the spring. Total number of activities was only predictive of letter word identification at the trend level. Unfortunately, total number of activities was not predictive of the other measures of literacy, nor was it predictive of either measure of mathematics in the spring. The results of these regressions are presented in Table 7.

Intensity of Activity Involvement

Curriculum-based activity domain. A number of hypotheses were made regarding the direct relations between intensity of involvement in curriculum-based activities in the fall and children's academic outcomes in the spring. It was hypothesized that there would be a positive relation between children's intensity of involvement in library and dramatic play, and a negative relation between

intensity of involvement in outdoors and large motor activities in the fall, and children's literacy skills in the spring. To test these hypotheses, the intensity variables for library, dramatic play, and outdoors and large motor were entered in the second step of a regression analysis. As can be seen in Table 8, results for literacy outcomes revealed that intensity of involvement in library activities was a positive predictor of letter word identification at a trend level, as expected. Intensity of involvement in dramatic play and outdoor and large motor activities in the fall was not a significant predictor of literacy abilities in the spring.

For predicting mathematics outcomes, it was hypothesized that there would be a positive relation between children's intensity of involvement in discovery, art, and toys and games and a negative relation between intensity of involvement in outdoors and large motor activities in the fall and children's mathematics scores in the spring. To test these hypotheses, the intensity variables for discovery, art, toys and games, and outdoors and large motor were entered in the second step of a regression. Results for mathematics outcomes in the second step showed that involvement in outdoors and large motor was a negative predictor of applied problem solving as expected (trend level; see Table 6). Contrary to expectations, involvement in discovery and toys and games were also negative predictors of applied problem solving at the trend level. Intensity of involvement in art activities in the fall was not a significant predictor of applied problem solving and none of the activities predicted logic and numbers in the spring.

Gender-based activity domain. The hypotheses for the relation between intensity of gender-based activity involvement in the fall and academic abilities in the spring are straightforward. It was hypothesized that intensity of involvement in *feminine* activities would positively predict children's literacy skills and intensity of involvement in *masculine* activities would negatively predict children's literacy skills. To test these hypotheses, the intensity variables for feminine and masculine activities were entered on the second step. As can be seen in Table 9, the hypothesized relations for literacy were partially supported. Interestingly, intensity of involvement in feminine activities was a significantly positive predictor of one child assessed measure of literacy (letter word identification), but a significantly negative predictor of the other (passage comprehension). Furthermore, intensity of involvement in feminine activities was not predictive of the teacher rated measure of literacy (reading and writing). Intensity of involvement in masculine activities in the fall was not significantly predictive of literacy in the spring.

The opposite relations were hypothesized for mathematic abilities; specifically, intensity of involvement in *masculine* activities was expected to positively predict children's mathematic abilities and intensity of involvement in *feminine* activities was expected to negatively predict children's mathematic abilities. To test these hypotheses, the same variables were entered as in the gender-based analyses for literacy described above. Unfortunately, the hypotheses for math outcomes were not supported (see Table 9). In fact, intensity of

involvement in feminine activities and masculine activities in the fall were not significant predictors of math abilities in the spring.

Across-Activity Domain Breadth

Engaging in many types of activities – both across gender-based activities and curriculum-based activities -- was expected to be positively related to both literacy and mathematic abilities. Separate hierarchical regression analyses were conducted in which each of the types of breadth scores (i.e., the across-curriculum and across-gender activity breadth) were entered on the second step. Neither variability in breadth across curriculum-based activities nor variability in breadth across gender-based activities were significant predictors of literacy and mathematics in the spring (see Table 10). These patterns held for both teacher rated assessments of children's skills and direct assessments of children's skills.

I also expected to find that across-activity domain breadth for both curriculum-based and gender-based activities would predict both literacy and mathematics abilities above and beyond the influence of total number of activities and intensity of activity involvement. Given that the relations between breadth scores and children's math and literacy scores were not supported, no additional analyses were undertaken.

Within-Activity Domain Breadth

Unfortunately, due to a lack of prior research on which to base hypotheses, no directional relations between scores for within-activity domain breadth in the fall and academic scores for math and literacy in the spring were predicted. Thus,

all within-activity breadth scores for each domain (curriculum-based, gender-based) were included on the second step. Specifically, for curriculum-based analyses, within activity domain variables for library, dramatic play, discovery, art, toys and games, and outdoors and large motor were entered on the second step. For gender-based analyses, within activity domain variables for feminine and masculine activities were entered on the second step. Because no directional hypotheses were made, all significance tests are two-tailed for this set of analyses.

For assessments of within-category breadth for curriculum domains, involvement in a wider variety of discovery activities was associated with child assessed passage comprehension. Furthermore, involvement in a wider array of dramatic play activities was positively predictive of applied problem solving abilities at a trend level. There were no other significant associations between within-curriculum category breadth and any measures of literacy or mathematics. The results of these regressions are presented in Table 11.

For the assessments of breadth within gender-based activities, results revealed that within-activity breadth for feminine activities was a positive predictor of applied problem solving at the trend level (see Table 12 for all gender-based within-activity-domain results). There were no other significant associations between breadth of activities within gender categories and any measures of literacy or mathematics.

Summary

The aims of the study were threefold: (1) to determine if the total number of activities in which children tend to participate (regardless of activity domain) early in the preschool year is associated with children's literacy and mathematics scores at the end of the preschool year; (2) to explore the relative utility of curriculum-based and gender-based activity categories using children's intensity of involvement in each as predictors of children's academic abilities and; (3) to explore the breadth of activity involvement across and within these domains as predictors of children's academic abilities.

A series of hierarchical regression analyses were conducted to evaluate the hypotheses of the current study. Overall, although some trend level relations emerged, little evidence was found supporting the hypothesized relations between activity involvement in the fall and academic outcomes in the spring. Most notably, total number of activities in which children tend to participate (regardless of activity domain) early in the preschool year was not associated with children's literacy and mathematics scores at the end of the preschool year. For the relation between intensity of activity involvement and academic outcomes, only two significant relations emerged and they were contradictory. Specifically, intensity of involvement in feminine activities was a significantly positive predictor of one child-assessed measure of literacy (letter word identification) and a significantly negative predictor of the other child-assessed measure of literacy (passage comprehension). Breadth of activity involvement across both curriculum-based

and gender-based activity categories in the fall were not significant predictors of academic outcomes in the spring. Finally, results for breadth within curriculum-based activities revealed that the greater variety of activities in which children participate within the discovery activity domain during the fall semester, the higher children scored on one measure of literacy abilities (passage comprehension) in the spring. Otherwise, within-activity-domain breadth in the fall was not a significant predictor of academic abilities in the spring.

Chapter 6

DISCUSSION

A major goal of the current study was to extend previous research on dimensions of adolescent activity involvement to preschoolers by assessing these dimensions across and within both curriculum-based and gender-typed activity domains. Additionally, the current study aimed to longitudinally explore the relation between these dimensions of activity involvement and children's academic outcomes across the course of the preschool year. Specifically, the study examined three research questions regarding the relation between dimensions of activity involvement and children's academic abilities: (1) does the total number of activities in which children tend to participate (regardless of activity domain) early in the preschool year predict children's academic abilities; (2) does the intensity of involvement in curriculum-based (i.e., art, dramatic play, library, toys and games, discovery, and outdoors and large motor) and gender-based (i.e., feminine, masculine, neutral) activity categories influence children's academic abilities and; (3) does the breadth of activity involvement across and within these domains serve as predictors of children's academic abilities. This study was the first to examine the unique and joint effects of dimensions of preschool children's activity involvement on their literacy and mathematics skill development using two different activity categorization systems.

Across the fall semester of their preschool year children were repeatedly observed engaging in a number of activities (e.g., ball, bike, books) during free

play. The 26 observed activities were subsequently categorized with two different classification schemes, using curriculum-based (blocks, dramatic play, toys and games, art, library, discovery, sand and water, music, computers, and outdoors) and gender-based (feminine, masculine, neutral) activity categories. Four types of scores were created: total number of activities, intensity of activity involvement, across-activity domain breadth, and within-activity domain breath. The latter three scores were created for each of the categorization schemes. Additionally, in the spring semester, three child-assessed (letter word identification, passage comprehension, applied problem solving) and two teacher-rated (reading and writing, logic and numbers) measures were used to identify children's level of skill development in two academic domains: literacy and mathematics. Multiple hierarchical regression analyses were used to test the various study hypotheses. It was expected that variations in dimensions of children's activity involvement would differentially predict literacy and mathematics competencies.

Overall, the results from this study provided little support for the hypotheses. The total number of activities in which children participated overall in the fall semester was not predictive of their academic abilities in the spring. In general, relations among the intensity of activity involvement predictors and academic outcomes were nonsignificant and the relations that did emerge as statistically significant were inconsistent. Additionally, hypothesized relations between the breadth of children's activity involvement across domains in the fall and scores on academic outcomes in the spring did not receive support. Finally,

no significant relations were found between children's within-activity domain breadth scores and their literacy and mathematic abilities.

In the following sections, specific findings and potential explanations for the lack of support for the study hypotheses are discussed. In the subsequent sections, the strengths and limitations of the current study are discussed. Finally, directions for future research are provided.

How Does the Total Number of Activities Children Engage in Influence Their Academic Outcomes?

A primary goal of this study was to assess the relation between the total number of activities in which children engaged in beyond what would be expected by chance in the fall semester and children's academic outcomes at the end of the spring. It was anticipated that the total number of activities in which children participated would be positively related to their academic outcomes. This hypothesis was grounded in research on adolescents suggesting that total number of activities in which older children participated afterschool positively predicted adjustment two years later and theory suggesting that preschool play activities afford children opportunities to learn and develop academic skills (Fredricks & Eccles, 2006; Renner et al, 1976; Vygotsky, 1978; Kolb & Kolb, 2009). However, the hypothesis was not supported; no relations were found between total number of activities in the fall and any measure of children's academic outcomes in the spring, indicating that variability in the total number of activities children engage

in beyond what would be expected by chance does not influence their later academic outcomes.

A potential explanation for the lack of relations between children's total number of activities and academic outcomes could be a developmental one. That is, involvement in greater numbers of activities may have different meaning for adolescents than it does for preschool children. The total number of activities in which adolescents are involved may relate to adjustment because each additional activity they do afterschool means they have fewer opportunities to engage in unsupervised risky behaviors, which have been linked with poor developmental outcomes (Mahoney & Stattin, 2000). Thus, the significant effect of activities on adjustment that was found for adolescents may be an indirect effect rather than a direct effect. This same process would not operate for preschoolers' involvement in multiple activities at school because, for young children, school-based activity engagement would not reduce risk for involvement in risky activities.

Furthermore, the types of activities that children engage in may be more important than the quantity of activities that they engage in of activities. . For example, it may be the case that certain activities are more predictive of literacy and mathematic abilities than are others (e.g., books for literacy; Neuman, 1995). By summing across all activities, information is lost about the effects of the specific activities in which children engage. In sum, it may not matter whether children tend to play with 5 or 10 activities but rather the nature of those 5 or 10 individual activities (e.g., books, blocks, dress-up). Information about the specific

activities in which children were engaged was partially tested in the current study by exploring the direct effects between domains of activities (e.g., feminine, masculine; art, library) rather than specific activities (e.g., books, art, balls) and their relation to children's academic outcomes. The findings for intensity of activity involvement in curriculum-based and gender-based activity domains will be discussed in the next sections.

How does the Intensity of Children's Activity Involvement in Each Domain Influence Their Academic Outcomes?

The second goal of this study was to assess the intensity of children's involvement in a variety of activity domains and to explore how each domain predicted academic outcomes in the spring. A number of hypotheses were proposed for each of two categorization systems. For the curriculum-based category, the intensity of involvement in library, dramatic play, and outdoors and large motor activities was predicted to relate to children's literacy scores; intensity of involvement in discovery, art, toys and games, and outdoors and large motor activities was predicted to be related to children's mathematics scores. For the gender-based category, intensity of involvement in both feminine and masculine activities was predicted to be related to literacy and mathematic abilities.

In general, the study hypotheses for intensity of activity involvement in both curriculum-based and gender-based activity domains were not supported. In one exception, children's intensity of involvement in feminine activities was

significantly related to two measures of literacy, however, these findings were contradictory in that for one measure of literacy (letter word identification) intensity of engagement in feminine activities was positively related but for the other measure of literacy (passage comprehension) intensity of engagement in feminine activities was negatively related. These findings suggest little support for the idea that the intensity of children's involvement for both curriculum- and gender-based categories in the fall influences children's academic outcomes in literacy and mathematics in the spring.

These null findings for intensity of activity involvement are surprising. For example, correlational research on adolescents has shown that greater intensity of activity involvement in various domains was associated with stronger academic orientation (Busseri, Rose-Krasnor, Willoughby, & Chalmers, 2006). Additionally, consistent engagement in preschool activities (whether curriculum- or gender-based) is thought to afford children opportunities to learn math and literacy related skills and concepts (Neuman, 1995; Snow, 1999; Dodge, Colker, & Heroman, 2002; Bredkamp & Copple, 1997). Thus, the lack of findings in the current study may suggest that other important factors remain to be considered in the relation between intensity of activity involvement and academic outcomes.

A possible explanation for the lack of findings could be that the current study did not consider *how* children played with the toys and activities, or the complexity of children's play with specific toys and activities. There could be variability in the ways children' play with toys. Take for example a doll; a child

could carry or passively hold the doll while walking around the classroom or alternatively the child could be creative and use the doll to engage in pretend play (Howes & Stewart, 1987). The academic skills children acquire through involvement with toys are likely related to the complexity of their play with toys and thus should be considered.

An additional explanation of the lack of findings could be the specific classification systems chosen for the study. There are other ways to categorize the activities that were not considered here. For example, perhaps a more useful classification would involve separating activities into those that are academic and non-academic. However, given that most preschool activities are thought to promote academic skills through play, it is unlikely that a clear non-academic set of activities would exist. The current study considered two possible classification schemes based on preschool curriculum and extant research on preschool play activities. Another possibility is that the ideal classification system would not be apparent simply by using the nature of the activities to derive the categories. Instead, exploratory factor analyses (EFA) or principal component analyses (PCA) could have been considered as methods for deriving categories of play activities. The value of using either EFA or PCA would be to determine if variability in children's academic outcomes could be predicted by an underlying structure of the activity variables not considered in the current study.

Finally, an important aspect to consider in examining intensity of involvement in specific curriculum- and gender-based activities is the specific

activities within each category. In analyses of individual domains of activities, a number of individual activities were averaged together. For example, within the curriculum-based domain of art, three individual activities including play with clay, play with activities that involve music, and play with crayons and paints were averaged to provide a domain score for play in art. It could be that the specific activities within a domain differentially predict academic outcomes. So for example, if play with clay positively predicted math and play with crayons and paints negatively predicted math then combining these two individual activities into the same domain would potentially negate any overall effect between the art activities and mathematic ability. Alternatively, it could be that specific activities are carrying all of the weight within one activity domain.

How does Children's Across-Activity Domain Breadth Influence Their Academic Outcomes?

Recent work in adolescent activity involvement research has suggested that measuring across-activity domain breadth provides unique predictive power in examining positive adolescent outcomes (Busseri et al., 2006). The idea for this is that breadth in activity involvement provides children opportunities to pursue different interests and learn different skills. Accordingly, in this investigation, it was predicted that across-activity domain breadth for both curriculum- and gender-based activities would be positively related to both literacy and mathematic abilities. In related research, there is evidence that breadth of activity involvement predicts outcomes above and beyond other

dimensions of activity involvement. For example, across-activity domain breadth scores predicted beyond their total number of activities, duration of activity involvement, and intensity of activity involvement for adolescent positive outcomes in both cross-sectional and longitudinal analyses (Fredricks & Eccles, 2006). Thus, it was also expected that across-activity domain breath would predict both literacy and mathematics abilities above and beyond the influence of total number of activities and intensity of activity involvement.

In the present study, no relations were found between across activity domain breadth scores for curriculum- or gender-based categories in the fall and any measure of children's academic outcomes in the spring. Given that initial relations between breadth scores and children's math and literacy scores were not supported, no additional analyses were conducted to examine the hypothesis in which I expected that across activity domain breadth would predict beyond other dimensions of activity involvement. The findings fail to support the hypothesis that children's across activity domain breadth scores for curriculum- or gender-based categories in the fall influences any measure of children's academic outcomes in the spring.

It should be noted that mean levels for scores on across activity domain breadth for both curriculum-based and gender-based domains were almost at ceiling, suggesting that many children engaged in at least one activity in every activity domain (above chance levels). This finding suggests that perhaps a higher threshold is needed to determine what level should indicate meaningful

involvement. For example, if many of the children in the sample were observed engaging in each of the individual activities above what would be expected by chance (a preferred activity score of 1 for each of the 26 activities), this would support the possibility that a higher threshold for calculating preferred activities was needed. As can be seen in Table 13, however, there is great variability in the percentage of children who were observed engaging in each individual activity above chance levels. Thus, it is not that *all* children engage in *all* activities beyond what would be expected by chance, but rather that most children engaged in at least one activity in each activity domain beyond what would be expected by chance. This lack of variability in across activity domain breadth scores could be one reason for the null results.

The findings for breadth of activity involvement are inconsistent with research on breadth of activity involvement in adolescence. For example, adolescents' breadth of activity involvement across a range of activity domains predicted positive outcomes in both cross-sectional and longitudinal analyses (Fredricks & Eccles, 2006). Given that each activity domain is thought to afford opportunities to learn various skills and concept, it is surprising that that the hypotheses for the direct relations between breadth of activity involvement and academic outcomes were not supported. Perhaps, breadth of activity involvement would be important to consider under different circumstances. For example, it could be fruitful to examine the relation between breadth of activity involvement and academic outcomes within children's social context.

The social context of the preschool classroom likely influences children's activity involvement. Children's behavior is not constant across situations; rather, children vary their behaviors in relation to their immediate social context (Deaux & Major, 1987; DeRosier, Cillessen, Coie, & Dodge, 1994; Fabes, Shepard, Guthrie, & Martin, 1997; Smith, Noll, & Bryant, 1999; Hanish, Marin, Fabes, Leonard, & Herzog, 2005; Hanish, Ryan, Martin, & Fabes, 2005). Preschool classrooms provide numerous opportunities for children to move from one social context to another, as they alternately play alone, with male peers, with female peers, with mixed-groups of both male and female peers, and with teachers. Moreover, dimensions of children's activity involvement may differ depending on the types of peers (i.e., same-, other-, and mixed-sex) with whom they are playing, and when interacting with teachers (Goble et al., 2010; Fabes, Martin, & Hanish, 2003; Fagot, 1978).

Specifically in regard to across activity domain breadth, there could be great variability in breadth scores within different social contexts (e.g., play with same-, other-, mixed-sex peers, interactions with teachers). For instance, research has shown that children tend to play with almost exclusively gender-typical (e.g., feminine for girls) activities followed by gender neutral activities when engaging in play with same-sex peers (e.g., girl playing with girls; Goble, et al, 2010). Thus, the breadth of children's activity involvement across domains may be limited when engaging in same-sex peer groups. For example, a girl might have a gender-based activity breadth score of three (i.e., ceiling) when her scores are

calculated across all types of social contexts, but if only play with same-sex peers was considered, girls might have a gender-based activity breadth score of one. Considering the possible variations of children's breadth of activity involvement within and across various preschool social contexts, this could potentially shed light on the relation between across activity domain breadth and academic abilities.

How does Children's Within-Activity Domain Breadth Influence Their Academic Outcomes?

Research on the topic of within-activity domain breadth has been limited. Due to a lack of prior research on which to base hypotheses, no directional relations between scores for within-activity domain breadth in the fall and academic scores for math and literacy in the spring were predicted. Overall, within-activity-domain breadth in the fall was not a significant predictor of academic abilities in the spring.

Given that individual activities are grouped into domains because they are thought to afford similar opportunities for skill development, the breadth of involvement within a particular domain may not be important. However, it is difficult to postulate further explanations for the lack of findings between within activity domain breadth and academic outcomes due to the lack of prior research from which to draw hypotheses.

Summary

In summary, the results of this study provided little evidence to support the hypotheses that children's dimensions of activity involvement in the fall semester of their preschool year contribute to their academic abilities in literacy and mathematics at the end of their preschool year. However, there remain a number of potential explanations for the null findings which suggest that the relation between children's preschool activity involvement and academic outcomes should be explored further. Additionally, one group of adolescent activity involvement researchers has started discussion about the potential reasons that is difficult to detect discernable effects on children's academic abilities longitudinally (Granger & Kane, 2004). These researchers showed that in national samples, elementary and middle school students score only one-third to one-half of a standard deviation higher on reading and math than students' one grade below. Their conclusion was that although involvement in after-school activities likely improves children's academic skill development, given the modest gains children make in academic abilities across years, any influence of activity involvement is likely to be small. Thus, the null findings of the current study may reflect the difficulty of predicting discernable effects in children's academic abilities across such a short period of time. In the next sections, strengths and limitations of the current study and directions for future research are discussed.

Strengths of the Study

Dimensions of activity involvement (e.g., total number of activities, intensity of activity involvement, across and within activity domain breadth) have been widely studied in school-aged children with a focus on adolescent after school activities (e.g., Simpkins, et al., 2008; Fredricks and Eccles, 2006). Although the relation between dimensions of activity involvement and academic outcomes are evident in adolescence (e.g., Busseri et al. 2006), less work has examined the dimensions of activity involvement and their relation to academic abilities prior to formal schooling. The current study expands upon adolescent research by examining the relation between dimensions of activity involvement and academic outcomes for preschool aged children.

A limited amount of research exists suggesting that the amount of time children spend engaging in activities is related to academic abilities (e.g., Serbin & Connor, 1979). However, prior to this study, a comprehensive assessment of the influence of preschool play activities on children's early academic success did not exist. Hence, this investigation advanced the previous research on preschool play activities by examining the unique effects of numerous activity involvement measures within two categorization systems, curriculum- and gender-based domains.

The research design of this study also improves upon past work. Although concurrent research exists examining preschool activity involvement and academic abilities, longitudinal data was needed to support or disprove directional

relations between involvement in specific preschool activities and early academic outcomes. Moreover, although causality cannot be definitively established without experimental data, longitudinal work can more fully explore causal assumptions. Thus, this study adds to the presently scarce longitudinal research on the relation between preschool children's activity involvement and subsequent skill development in academic domains.

Limitations of the Study

The current research was guided by theories of child development, empirical research on preschool curricula and play activities, and a framework put forth in adolescent activity involvement research. Although the hypotheses of the current study were not supported, there remain important factors to consider in terms of the relation between children's dimensions of activity involvement and their academic skill development. Specifically, a number of moderators not assessed in this investigation could have been considered. The goal of this section is to highlight potentially important moderators of the relation between preschool activity involvement and academic abilities as they pertain to this study's general lack of findings.

A primary concern for the interpretation of the present results is that the sample from which the results of this study were drawn may not be representative of the larger population, thus limiting the generalizability of the results. Previous research on dimensions of activity involvement primarily focused on non-Hispanic white middle class students (Serbin &Connor, 1979; Green, Bigler, & Di

Catherwood, 2004; Powlishta, Serbin, & Moller, 2004; Fredricks & Eccles, 2006; Busseri et al., 2006). The majority of children in this study were Mexican or Mexican-American, used Spanish as their primary language, and came from lower socioeconomic status families. Thus, given the inconsistencies between the current study's findings and existing research, a number of potentially important moderators related to the homogeneity of this sample could be considered in future research between dimensions of preschool play activities and early academic abilities

For example, a potentially important moderator of the relation between preschool activity involvement and academic abilities that have implications for the lack of findings in the current study could be children's preferred language (i.e., Spanish or English). Given that the sample for this study was predominately Mexican or Mexican- American (approximately 70%), it is not surprising that many of these children (approximately 60%) selected Spanish as their primary language (as indicated by language of preference for the PPVT assessment in the fall semester). It may be the case that Spanish speaking children make larger academic gains over the course of preschool than their English speaking counterparts as they have opportunities to learn English and develop skills through play with English-based toys and materials. Alternatively, it could be that because of their language barriers, Spanish speaking children do not gain as much in terms of skill development through interactions with toys and materials during preschool as their English speaking counterparts. Unfortunately, no research

exists suggesting that differences in preschool children's preferred language would differentially predict activity involvement. Thus, directional hypotheses regarding how language would moderate the relation between activity involvement and child outcomes cannot be made. Moreover, a limitation of the current study related to children's language is that children's initial verbal ability was assessed using separate measures for Spanish and English speaking groups. Unfortunately, no equivalent tests for initial verbal abilities exist in both languages. Thus, aside from initial verbal abilities in their preferred language, the current study did not have an equivalent measure for Spanish and English speaking children to control for initial abilities in the fall in prediction of academic abilities in the spring.

In addition to children's language preference, preschoolers' activity involvement at school may be associated with different outcomes for children of varying cultures due to the home environment. For example, research has suggested that in comparison to non-Hispanic white families, Hispanic families tend to engage their children in lower levels of home-learning activities (e.g., reading books, doing crafts; Cooper, Crosnoe, Suisso, & Pituch 2010). Additionally, there is variability in the degree to which parents across cultures promote engagement in specific activities. Specifically, in Hispanic families, researchers have shown that parents are more traditional in gender attitudes and the degree to which they socialize their children in gender-typical ways (Adams, Coltrane, & Parke, 2007). This traditionalism may translate into the degree that

families of Hispanic origin encourage children to play with gender-typed toys and activities (e.g., masculine for boys). Based on hypotheses made in the current study, children who are only exposed to a limited set of toys and activities (e.g., masculine activities for boys) may be more limited in their skill development in areas thought to be related to other types of play activities (e.g., literacy skills and feminine activities). Accordingly, it may be important to understand how much exposure to activities and potential for skill development there is in children's homes, especially within Hispanic communities.

Aside from cultural factors, children's home environment may be an important moderator to consider for other reasons. For example, given the low socioeconomic status of many of the families in this sample, it is possible that whereas some children may have a number of opportunities to engage with toys and activities outside of school, others may be more limited in their activity exposure (Cooper et. al., 2010). Furthermore, although diary studies of parental time use suggest that a majority of time spent with children involves primary care activities (e.g., feeding, bathing, transportation), research has suggested that there is considerable variability in the amount of time parents spend engaging in play activities with their children (Sayer, Bianchi, & Robinson, 2004). Thus, variability in the availability of toys in children's homes and the amount of time parents invest playing with their children may be important moderators of the relation between preschool activity involvement and academic outcomes, as these likely produce additional opportunities to learn specific skills.

Finally, a potentially important moderator could be the consideration of children's sex. Given the preliminary sex differences found in many of the study variables, relations between activity involvement variables and academic outcomes may be different for boys and girls. The idea that boys and girls prefer different play activities is well documented. Research on activity involvement in preschool shows that boys typically choose to play with balls, bikes, blocks, and transportation toys and girls prefer art activities, dolls, kitchen items, and dress-up clothes (Conner & Serbin, 1977; Eisenberg, Tryon, & Cameron, 1984; Levy, 1994; Caldera et al. 1999; Green, Bigler, & Di Catherwood, 2004; Powlishta, Serbin, & Moller, 2004; Ruble, Martin, & Berenbaum, 2006). In the current study, rather than considering children's sex as a potential moderator, sex was entered as a control, meaning that the differences in boys and girls activity preferences were partialled out of all of the study analyses. Analyses revealed, however, that child sex predicts a significant amount of variance in children's literacy and mathematic abilities. It could be the case that the relation between dimensions of activity involvement and later academic skill development are different for girls and boys. Thus, by including child sex as a moderator of the study hypotheses, the relations between dimensions of activity involvement and academic skill development could be explored for boys and girls separately.

Conclusions and Future Directions

The primary goals of this study were to examine the relation between children's activity involvement and their subsequent academic abilities in literacy

and mathematics during their preschool year. Although the study hypotheses were not supported, the results of this investigation contribute to the understanding of the dimension of preschool activity involvement and provide important directions for future research.

The unexpected lack of relations between children's activity involvement and academic outcomes suggests that potential moderators should be explored and that other factors related to children activity involvement may be important in predicting academic abilities. Examining the relations between activity involvement and academic outcomes considering the potential moderators outlined above (i.e., children's physical and social home environment, children's language preference, children's own sex) would be an important next step for future research.

There remain a few other potentially important steps for research on the relation between preschool activity involvement and academic abilities. First, the current research should be replicated in a less homogenous sample. Additionally, initial measures of children's academic abilities should be considered when predicting skill development over time. Research should also consider the individual relations between specific toys and materials (e.g., book, block, dolls, etc) and academic abilities. It may be the case that specific activities are more predictive of specific skills than are conceptually similar groups of activities. Similarly, future research should consider the efficacy of the curriculum- and gender-based categorization schemes put forth in the current study. Specifically,

confirmatory factor analyses could be conducted in order to test the accuracy of the existing categorization schemes or exploratory factor analyses on all activities could be conducted in order to determine if activities should be grouped in a new way.

Furthermore, future research on preschool children's activity involvement should consider the complexity of children's play. There is likely variability in the sophistication level of children's play with various toys and activities and more advanced levels of play could differentially predict the degree of skill development that is acquired through consistent play in specific activities. Finally, future research should examine the relation between activity involvement and academic outcomes across a variety of social contexts within the preschool classroom. For example, engaging in library activities with a teacher might afford children more opportunities for skill development than engaging in library activities with a group of peers. Unfortunately though, these types of associations have never been tested. Thus, as suggested previously, it may be important to consider in the relation between activity involvement and skill development may be the social context in which activities are performed.

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Table 1
Gender-based Activity Categories and Descriptive Statistics for all Activities

	Child Sex			
	Girls		Boys	
Activity	*M*	*SD*	*M*	*SD*
Feminine				
Crayons	0.15	0.10	0.08	0.07
Books	0.04	0.04	0.03	0.03
Writing	0.03	0.04	0.01	0.02
Phone	0.00	0.02	0.00	0.01
Dress-up	0.02	0.03	0.01	0.02
Kitchen	0.04	0.04	0.03	0.03
Puzzle	0.05	0.06	0.04	0.04
Pretend Feminine	0.05	0.05	0.01	0.02
Pretend Neutral	0.04	0.06	0.03	0.04
Figure Play Feminine	0.02	0.04	0.00	0.01
Masculine				
Balls	0.02	0.04	0.04	0.05
Bikes	0.08	0.09	0.11	0.10
Blocks	0.06	0.05	0.11	0.08
Computer	0.06	0.07	0.08	0.07
Toy Animals	0.01	0.02	0.02	0.03
Toy Vehicles	0.01	0.02	0.06	0.07
Pretend Masculine	0.01	0.01	0.04	0.06
Figure Play Masculine	0.00	0.01	0.01	0.02
Figure Play Neutral	0.01	0.01	0.02	0.03
Neutral				
Clay	0.04	0.04	0.03	0.04
Board Games	0.02	0.03	0.02	0.03
Digging	0.04	0.06	0.04	0.04
Large Motor	0.12	0.07	0.11	0.08
Math/Science	0.02	0.03	0.03	0.04
Sensory	0.04	0.04	0.04	0.04
Music	0.02	0.03	0.01	0.02

Note. All items categorized as feminine or masculine differed significantly at $p < .05$

Table 2

Curriculum-based Activity Categories

Art	**Dramatic Play**	**Library**	**Toys and Games**	**Discovery**	**Outdoors and Large Motor**
Crayons Clay Music	Phone Dress-up Kitchen Pretend Fem Pretend Masc Pretend Neu	Books Writing	Board Games Blocks Toy Vehicles Toy Animals Puzzles Figure Play Fem Figure Play Masc Figure Play Neut	Math/science Computer Sensory	Bikes Balls Digging Large Motor

Table 3
Descriptive Statistics for all Study Variables

	Sex of Child					
	Girls		Boys		Both	
Activity	*M*	*SD*	*M*	*SD*	*M*	*SD*
Predictors						
Total Number of Activities	7.62	2.22	7.86	2.00	7.75	2.11
Intensity Scores						
Feminine	0.15_a	0.06	0.08_a	0.04	0.11	0.06
Masculine	0.12_a	0.06	0.22_a	0.08	0.17	0.09
Neutral	0.18_a	0.07	0.16_a	0.06	0.17	0.07
Art	0.09_a	0.05	0.06_a	0.04	0.08	0.05
Dramatic Play	0.07_a	0.04	0.05_a	0.04	0.06	0.04
Toys & Games	0.08_a	0.04	0.12_a	0.06	0.10	0.06
Library	0.03_a	0.02	0.02_a	0.02	0.02	0.02
Discovery	0.05_a	0.03	0.07_a	0.04	0.06	0.04
Outdoors & Large Motor	0.12	0.07	0.14	0.07	0.13	0.07
Within Activity Breadth						
Feminine	0.36_a	0.17	0.19_a	0.13	0.27	0.17
Masculine	0.24_a	0.12	0.42_a	0.15	0.34	0.16
Neutral	0.38_a	0.16	0.35_a	0.14	0.37	0.15
Art	0.49_a	0.24	0.37_a	0.26	0.43	0.26
Dramatic Play	0.26_a	0.16	0.16_a	0.15	0.21	0.16
Toys &Games	0.20_a	0.14	0.30_a	0.16	0.25	0.16
Library	0.34_a	0.36	0.22_a	0.30	0.28	0.34
Discovery	0.38_a	0.25	0.48_a	0.26	0.43	0.26
Outdoors & Large Motor	0.51	0.25	0.56	0.21	0.54	0.23
Across Gender Activity Breadth	2.94	0.24	2.88	0.32	2.91	0.29
Across Curriculum Activity Breadth	5.00_a	0.79	4.68_a	0.90	4.83	0.86
Outcomes						
Literacy						
Reading and Writing	2.77_a	0.63	2.38_a	0.64	2.57	0.67
Letter Word Identification	332.01_a	22.08	325.72_a	23.09	328.68	22.79
Passage Comprehension	394.54_a	28.74	384.80_a	37.74	389.39	34.08
Mathematics						
Logic and Numbers	3.20_a	0.59	2.99_a	0.64	3.09	0.62
Applied Problem solving	398.70_a	23.08	391.99_a	25.98	395.15	24.83

Note. Items with a subscript significantly differ for girls and boys, ts(212.82 -276.26) range -12.41 to 12.41, $p < .05$.

Table 4

Zero-order Correlations between Control and Study Variables.

Variable:		Age	PPVT	SES
Controls				
1	Age	--		
2	PPVT	0.28***	--	
3	SES	0.05	.28***	--
Predictors				
4	Total Number of Activities	-0.04	-0.03	0.02
	Intensity Scores			
5	Feminine	-0.15*	0.01	0.00
6	Masculine	0.11	0.01	0.03
7	Neutral	0.07	0.04	-0.10
8	Art	0.04	0.05	-0.02
9	Dramatic Play	0.01	0.12	0.00
10	Toys & Games	-0.04	-0.08	-0.05
11	Library	-0.14*	-0.02	-0.05
12	Discovery	0.09	0.04	-0.02
13	Outdoors & Large Motor	0.06	-0.02	0.02
	Within Activity Breadth			
14	Feminine	-0.24***	-0.07	0.00
15	Masculine	0.14*	0.03	0.04
16	Neutral	0.02	0.01	0.00
17	Art	0.07	0.03	-0.01
18	Dramatic Play	-0.11	0.04	-0.03
19	Toys &Games	-0.02	-0.11	-0.07
20	Library	-0.15*	-0.04	0.05
21	Discovery	-0.02	0.02	0.05
22	Outdoors & Large Motor	0.10	0.04	0.11
23	Across Gender Activity Breadth	-0.01	0.03	-0.05
24	Across Curriculum Activity Breadth	-0.13*	0.07	0.02
Outcomes				
	Literacy			
25	Reading and Writing	0.39***	0.24***	0.27***
26	Letter Word Identification	0.12	0.25***	0.12
27	Passage Comprehension	0.09	0.29***	0.17*
	Mathematics			
28	Logic and Numbers	0.31***	0.40***	0.28***
29	Applied Problem solving	0.22***	0.62***	0.21**

*$p < .05$; **$p < .01$; ***$p < .001$.

Table 5

Zero-order Correlations between Curriculum-based Activity Variables.

Variable:		1	2	3	4	5	6
1	Art	--	0.07	-0.06	-0.01	-0.02	-0.12*
2	Dramatic Play	0.09	--	-0.09	0.13*	-0.10	-0.13*
3	Toys & Games	-0.35***	-0.24***	--	0.08	0.03	-0.05
4	Library	0.03	0.01	-0.12	--	-0.06	0.04
5	Discovery	-0.18**	-0.11	0.02	-0.06	--	0.07
6	Outdoors & Large Motor	-0.19***	-0.22***	-0.25***	-0.21***	-0.09	--

Note. Correlation coefficients presented below the diagonal are those for intensity variables. Presented above the diagonal are those for within breadth variables.

*p < .05; **p < .01; ***p < .001.

Table 6

Zero-order Correlations between Gender-based Activity Variables.

Variable:		1	2
1	Feminine	--	-0.30***
2	Masculine	-0.66***	--

Note. Correlation coefficients presented below the diagonal are those for intensity variables. Presented above the diagonal are those for within breadth variables.

***p < .001.

Table 7
Hierarchical Regressions Predicting Academic Outcomes from Total Number of Activities.

Dependent Variable	Step	Independent Variable	R^2	ΔR^2	β
Literacy					
Reading and Writing	1	Sex[a]	0.32	0.32***	0.32***
		Age[a]			0.39***
		PPVT[a]			0.03
		SES[a]			0.25***
	2	Total Number of Activities[b]	0.32	0.00	-0.05
Letter Word Identification	1	Sex[a]	0.08	0.08***	0.13
		Age[a]			0.11
		PPVT[a]			0.17*
		SES[a]			0.06
	2	Total Number of Activities[b]	0.09	0.01	0.11[T]
Passage Comprehension	1	Sex[a]	0.11	0.11***	0.14*
		Age[a]			0.03
		PPVT[a]			0.26***
		SES[a]			0.10
	2	Total Number of Activities[b]	0.11	0.00	0.02
Mathematics					
Logic and Numbers	1	Sex[a]	0.24	0.24***	0.20***
		Age[a]			0.23***
		PPVT[a]			0.25***
		SES[a]			0.20**
	2	Total Number of Activities[b]	0.24	0.00	0.01
Applied Problem Solving	1	Sex[a]	0.39	0.39***	0.16**
		Age[a]			0.08
		PPVT[a]			0.57***
		SES[a]			0.03
	2	Total Number of Activities[b]	0.39	0.00	0.05

Note. Reported betas are from the last step in the regression.

[a]Two-tailed test.

[b]One-tailed test.

[T]p < .10; *p < .05; **p < .01; ***p < .001.

Table 8
Hierarchical Regressions Predicting Academic Outcomes from Curriculum-based Intensity Scores.

Dependent Variable	Step	Independent Variable	R^2	ΔR^2	β
Literacy					
Reading and Writing	1	Sex[a]	0.32	0.32***	0.33***
		Age[a]			0.39***
		PPVT[a]			0.02
		SES[a]			0.25***
	2	Library[b]	0.33	0.01	-0.07
		Dramatic Play[b]			0.04
		Outdoors & Large Motor[b]			-0.02
Letter Word Identification	1	Sex[a]	0.08	.08**	0.11
		Age[a]			0.11
		PPVT[a]			0.19*
		SES[a]			0.06
	2	Library[b]	0.09	0.02	0.09[T]
		Dramatic Play[b]			-0.04
		Outdoors & Large Motor[b]			-0.08
Passage Comprehension	1	Sex[a]	0.11	0.11***	0.14*
		Age[a]			0.02
		PPVT[a]			0.27***
		SES[a]			0.09
	2	Library[b]	0.11	0.00	0.02
		Dramatic Play[b]			-0.05
		Outdoors & Large Motor[b]			0.01
Mathematics					
Logic and Numbers	1	Sex[a]	0.24	0.24***	0.19**
		Age[a]			0.24***
		PPVT[a]			0.24****
		SES[a]			0.20**
	2	Discovery[b]	0.25	0.00	0.01
		Art[b]			0.00
		Toys & Games[b]			-0.01
		Outdoors & Large Motor[b]			-0.07
Applied Problem Solving	1	Sex[a]	0.39	0.39***	0.11
		Age[a]			0.08
		PPVT[a]			0.57***
		SES[a]			0.02
	2	Discovery[b]	0.40	0.02	-0.09[T]
		Art[b]			-0.06
		Toys & Games[b]			-0.11[T]
		Outdoors & Large Motor[b]			-0.10[T]

Note. Reported betas are from the last step in the regression.
[a]Two-tailed test.
[b]One-tailed test.
[T]$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$.

Table 9
Hierarchical Regressions Predicting Academic Outcomes from Gender-based Intensity Scores.

Dependent Variable	Step	Independent Variable	R^2	ΔR^2	β
Literacy					
Reading and Writing	1	Sex[a]	0.32	0.32***	0.25***
		Age[a]			0.41***
		PPVT[a]			0.03
		SES[a]			0.25***
	2	Feminine[b]	0.33	0.01	0.06
		Masculine[b]			-0.08
Letter Word Identification	1	Sex[a]	0.08	0.08**	-0.01
		Age[a]			0.14
		PPVT[a]			0.17*
		SES[a]			0.06
	2	Feminine[b]	0.11	0.03*	0.24**
		Masculine[b]			0.01
Passage Comprehension	1	Sex[a]	0.11	0.11***	0.17*
		Age[a]			0.01
		PPVT[a]			0.27***
		SES[a]			0.10
	2	Feminine[b]	0.12	0.01	-0.17*
		Masculine[b]			-0.11
Mathematics					
Logic and Numbers	1	Sex[a]	0.24	0.24***	0.13
		Age[a]			0.24***
		PPVT[a]			0.24***
		SES[a]			0.20**
	2	Feminine[b]	0.25	0.01	0.06
		Masculine[b]			-0.05
Applied Problem Solving	1	Sex[a]	0.39	0.39***	0.11
		Age[a]			0.09
		PPVT[a]			0.57***
		SES[a]			0.03
	2	Feminine[b]	0.39	0.00	0.08
		Masculine[b]			0.00

Note. Reported betas are from the last step in the regression.

[a]Two-tailed test.

[b]One-tailed test.

*$p < .05$; **$p < .01$; ***$p < .001$.

Table 10
Hierarchical Regressions Predicting Academic Outcomes from Across-Activity Domain Breadth.

			Activity Domain					
			Curriculum Based			Gender-Based		
Dependent Variable	Step	Independent Variable	R^2	ΔR^2	β	R^2	ΔR^2	β
Literacy								
Reading and Writing	1	Sex[a]	0.32	0.32***	0.33***	0.32	0.32***	0.33***
		Age[a]			0.39***			0.39***
		PPVT[a]			0.03			0.03
		SES[a]			0.25			0.25***
	2	Across Activity Domain Breadth[b]	0.32	0.00	0.00	0.32	0.00	-0.05
Letter Word Identification	1	Sex[a]	0.08	0.08***	0.12	0.08	0.08**	0.12
		Age[a]			0.10			0.11
		PPVT[a]			0.18*			0.18*
		SES[a]			0.06			0.06
	2	Across Activity Domain Breadth[b]	0.08	0.00	0.03	0.08	0.00	0.06
Passage Comprehension	1	Sex[a]	0.11	0.11***	0.13*	0.11	0.11***	0.13*
		Age[a]			0.03			0.03
		PPVT[a]			0.26***			0.26***
		SES[a]			0.10			0.10
	2	Across Activity Domain Breadth[b]	0.11	0.00	0.02	0.11	0.00	0.03
Mathematics								
Logic and Numbers	1	Sex[a]	0.24	0.24***	0.20***	0.24	0.24***	0.20***
		Age[a]			0.23***			0.23***
		PPVT[a]			0.25***			0.25***
		SES[a]			0.20**			0.20**
	2	Across Activity Domain Breadth[b]	0.24	0.00	-0.01	0.24	0.00	-0.03
Applied Problem Solving	1	Sex[a]	0.39	0.39***	0.16**	0.39	0.39***	0.17**
		Age[a]			0.07			0.07
		PPVT[a]			0.58***			0.58***
		SES[a]			0.03			0.02
	2	Across Activity Domain Breadth[b]	0.39	0.00	-0.01	0.39	0.01	-0.08

Note. Reported betas are from the last step in the regression.
[a]Two-tailed test.
[b]One-tailed test.
*$p < .05$; **$p < .01$; ***$p < .001$.

Table 11

Hierarchical Regressions Predicting Academic Outcomes from Curriculum-Based Within-Activity Domain Breadth.

Dependent Variable	Step	Independent Variable	R^2	ΔR^2	β
Literacy					
Reading and Writing	1	Sex	0.32	0.32***	0.33***
		Age			0.41***
		PPVT			0.03
		SES			0.26
	2	Library Within	0.33	0.01	-0.02
		Dramatic Play Within			0.09
		Discovery Within			-0.01
		Art Within			-0.05
		Toys & Games Within			0.06
		Outdoors & Large Motor Within			-0.03
Letter Word Identification	1	Sex	0.08	0.08**	0.15*
		Age			0.11
		PPVT			0.19**
		SES			0.06
	2	Library Within	0.10	0.03	0.08
		Dramatic Play Within			-0.13
		Discovery Within			0.03
		Art Within			0.03
		Toys & Games Within			0.04
		Outdoors & Large Motor Within			-0.08
Passage Comprehension	1	Sex	0.11	0.11***	0.18*
		Age			0.02
		PPVT			0.24***
		SES			0.09
	2	Library Within	0.15	0.04	-0.04
		Dramatic Play Within			-0.05
		Discovery Within			0.13*
		Art Within			-0.09
		Toys & Games Within			-0.06
		Outdoors & Large Motor Within			0.05

Table 11 Continued

Hierarchical Regressions Predicting Academic Outcomes from Curriculum-Based Within-Activity Domain Breadth.

Dependent Variable	Step	Independent Variable	R^2	ΔR^2	β
Mathematics					
Logic and Numbers	1	Sex	0.24	0.24***	0.19**
		Age			0.24***
		PPVT			0.24***
		SES			0.20**
	2	Library Within	0.24	0.00	-0.01
		Dramatic Play Within			0.04
		Discovery Within			0.02
		Art Within			-0.01
		Toys & Games Within			-0.02
		Outdoors & Large Motor Within			-0.02
Applied Problem Solving	1	Sex	0.39	0.39***	0.11
		Age			0.10
		PPVT			0.57***
		SES			0.03
	2	Library Within	0.40	0.02	0.07
		Dramatic Play Within			0.10^{T}
		Discovery Within			0.00
		Art Within			0.02
		Toys & Games Within			-0.02
		Outdoors & Large Motor Within			-0.03

Note. Reported betas are from the last step in the regression.
*$p < .05$; **$p < .01$; ***$p < .001$.*

Table 12

Hierarchical Regressions Predicting Academic Outcomes from Gender-based Within-Activity Domain Breadth.

	Dependent Variable	Step	Independent Variable	R^2	ΔR^2	β
Literacy						
	Reading and Writing	1	Sex	0.32	0.32***	0.27***
			Age			0.41***
			PPVT			0.03
			SES			0.25***
		2	Feminine Within	0.32	0.01	0.03
			Masculine Within			-0.08
	Letter Word Identification	1	Sex	0.08	0.08**	0.05
			Age			0.12
			PPVT			0.19*
			SES			0.06
		2	Feminine Within	0.08	0.01	0.07
			Masculine Within			-0.08
	Passage Comprehension	1	Sex	0.11	0.11***	0.15
			Age			0.02
			PPVT			0.25***
			SES			0.10
		2	Feminine Within	0.11	0.00	-0.05
			Masculine Within			-0.01
Mathematics						
	Logic and Numbers	1	Sex	0.24	0.24***	0.14
			Age			0.25***
			PPVT			.025***
			SES			0.20**
		2	Feminine Within	0.25	0.01	0.02
			Masculine Within			-0.11
	Applied Problem Solving	1	Sex	0.39	0.39***	0.11
			Age			0.09
			PPVT			0.58***
			SES			0.02
		2	Feminine Within	0.40	0.01	0.12^{T}
			Masculine Within			0.01

Note. Reported betas are from the last step in the regression.

$^{T}p < .10$; $*p < .05$; $**p < .01$; $***p < .001$.

Table 13
Distribution of Preferred Activity Scores.

Balls	31.18
Books	37.63
Bikes	62.01
Blocks	69.53
Board games	18.28
Clay	31.90
Art materials	79.93
Computer	63.44
Digging	37.99
Dress -up	13.62
Figure play masculine	5.02
Figure play feminine	11.11
Figure play neutral	11.47
Kitchen	34.41
Large Motor	83.15
Math/Science	25.45
Pretend feminine	20.79
Pretend masculine	18.64
Pretend neutral	35.48
Puzzle	41.58
Sensory	41.22
Toy vehicles	27.96
Toy animals	15.05
Phone	3.23
Writing	17.92
Music	16.49

Note. Scores represent percent of sample observed engaging above and beyond chance in each individual activity.

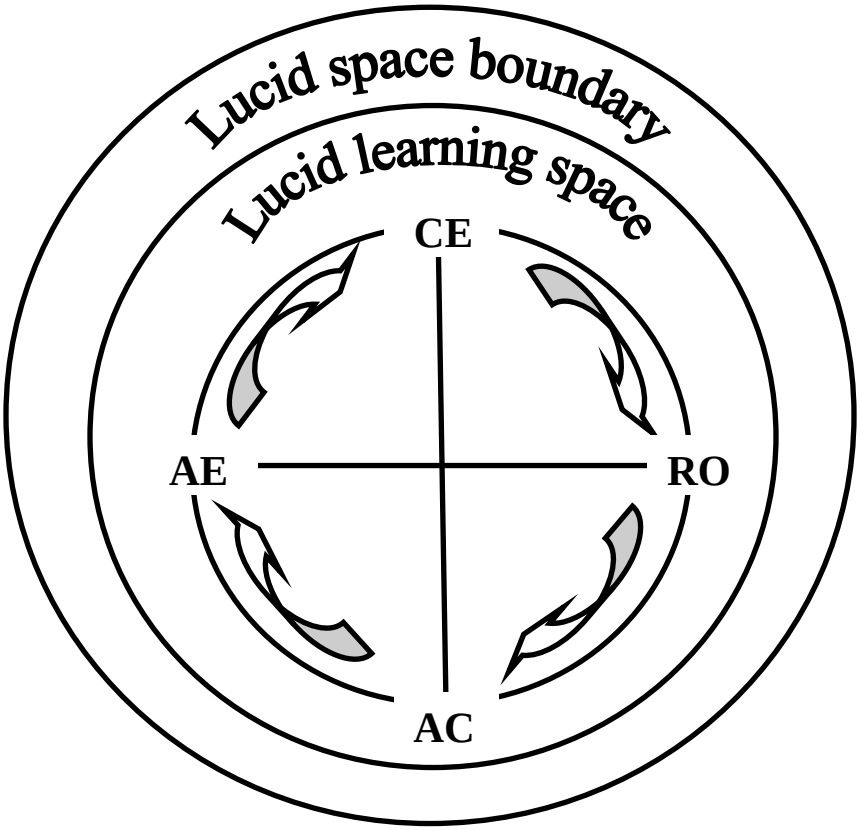

Figure 1. Lucid learning space and the experiential learning process (Kolb & Kolb, 2009).

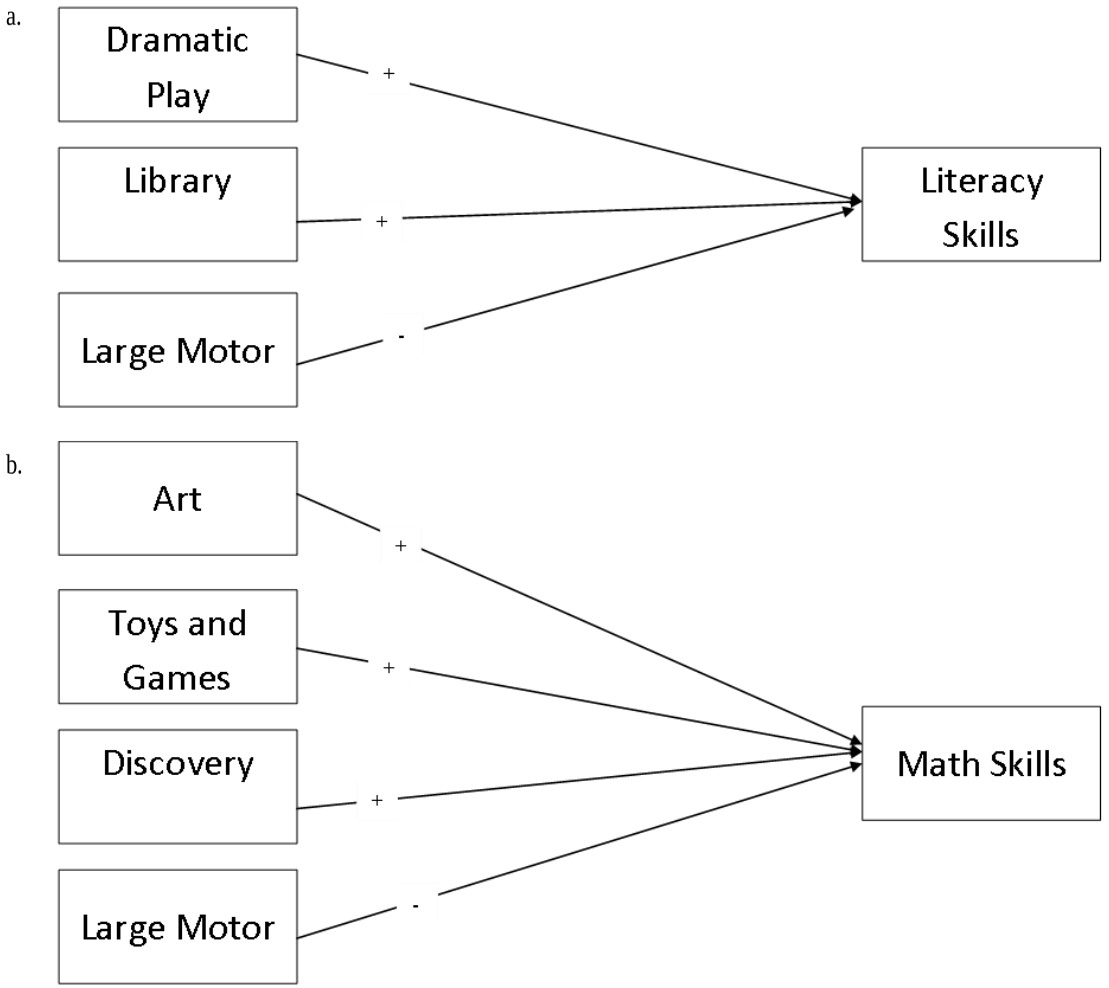

Figure 2. Hypothesized relations for intensity of activity involvement in curriculum-based activity domains in the fall and academic outcomes in the spring.

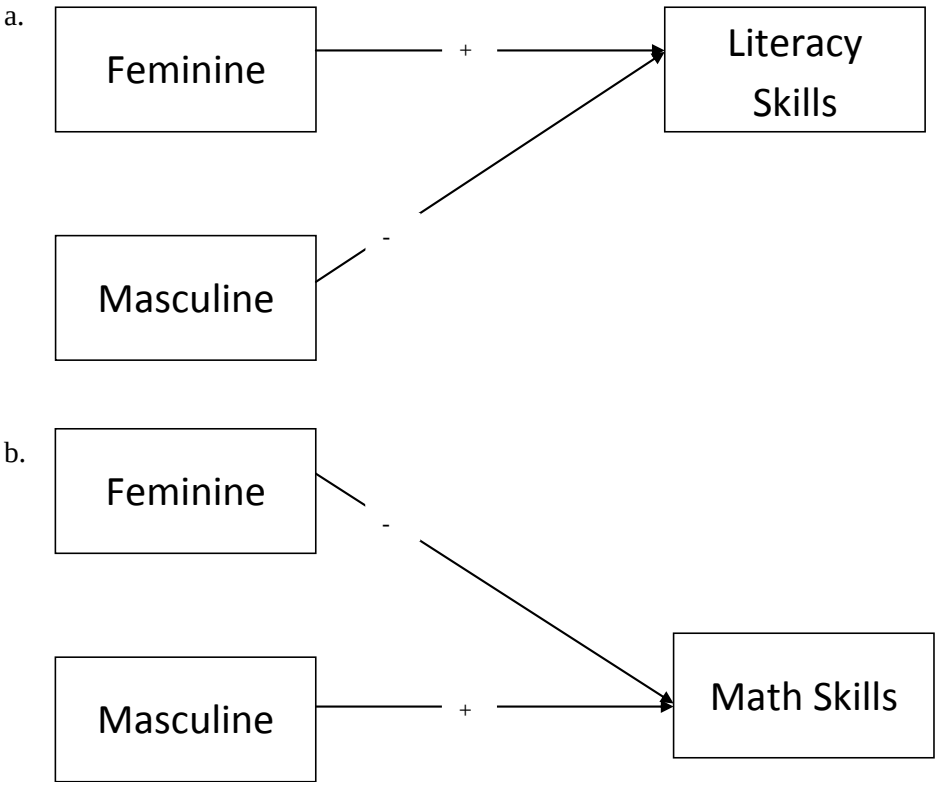

Figure 3. Hypothesized relations for intensity of activity involvement in gender-based activity domains in the fall and academic outcomes in the spring.

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