Social-Emotional Readiness for Preschool: An Examination of Temperament and Behavior in Three-Year-Olds

By

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Abstract

Given the current promotion of nationwide mandatory public preschool (Desshoff, 2010) there is a need to examine school readiness earlier (Lally, 2010; Snow, 2006; Wilen, 2003). Study one explored which temperament, behavior, and cognitive items teachers of 4-year-old kindergarten (N = 29) rated as highly characteristic versus uncharacteristic of ready preschoolers. Clusters of children who were deemed ready for preschool were identified from this teacher-generated data. Study two examined the degree to which an existing sample of 3-year-olds (N = 662) were socially and emotionally ready for preschool as determined based on similarity to the clusters of ready children created by the teachers in study one. I examined the quality of parent-child interactions, status variables, and earlier temperament as potential predictors of these readiness outcomes. Additionally, for a subset of children (N = 27), I explored the degree of similarity to teacher-chosen ready children as a predictor of cognitive outcomes at about age seven, around the time of first grade.

In study one, five ready clusters emerged from the teachers' perspectives. Teachers noted high cognitive skills and following directions as highly characteristic of many of the clusters. Distinguishing the clusters from one another included items pertaining to activity level, sociability, shyness, enthusiasm, and patience. Study two revealed that children who more closely resembled the teacher-selected ready children came from families with higher SES, tended to be female, and were rated by mothers as highly positive at 12 months of age. Additionally, these readiness scores predicted performance on a spatial intelligence task at age 7.

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CHAPTER 1: INTRODUCTION

As the pressure to succeed academically is imposed on our children earlier than ever before, there is understandably widespread interest in assuring our children are prepared to enter the classroom environment and thrive once there. Readiness to start school is a multifaceted construct that encompasses not only cognitive aspects of children's development, but also social-emotional aspects. Researchers emphasize the need to consider readiness prior to kindergarten entry, with some even advocating beginning in infancy (Lally, 2010; Snow, 2006; Wilen, 2003). This is significant given that kindergarten teachers judge approximately one-third of children as unprepared for kindergarten-level work (Ramey & Ramey, 2004; Wilen, 2003).

Successfully adapting to and succeeding in the classroom context is highly influenced by the child's cognitive and social-emotional development as well as the educational environment itself. Specifically, the component of social-emotional development deserves increased attention in the consideration of a child's readiness for early education. Temperament theory provides a useful framework for conceptualizing this aspect of development. Differences in temperament affect how children interact with the world around them, learn, and develop. Knowledge of childhood temperament can help identify why some children are more prepared for

formal schooling than others. Moreover, a consideration of temperament theory may facilitate educators' use of classroom management strategies and interventions to provide children with varied temperaments an equal chance at early academic success (Keogh, 2003).

Early Readiness for School

The Promotion of Early Education

In the year 1989, President Bush and the state governors established six goals for education in the United States. Their number one goal was that "by the year 2000, all children will start school ready to learn" (Lewit & Schuurmann Baker, 1995). Currently our nation is engaged in a discussion on making public preschool mandatory for all children as a means of promoting readiness for formal schooling. Early childhood education has received increased funding and is being offered to an increasing number of children (LoCasale-Crouch, Mashburn, Downer, & Pianta, 2008). According to the Institute of Education Sciences in the U.S. Department of Education, in the 2007-2008 school year 27, 658 public schools had prekindergarten, a notable increase from about 19,000 in 2000-2001 (Desshoff, 2010). In 2008-2009 enrollment in state-funded prekindergarten programs increased by about 81,000 from the previous year to include 1.2 million children, according to The State of Preschool 2009, the annual survey of state-funded preschool programs by the National Institute for Early Education Research (NIEER) at Rutgers University. NIEER researchers found that at age 4 thirty percent of children in the U.S. attended a state-funded preschool program and total funding for state

prekindergarten rose to more than $5 billion in 2008-2009, an increase of $446 million from the previous year. However, due to the current state of the economy and declining state revenues the future of public preschool is in jeopardy (Desshoff, 2010).

Starting school early does not seem to constitute a risk factor for school readiness. Younger first graders, as a group, progressed similarly to the older first graders across the course of first grade (Morrison, Griffith, & Alberts, 1997). There are good reasons to favor an early, structured learning environment. Evidence suggests that high-quality, comprehensive prekindergarten experiences can ameliorate the negative effects of poverty on children's academic, social, and self-regulatory competencies (LoCasale-Crouch et al., 2008). High quality preschool programs provide children with vital early learning experiences and opportunities. This is especially true for children whose families lack the resources for essential child development (Ramey & Ramey, 2004). Young children deserve access to a quality preschool as this experience relates to higher achievement, better social and behavioral skills, and a decreased chance of grade retention (Perez & Dagen, 2009). Enriched preschool opportunities better prepare children to successfully navigate the demands of formal education (Espinosa, Thornburg, & Mathews, 1997).

This promotion of early education programs is focused on achievement in this country, whereby prekindergarten and kindergarten are largely seen as training for entering the first grade (Elkind, 2008). However, an achievement focused, drill and testing learning environment may not be in the best interest of our young children.

Possessing strong academic skills is not the most important determinant of success in kindergarten and first grade. Moreover, research does not support the notion that early academic training and an array of educational tools is most beneficial for long term learning and achievement (Elkind, 2008). Instead, for very young children education should focus on learning through play and exploration (Perez & Dagen, 2009). A place for discovery, play, and socialization was the original model of kindergarten in the United States when it began in Boston in 1860. This stance was maintained for 100 years (Welch & White, 1999). Although cognitive aspects are important, successful preschool education should also include a focus on social, emotional, linguistic, and physical domains of development (Perez & Dagen, 2009).

Defining Early Readiness

Given the endorsement of structured preschool, an operational definition of readiness for this early transition to education is required. Readiness is conceptualized as two separate concepts, readiness to learn and readiness for school (Kagan, 1990; Lewitt & Baker, 1995). Readiness to learn is the level of development at which an individual of any age is ready to undertake the learning of specific material. It includes individual characteristics or qualities that are influenced by environmental factors. Children are always ready to learn, unless significant impairment interferes with brain function (Farran, 2011). Readiness for school on the other hand refers to a fixed standard of physical, intellectual, and social development that allows the individual to fulfill school-specific requirements and assimilate into the classroom context (Kagan, 1992).

Historically, readiness has been considered using a maturationist frame, often traced to Gesell (1928). When children are mature enough, i.e. reach a certain age, they are ready to begin schooling (Snow, 2006). This perspective assumes that children should attain a fixed standard of skills and behaviors, which develop over time, before attending school (Kagan, 1992; Perry, Dockett, & Tracey, 1998). In other words, development enables learning. Requiring a certain skill set prior to school entry has been challenged by a transition to school framework whereby children's readiness is viewed as personal abilities dependent upon the broader contextual perspective in which they are situated (LoCasale-Crouch et al., 2008).

School readiness must then be understood as an interaction between the child's development and elements of his or her environment (Snow, 2006). Recent developmentally and ecologically informed models of the school transition consider the wide array of environmental inputs to the child as well as the ways in which these inputs interact with one another over time, rather than solely relying on the child's skills or influences on those skills to understand the transitional period (Pianta & Rimm-Kaufman, 2006). This interactionist/constructivist theoretical perspective suggests that children possess an innate knowledge that fosters creativity and a desire for problem solving. Through their interaction with the environment children learn by continuously developing and testing hypotheses about the world (Welch & White, 1999). If learning precedes development, then all schools must be ready for children to learn (Kagan, 1992). Therefore, in transactional models children's readiness involves the concept of ready schools and understanding school

readiness requires a consideration of the specific school environment (Snow, 2006). The association between the child's level of social-emotional and intellectual development and the particular expectations and demands of the learning environment influences readiness (Elkind, 2008).

Although there is no professional consensus on the definition of readiness (Carlton & Winsler, 1999; Farran, 2011; Kagan, 1992; Snow, 2006), several components are agreed upon. Readiness is a multifaceted construct that includes physical, social, emotional, linguistic, and behavioral components. It involves the relation between a child's level of social-emotional and cognitive development and the particular expectations of the academic program (Elkind, 2008; Kagan, 1992; Snow, 2006). School readiness is a multidimensional construct and more evidence is needed to describe how these dimensions influence one another (Farran, 2011).

Assessment of School Readiness

Another difficulty coupled with a lack of a uniform definition of readiness is how to best assess it. One of the first assessment tools of school readiness is the Gesell School Readiness Test (GSRT), which focuses on individual skills acquired through maturation (Ilg, Ames, Haines, & Gillespie, 1978). Some other frequently used skill-oriented measures include: the Developmental Indicators for the Assessment of Learning (DIAL-R; Mardell-Czudnowski & Goldberg, 1998), the Brigance Diagnostic Inventory of Early Development (Brigance, 1992), the Lollipop Test (Chew & Lang, 1990), and the Phelps Kindergarten Readiness Scale (Augustyniak, Cook-Cottone, & Calabrese, 2004; Duncan & Rafter, 2005).

Measures, such as these, adhere too strictly to the accomplishment of specific tasks and tend to misclassify many children as not ready for school (Janus & Offord, 2007). These assessments are currently used to provide a basis for decision-making regarding school retention, tracking, services, or as performance standards for schools accountability (Janus & Offord, 2007).

Educators and others frequently denounce the use of these readiness screening tests to determine readiness for school due to questionable reliability and validity (Hains, Fowler, Schwartz, Kottwitz, & Rosenkoetter, 1989; Lewit & Schuurmann Baker, 1995). Moreover, these assessments cannot account for a substantial amount of variability in later achievement. In a meta-analysis of early screening and school outcomes, La Paro and Pianta (2000) estimated an average correlation of .49 between screenings and later cognitive outcomes, a moderate effect size accounting for less than one quarter of the variance, and a predictive correlation of only .27 with socio-emotional outcomes. We need valid and reliable measures of school readiness given the concerns with skill-focused assessments.

In an attempt to appropriately broaden the assessment criteria of school readiness, researchers developed the Early Development Instrument (EDI, Janus & Offord, 2007). The EDI is a psychometrically sound instrument that examines the constructs of physical health and well-being, social competence, emotional maturity, language and cognitive development, communication skills, and general knowledge in the assessment of school readiness (Janus & Offord, 2007).

Teachers' and Parents' Ideas of School Readiness

While formally readiness is typically measured using chronological age and mastery of skills, informally it is defined as the expectations regarding the abilities and skills a child should enter the classroom with to be successful (Espinosa et al., 1997). Teachers and parents hold specific ideas regarding essential characteristics for school readiness. Skill-focused assessments fail to align completely with their perceptions of readiness, which is also social and behavioral (Hains et al., 1989). The most important qualities identified by both parents and teachers are: 1) being well rested and physically healthy, 2) effectively communicating needs, wants, and thoughts, and 3) having enthusiasm and curiosity for approaching new activities (Harradine & Clifford, 1996; Lewit & Schuurmann Baker, 1995; Welch & White, 1999; West et al., 1993). Both groups also noted, albeit with less consensus, not disrupting the class, knowing English, being sensitive to others, taking turns, sitting still, and paying attention as moderately important characteristics (Harradine & Clifford, 1996).

Skill focused abilities (e.g. counting, identifying colors and shapes, knowing the alphabet, problem solving) are generally rated more important by parents than kindergarten teachers (Harradine & Clifford, 1996; Lewit & Schuurmann Baker, 1995; Welch & White, 1999; West et al., 1993). A survey of kindergarten teachers revealed only a small number believed knowledge of shapes, colors, numbers, and letters was essential for success in the kindergarten classroom (Heaviside, 1993). Kindergarten teachers generally rate social and communication skills as more

important than these cognitive skills (Davies & North, 1990; Heaviside, 1993; Lin, Lawrence, & Gorrell, 2003). A national survey of more than 7,000 kindergarten teachers conducted by the Carnegie Foundation for the Advancement of Teaching (Boyer, 1991) indicated that teachers judged children as unready for the following reasons: problems with language (88%), emotional immaturity (86%), lack of general knowledge (83%), and lack of social confidence (80%). Preschool teachers often encourage talking as it promotes communication and language skills (Hadley, Wilcox, & Rice, 1994) and rank basic social interaction and communication among the most important skills for children to acquire (Hains et al., 1989).

Social-Emotional Readiness for School

Social-emotional aspects of school readiness are very important to teachers and parents, and for good reason. A child's ability to regulate his or her emotionality and maintain positive relationships with others is strongly linked to academic learning. Preschoolers who struggle with this will have difficulty succeeding in school (Raver & Knitzer, 2002). Emotional well-being and academic success likely have a bidirectional effect whereby feeling unready for the challenges of schooling can generate an array of negative emotionality from the child (Raver, 2002). Children who have difficulty paying attention, following directions, getting along with others, and controlling negative emotions are not as prepared for school (Arnold et al., 1999; McClelland, Morrison, & Holmes, 2000; Raver & Knitzer, 2002). Risk factors for poor social-emotional well-being include low income, low maternal education,

and single parent status. Research suggests that 32% of kindergartners face one demographic risk, and 16% face two or more (Raver & Knitzer, 2002).

Social exchanges with peers and teachers have important implications for development and school adjustment. Given that the classroom context is highly social, a child's readiness to enter this environment is dependent upon his or her ability to get along with peers and teachers. Teachers tend to focus on social competency in the assessment of adjustment to kindergarten (Slee, 1986). Relevant social skills for adaptation to the classroom context include interacting positively, cooperating, sharing, and respecting others (McClelland et al., 2000). Troublesome relationships with peers can lead to poor achievement in kindergarten and a negative attitude toward school in general (Raver, 2002; Ladd, 1990; Welsh, Parke, Widaman, & O'Neil, 2001).

Strength of communication skills is central to the teacher-child relationship. Children who do not communicate well are likely to have poor relationships with their teachers since they are unable or unwilling to engage in social interactions with them (Rudasill, Rimm-Kaufman, Justice, & Pence, 2006). It is also important to consider the positive or negative effect teachers can have on their students' emotionality. Having a poor relationship with a teacher increases the probability that a child will be referred for special education (Pianta, Steinberg, & Rollins, 1995), a strong indicator of later school dropout (Alexander, Entwisle, & Horsey, 1997). Conflict in the teacher-child relationship during early school transitions (kindergarten through grade 3) is also associated with faster rates of increasing externalizing behavior problems

controlling for negative parenting and prior externalizing behavior. Moreover, decreases in externalizing behavior are correlated with teacher-child closeness (Silver, Measelle, Armstrong, & Essex, 2005).

Temperament Theory and Social-Emotional Readiness

Definition of Temperament

Temperament theory provides a useful way to examine children's social-emotional development and its association with school readiness. Similar to the construct of readiness, the definition of temperament is still in the process of refinement. Points of consensus regarding the construct of temperament among theorists include: (1) temperament dimensions represent predispositions and are not deterministic, (2) there is a biological basis to temperament that is somewhat stable over time, (3) the construct concerns individual differences, rather than universal patterns of development, and (4) temperament is modifiable over time due to the environment (Goldsmith, Buss, Plomin, & Rothbart, 1987). Taking these points of agreement into consideration, a current conceptualization of temperament refers to Rothbart's notion of individual differences in reactivity and regulation evident in behavioral dimensions (2007). Many of these dimensions are related to emotionality, a concept central to Goldsmith's theory.

The term constitutional refers to the biological basis of temperament, which is influenced over time by heredity, maturation, and experience. Reactivity is a broad domain of temperament, defined by latency, duration, and intensity, that refers to one's reaction to internal and external stimuli. Regulation, specifically self-regulation,

refers to processes that moderate (either enhance or inhibit) reactivity (Rothbart & Bates, 2006). Behavioral dimensions of reactivity and regulation that pertain to school readiness include behavioral inhibition/withdrawal, approach/extraversion, negative affect/distress, positive affect, interest, activity level, distractibility/attention shifting, attention focusing/persistence, effortful control, and adaptability. Effortful control fits within the broader concept of self-regulation and generally refers to the ability to inhibit a prepotent response and instead activate and perform a subdominant response (Murray & Kochanska, 2002; Posner & Rothbart, 2003; Rothbart & Bates, 1998; Rothbart, Sheese & Posner, 2007). The dimension of effortful control overlaps with the constructs of executive function, inhibitory control, and attention regulation. The temperament dimensions of activity level, distractibility, and persistence constitute a “task orientation” factor, which is particularly relevant for school achievement (Martin, 1989).

Assessment of Temperament

Temperament traits are most commonly studied in infants and children. The tendency to focus measurement approaches within the first few years of life derives from the shared assumption that the association between temperament and behavior becomes increasingly complex as the child matures. Later in development relatively pure temperamental expression is likely only evident when a novel environment renders coping skills ineffective (Thomas & Chess, 1977). Temperament is assessed using a variety of methods including caregiver-, self-, and experimenter-reports, as well as naturalistic, structured laboratory, and home

observations. There are strengths and weaknesses associated with each approach to measuring differences in temperament.

Most researchers advocate employing a variety of measures for studying temperament (Bates, 1994; Rothbart, 1995; Rothbart & Hwang, 2002). While caregiver questionnaire data can introduce biases and inaccuracy (Kagan, 1994, 1998), it does have broadly established validity (Rothbart & Bates, 1998). Questionnaires of young children's behavior for temperament study are also convenient and allow access to an extensive knowledge base of children over time across a variety of contexts (Bates, 1989). Observational measures lack strong evidence of reliability and validity (Goldsmith & Hewitt, 2003; Rothbart & Bates, 2006), can be time consuming and expensive, and the behaviors elicited can be quite limited. This is due to both physical constraints of the lab space and ethical constraints of assessing temperament under aversive conditions (Rothbart & Bates, 2006). However, laboratory observations do allow researchers to precisely control the context, protecting against potential confounds that could alter the child's behavior (Rothbart & Bates, 2006). Using both parent and observer ratings of children's behavior may provide a more accurate and comprehensive understanding of temperament. Adopting a multi-method approach to studying temperament can minimize the weaknesses of each methodology while capitalizing on their respective strengths.

Temperament in the School Context

The interaction between temperament and context is complex and bidirectional; the environment alters the expression of temperament and a child's temperament influences his or her encounters with the environment (Carey, 1981). The transactional model, which proposes that the interaction of an individual's characteristics and his or her environmental experiences determines developmental outcomes rather than either of these factors in isolation (Sameroff & Fiese, 1990), supports this concept. Thomas and Chess's influential "goodness of fit" model (1977) also stresses the importance of considering the interaction between a child's genetic predispositions and surrounding environmental context. "Goodness of fit" involves the examination of the properties of the environment, namely its demands and expectations, in relation to an individual's capacities, characteristics, and behavioral style. When the two act in accordance with one another this is known as a "good fit" and optimal development is possible. Conversely, if qualities of the environment and the individual are discrepant, a "poor fit" exists and maladaptive development is likely (Thomas & Chess, 1977). The "goodness of fit" concept has been widely used in describing parent-child interactions both theoretically and clinically (Lerner, 1982). This same model may also be used to illustrate student-student and student-teacher interactions (Keogh, 1986a, 1986b).

The classroom represents a specific environmental context for considering children's expression of temperamental predispositions. Martin (1983, 1989) and Keogh (1982, 1989), the principal investigators of the associations between

temperament and the school context, generated many influential ideas in need of further investigation today. Children encounter many demands and challenges in the classroom context that differ from those of the home environment. The traditional, formal school setting places higher demands on attention, interest, and behavioral control compared to the home (Goldsmith, Aksan, Essex, Smider, & Vandell, 2001). Distraction and interruption are also typical components of the traditional classroom context that children must adjust to. Moreover, children need to learn how to successfully navigate various transitions throughout the school day (Keogh, 2003).

Certain aspects of temperament are more easily observed and documented than others in this context. Temperament dimensions that are most disruptive to classroom routines, or “outward” traits such as high levels of activity or negative affect, are frequently noticed and acknowledged. Conversely, “inward” traits, such as withdrawal, receive much less attention (Boudreault & Thivierge, 1986). In general, inhibited children receive less attention from their teachers compared to their more outgoing peers (Martin, Nagel, & Paget, 1983).

School psychologists use the term “academic enablers” to describe aspects of temperament that relate directly to a child’s participation in and benefit from academic instruction in the classroom (DiPerna & Elliott, 1999, 2000; DiPerna, 2006). Four specific academic enablers identified in the literature include interpersonal skills, study skills, motivation, and engagement (DiPerna & Elliott, 2000; Greenwood, 1991; Wentzel, 1993; Wigfield & Karpathian, 1991). Academic enablers are important predictors of children’s readiness for the classroom

environment and their ability to be successful in this context. These specific aspects of children's temperament should be considered within assessment and intervention practices in schools (DiPerna, 2006).

Temperament and Social-Emotional Readiness for School

Understanding differences in temperament is essential to the consideration of school readiness since it relates to children's adjustment to the classroom (Martin, 1983; Keogh, 1986a, 1986b; Nelson, Martin, Hodge, Havill, & Kamphaus, 1999). The success of transitioning from the home to classroom context will vary based on temperament. Certain temperaments are better aligned with the constraints and characteristics of a particular educational environment, a specific example of the "goodness of fit" theory. "Goodness of fit" between the classroom context and children's temperament implies that certain children will enter the classroom more prepared to successfully transition than others on the basis of their temperament (Keogh 1986a, 1986b). A child with a low threshold of responsiveness may have a difficult time adjusting to the classroom environment due to the overwhelming nature of sensory input (e.g. stiff, uncomfortable desks, the hum of the lights or radiator, or distracting sounds from other students in the classroom) (Keogh, 2003). Keogh and Speece (1996) designated three aspects of the classroom environment that can influence the fit between students and their educational context. These included the content and structure of instruction and the curriculum, the organization and management of space, time, and resources, and the nature of interactions between students, their peers, and teachers. Children who experience a "good fit" with their

classroom context, based on particular aspects of temperament, can be expected to adjust more easily.

The traditional classroom setting imposes various constraints on the expression of temperament. In this setting, children are often expected to sit still and sustain attention for seemingly long periods of time. Children are also asked to follow directions, transition relatively quickly between activities, and wait to speak. Given this typical educational environment, one might expect a “ready” temperament to be high on adaptability, attention focusing, and persistence and low on activity level. The children that teachers classify as “teachable,” or ready, can be differentiated from other students in the classroom in terms of their temperament. A child who is able to regulate activity level and emotionality, focus attention, persist, and withstand distractions, is seen as more ready for formal instruction compared to a child who does not have these temperamental tendencies (Keogh, 1986a).

Temperament dimensions of activity level, distractibility, and persistence, which load highly on a “task orientation” factor, are most related to being ready for the transition to school. Adaptability and approach are also significantly related to school achievement and have high loadings on a “social adaptability” factor (Martin, 1989; Martin, Olejnik, & Gaddis, 1994). The literature widely recognizes low activity, high persistence, and low distractibility as characteristics of temperament associated with academic success (Martin, Drew, Gaddis, & Moseley, 1988; Martin, 1989; Martin & Holbrook, 1985; Orth & Martin, 1994). Children with this type of temperament are expected to experience a “good fit” with the traditional classroom

environment, be prepared to learn, and therefore more easily transition to the school context.

Temperament is also conceptualized as a readiness variable since it is largely responsible for determining how easily children are able to acquire learning. The ability to regulate emotional reactivity is a key component of school readiness (Blair, 2003). Regulatory temperament relates directly to the ability to plan, a metacognitive or executive skill, which is necessary to gain knowledge and succeed in school (Perez & Gauvain, 2009). The dimension of effortful control, which consists of the ability to voluntarily focus and shift attention, exercise inhibitory control (i.e. suppress inappropriate responses), enact activation control (i.e. perform an action despite a strong inclination to avoid it), plan, detect errors, and sustain working memory (Derryberry & Rothbart, 1997), likely involves executive functioning (Zhou et al., 2007). Executive functioning is a broad construct that involves cognitive processes central to self-regulation and goal-directed activity. Children who lack effortful control have difficulty regulating attention, emotion, and behavioral impulses. These children will likely not transition to school smoothly due to problematic and disruptive behavior in the classroom (Eisenberg & Morris, 2002; Olson, Sameroff, Kerr, Lopez, & Wellman, 2005).

Temperament and Social Interactions with Peers and Teachers

Temperament is also directly related to social skills, an important characteristic of school readiness. McClelland and her colleagues linked aspects of social skills to self-regulatory characteristics of temperament (McClelland et al.,

2000; McClelland & Morrison, 2003; McClelland, Acock, & Morrison, 2006). Specifically, self-regulation and attention are cited as two main components of learning-related social skills (McClelland & Morrison, 2003). Children who are able to focus and pay attention will perform better academically upon entering school (Alexander, Entwisle, & Dauber, 1993). Possessing these important regulatory aspects of temperament is essential for both the initial adjustment to school and continued academic success as they provide the foundation for positive classroom behavior (McClelland & Morrison, 2003; McClelland et al., 2006).

Temperament differences can largely explain why some students are able to develop and maintain positive relationships with their peers and teachers while others cannot. For example, positive affect promotes the development of socially appropriate emotional expression. Children who do not express themselves in a socially appropriate way are more likely to be victimized by peers, while those who are rated as compliant and less disruptive are more likely to be accepted by their peers following the transition to kindergarten (Goldsmith et al., 2001). Appropriately expressing one's emotions can lead to positive interactions with others. Additionally, a child who is highly positive is likely to show increased and sustained empathic responding (Robinson, Zahn-Waxler, & Emde, 1994). Research shows that early positive affect predicts the development of prosocial empathy-related helping behavior in 2-year-olds (Volbrecht, Lemery-Chalfant, Aksan, Zahn-Waxler, & Goldsmith, 2007). The development of empathy fosters concern and helping behavior toward others, leading to positive social interactions. Children who are

prone to negative affectivity (e.g. anger, sadness) may be less likely to forge positive relationships with others. Children who are low in activity, withdrawn, and quiet are also at risk for adjustment problems since they tend to approach others less and are especially sensitive to feedback (Balck, Glass, & Cheng, 1998).

Both uninhibited and inhibited temperament types are implicated in poor interpersonal relationship formation. An extremely uninhibited child is at risk for later aggression problems (Kagan & Snidman, 2004). On the other hand, inhibited, withdrawn children are at serious risk for developing anxieties in social situations with unfamiliar others, such as new classmates (Coplan & Arbeau, 2008). Withdrawn children also take longer to initiate conversation and speak less frequently than their non-withdrawn counterparts (Asendorpf & Meier 1993, Coplan, Arbeau, & Armer, 2008). When they do interact with their peers, withdrawn children appear less socially competent than other children (Rubin & Krasnor, 1986). Both aggressive and withdrawn temperamental tendencies are associated with peer neglect and rejection (Rubin, Bukowski, & Parker, 1998). Aggressive children may encourage peer victimization by provocation, while withdrawn children are likely perceived as easy targets for peer victimization (Rubin, Coplan, & Bowker, 2009). Forming quality relationships is essential for adjusting to the classroom and certain aspects of temperament lend themselves well to positive social interactions, while others do not. Generally, children who are better at self-regulating their emotional states are apt to experience more positive relationships with their peers (Rubin, Coplan, Fox, & Calkins, 1995; Stocker & Dunn, 1990).

It is important to consider children's relationships with their teachers in addition to relationships with their peers. Resnick and colleagues (1997) proposed that a positive and supportive teacher-child relationship may heighten a child's chances for academic success since teachers would be more willing to provide extra support to these children. However, based on differences in temperament, some children are less likely to engage in positive interactions with their teachers. For example, uninhibited children with poor language skills are more likely to experience conflict in their relationships with teachers compared to inhibited children with better language skills (Rudasill et al., 2006). Uninhibited children are approach-oriented and show little fear toward the unfamiliar (Kagan, 1994). These children are assertive, attention seeking, less regulated in the classroom, and are more likely than less uninhibited peers to exhibit problem behavior that disrupts classroom activities (Keogh, 2003). Additionally, teachers tend to view emotionally expressive children as unregulated (Eisenberg et al., 2003). Teachers find these uninhibited, poorly regulated children more problematic in the classroom setting and tend to engage in negative, conflictual relationships with them. However, this type of relationship may be preferred over one more typical of withdrawn or inhibited children, who are more likely to be ignored by their teachers altogether (Rudasill et al., 2006).

Teachers' behaviors/attitudes toward and expectations for their students are influenced by their students' temperaments (Keogh, 1989; Keogh, 2003). Teachers place constraints on the expression of temperament beyond those imposed by the

educational context by preferring certain temperamental characteristics in their students. In general, teachers display a bias based on children's temperament as to which students are more "teachable," or ready for school, than others. Children who fit this classification exhibit high attention, approach, and adaptability coupled with low activity and reactivity and are especially valued by teachers (Keogh, 1982, 1986a; Martin, 1989). A study of British infant (kindergarten) school teachers revealed that the ideal pupil was low in reactivity, adaptable, and high on the "task orientation" factor (Klein & Ballantine, 1988). Teachers view ideal, "teachable" students in a more favorable light and thus are likely to provide them positive and frequent support and attention, fostering positive social interactions essential to successful adjustment. However, Paget, Nagle, and Martin (1984) found that teachers gave more attention to students who were less adaptable, less attentive, and more withdrawn possibly because they felt these students required more support to succeed. However, this particular support was likely more instructive and formal in nature. Temperament influences teaching style and interpersonal interactions with students, therefore educators need to recognize these biases to better support children with various temperaments in the classroom.

Additionally, teachers' own temperament styles influence how students adjust to the classroom (Keogh, 2003). For instance, Zeller (2004) discovered that depressed teachers were more likely to report close relationships with their students. Therefore, regardless of the student's temperament, a teacher who was depressed was more likely to report high quality social interactions with him or her. However,

this study did not indicate whether or not these students viewed the relationship in a similar way. Conversely, a highly sociable and positive teacher might be expected to maintain more reciprocally positive social interactions with many different students in the classroom. Teachers also differ in regard to how they interpret and value temperament differences in their students. Based on the specific temperament characteristics of the teacher, a child who is highly active and approaching may be seen as either a joy or a burden to interact with (Keogh, 2003).

Revisiting the concept of “goodness of fit”, the fit between the differing temperaments of children, their peers, and their teachers in the classroom is central to children’s social-emotional adjustment. It is the interaction among temperaments that is crucial for positive adjustment (Keogh, 2003). A specific illustration of this idea is that a highly active and distractible child would seem to adjust to school best with a persistent and patient teacher. A “good fit” results when a child’s temperamental tendencies and actual behaviors align with the teacher’s expectations for that child’s classroom behavior (Keogh, 1989).

Present Studies

In study one, using temperament, behavior, and cognitive items, 4-year-old kindergarten teachers identified characteristics of actual children they recalled as being most ready for school in the initial weeks of entering their classrooms. Study two examined the degree to which an existing sample of 3-year-olds were socially and emotionally ready for preschool based on similarity to the teacher-identified ready children from study one. I investigated potential predictors of these readiness

outcomes. Additionally, for a subset of children, I examined the associations of early school readiness and cognitive outcomes around age seven, near the start of first grade.

It is of particular interest that I assessed school readiness prior to preschool entry, at 36 months. This age marks the end point for birth to three programs. At age 3 years children's issues with development and learning become the responsibility of the schools. Examining readiness earlier than most of the literature, which focuses primarily on readiness for 5-year-old kindergarten and/or grade 1 (ages 5-7), is consistent with the current promotion of nationwide mandatory public preschool (Desshoff, 2010) and an investigation of the experiences that lead to the skills necessary for early school readiness and success (Farran, 2011; Lally, 2010; Snow, 2006; Wilen, 2003).

Hypotheses

Study One

I expected that varied descriptions of ready children would emerge from the preschool teachers' perspectives. The characteristics of ready preschoolers were compared to the ideas teachers and parents hold for kindergarten readiness in the literature. In terms of the specific characteristics preschool teachers associated with ready 4-year-old children, I expected that they would differ somewhat from those for older children developmentally. Based on the literature I predicted that preschool teachers would select temperament and behavior items related to high levels of

emotion regulation and persistence, and low levels of activity and distractibility as very characteristic of a child who was ready for school.

Study Two

I expected children's readiness, as determined by similarity to the preschool teacher-chosen children from study one, to be influenced by parent-child interactions, status variables, and earlier temperament. I hypothesized that children with the highest readiness scores had parent-child teaching interactions with high social-emotional and cognitive growth fostering, came from higher SES families, and displayed 12-month temperament that corresponded to teacher-noted characteristic aspects of readiness. Specifically, children in our existing sample with characteristics that more closely matched the ready children were expected to display: low activity level, low distress to novelty, low distress to limitations, high duration of orienting, high soothability, and high smiling and laughter as rated by parents at 12 months.

Additionally, I expected that children's similarity to preschool teacher-chosen ready children would predict later cognitive performance. Children who were rated as highly similar to ready preschoolers were expected to have higher scores on follow-up measures of vocabulary, visual abstract ability, spatial analysis, and abstract visual problem-solving.

CHAPTER 2: METHODS

Study One

Participants

I obtained a sample of local licensed preschool teachers (N = 29) to develop clusters of ready preschoolers. Teachers needed to have completed at least one year of teaching 4-year-old kindergarten to participate. The sample of 4-year-old kindergarten teachers identified themselves as exclusively White and female, with one teacher of Latino origin. Teachers ranged in age from 26 to 60 years (*M* = 41.17 years, *SD* = 9.457). Teachers reported having 2 to 31 years of teaching experience overall (*M* = 12.79, *SD* = 7.93) and 1 to 24 years of experience specifically teaching preschool, or 4-year-old kindergarten (*M* = 6.52, *SD* = 5.77).

Procedure

I contacted administrators and principals at 20 public school districts and six private schools for permission to contact preschool teachers. Thirteen of the districts and three of the private schools agreed to participate, two districts declined (one due to disinterest and one because it was the first year of their 4-year-old kindergarten program), and I was unable to confirm contact for five districts and three private schools. From this sample I was able to contact a total of 60 teachers for this study. Twenty-nine teachers agreed to participate and I was unable to confirm contact for 31 teachers. No teacher I was able to contact refused to participate. Upon agreeing to participate I arranged to meet the teacher at a location of her choosing to perform the assessment.

Teachers completed a consent form, demographics questionnaire, and two Q-sorts of cognitive, behavior, and temperament items (see Appendix). These sorts identified specific characteristics of children they had previously taught and believed were especially ready for their preschool classrooms. To ensure the teachers were comfortable with this Q-sort method, a small practice sort of 10 items describing a celebrity was performed with guidance prior to the actual readiness sorts. Additionally, I was present during the entire assessment to answer any questions the teachers had while performing the task. I gave teachers a $25 gift card for their participation.

Items for the Readiness Q-Sorts

Questionnaire Measure

The Children's Behavior Questionnaire (CBQ -106 item version, Rothbart, Ahadi, Hershey, & Fisher, 2001). The CBQ is a parent-report instrument that assesses temperament in children ages 3 to 8 years. Alpha coefficients for the 15 scales range from .67 to .94 (Rothbart et al., 2001). Using a 7-point scale, parents decided whether or not each item was true or untrue (1 = extremely untrue, 7 = extremely true) of their child within the past 6 months. To assess children's readiness for preschool, a selection of 60 items from the activity level, anger, approach, attention focusing, inhibitory control, sadness, shyness, smiling and laughter, and attention shifting scales were used. I selected items for the present analysis based on relevance to the school context and teachers' ability to evaluate them.

Observational Measures

Bayley Scales of Infant Development-Second Edition (Bayley, 1993). This individually administered examination assesses the current development and functioning of children ages 1 to 42 months of age. I used items from the Mental Scale and Behavior Rating Scale (BRS) in this study. The Mental Scale has a reported test-retest reliability of .91 at 3 years. Nine items that assess memory, habituation, problem solving, early number concepts, generalization, and classification were used. These items are scored dichotomously as correct or incorrect. The BRS examines qualitative aspects of the child's test taking behavior. I included these items on the basis that children's behavior in a novel situation with an experimenter may be comparable to their behavior in a new school setting with a teacher. Aspects of orientation/engagement, emotional regulation, and quality of movement were scored on a 1-5 scale. Test-retest reliability for the BRS ranges from .61 to .71 at age 3 years. Twenty-one items were used in this analysis (See Appendix for a complete listing of the 90 items).

Determination of Ready Clusters by Preschool Teachers

Twenty-nine preschool teachers performed two separate Q-sorts each to identify the characteristics of two children (one boy and one girl) who they deemed ready for preschool. Temperament, behavior, and cognitive items from the CBQ, the BRS, and the Bayley Mental Scale respectively were used to create the 90 items for the Q-sort. Again, item selection was based on appropriateness for teacher consideration and relevance to school readiness. Items on the CBQ that I

considered too parent-specific (e.g. “Sits quietly in the bath,” “Rarely gets upset when told s/he has to go to bed”) were not included in this analysis. Items from these measures were converted into statements that reflected the hypothesized positive direction for readiness as described by the literature. Specifically, the set of items reflected high levels of cognitive skill, controlled behavior, orientation/engagement, emotional regulation, quality of movement, approach, attention focusing, inhibitory control, and smiling and laughter, and low levels of activity, anger, sadness, shyness, and attention shifting. I printed each item on its own 3x5 index card for use in the Q-sort.

I asked each teacher to consider two particular children, one boy and one girl, that she felt was especially ready for preschool and sort the 90 items twice, once for each child’s characteristics. I specifically informed teachers that these two highly ready children could be quite different from or very similar to one another in terms of their characteristics. The Q-sorts required teachers to place each of the 90 index cards into one of nine small sleeves lined up in a row on the table. The first sleeve (numbered “1”) was for cards that were least descriptive of the child, while the ninth sleeve (numbered “9”) was where teachers placed cards that best described the child. I instructed teachers to begin by making three general piles (not necessarily containing the same number of items) of “not like this child,” “somewhat like this child,” and “a lot like this child” and then to sort the items into the nine categories. Items “not like this child” were divided into sleeves 1-3, “somewhat like this child” into sleeves 4-6, and “a lot like this child” into sleeves 7-9. The Q-sort technique

forced teachers to make multiple comparisons among the items in the sort since each of the nine sleeves needed to contain exactly 10 cards. After each sort was completed, I recorded the placement (sleeve 1-9) of each of the 90 items.

Cluster analysis of the teachers' sorts identified characteristics of children they considered ready for preschool. The final clusters depicted hypothetical 4-year-olds considered ready for school by preschool teachers. These final clusters had an average placement score for each of the 90 items in the sort. I expected a maximum of two or three clusters for each gender, some of which may be similar for both girls and boys.

Analyses

Statistical Approach

I employed K-means cluster analysis using SPSS on the Q-sort data to reveal common clusters of hypothetical children who were deemed ready for preschool across teachers. Because I asked teachers to identify the sex of the children used to perform the Q-sorts, the clusters were also examined for gender differences. Furthermore, I considered the placement of the various assessment item types (i.e. temperament, behavior, cognitive) in relation to one another in the sorts.

Study Two

Participants

Participants were 662 (332 girls, 330 boys) twins (331 pairs) studied at 36 (*M* = 36.73, *SD* = 1.02) months of age. Many children (N = 400) were also examined earlier, at 12 (*M* = 12.71, *SD* = 0.81) months of age. A subsample was also followed

up at approximately 7 years of age (N = 27, *M* = 88.37 months, *SD* = 5.29). These twins were born between the years of 1991 to 2000, and were recruited from: Wisconsin state birth records, the Mothers of Multiples group, advertisements seen on local television, newspapers, doctors' offices, the Internet, and/or word of mouth. This sample was selected such that all families lived in or around (within an hour drive of) Madison, Wisconsin. The sample was overwhelmingly White (93.1 %) with the remainder divided between the categories of African-American (2.4%), Hispanic (2.4%), Asian-American (1.5%), and American Indian (0.6%).

Procedure

Children participated in a laboratory visit at 36 months of age. From this visit information on the Bayley Scales of Infant Development and the Nursing Teaching Assessment was obtained. Upon arriving to the laboratory, experimenters gave parents a packet of questionnaires, containing the CBQ, to complete and return within two weeks. Some of the parents also completed a temperament questionnaire at 12 months. Approximately 4 years later, a subset of the children (N = 27) participated in a follow-up phase where cognitive performance data was collected.

Questionnaire Measures

The Infant Behavior Questionnaire (IBQ, Rothbart, 1981) was used to assess infant temperament through parental report when children were 12 months old. The items assessed the child's typical behavior across a variety of situations (e.g., During feeding, how often did the baby squirm or kick? During sleep, how often did the baby sleep in one position only?) and were scored on a 7-point scale (1 = never

to 7 = always). Scores reflected the parents' judgments of the frequency of a specific behavior during the previous week or, for some items, during the past 2 weeks. Scales, along with their respective 12-month internal reliability coefficients, include activity level (AL, .84), soothability (SO, .82), distress to novelty (DN, .81), distress to limitations (DL, .78), smiling and laughter (SL, .80), and duration of orienting (DO, .72). All six scales were used in the present study and internal consistency reliability (α) for the mothers' responses were: .82 for AL, .87 for SO, .79 for DN, .83 for DL, .82 for SL, and .83 for DO. For fathers' responses alpha coefficients were: .81 for AL, .90 for SO, .79 for DN, .80 for DL, .80 for SL, and .81 for DO.

Socioeconomic status. Families' socioeconomic status (SES) was measured via a demographics questionnaire. This questionnaire included 17 items assessing parents race, education, occupation, marital status, and income.

Observational Measures

The Nursing Child Assessment Teaching Scales (NCAST, Sumner & Spietz, 1995; Barnard & Kelly, 1990) is a six scale, 73 presence/absence item assessment tool designed to measure the quality of a teaching interaction between caregivers and their 3-year-old children. Caregivers selected a task for the interaction that they had not yet seen their child perform competently on his or her own from a standardized list of tasks. Experimenters provided caregivers with the materials needed for the task and instructed them to teach their children to complete the task in any manner they felt appropriate. Some of these tasks included writing a letter,

drawing a shape, cutting out a shape, and hopping on one foot. Subscales were created as a summation of the items the parent scored a “yes” on.

Of the six subscales, the following four subscales focus on the caregiver's behavior during the interaction: sensitivity to cues, response to child's distress, social-emotional growth fostering, and cognitive growth fostering. Child-based subscales include clarity of cues and responsiveness to caregiver. For the current study both mothers and fathers participated separately in a teaching interaction with their children and the four caregiver-based subscales were used.

Reported internal reliability estimates for these four scales range from .52 to .80. In the current sample, alpha coefficients for the mothers were .12 for sensitivity to cues, .70 for response to child’s distress, .13 for social-emotional growth fostering, and .34 for cognitive growth fostering. Internal consistency reliability estimates for the fathers were .23, .70, .37, and .51 respectively. The alphas in this sample were particularly low for sensitivity to cues and social-emotional growth fostering compared to published reliabilities. This is likely due to the absence of variability in specific items for our sample. For example, sensitivity to cues items 1, 2, and 3, which concern children’s safety, positioning, and attention at the start of the episode, were always present given our controlled laboratory setting. Also, items in the social emotional scale pertaining to openly criticizing and yelling at the child were almost never displayed. Overall the sample did not display a wide range of parenting behaviors outside of typical parenting practices. A controlled laboratory testing environment coupled with the lack of variation in parenting behaviors ultimately led

to the absence of variation in certain items, causing some reliability estimates to be especially poor and unlike those published.

The *Peabody Picture Vocabulary Test* (PPVT, Dunn & Dunn, 1997) is an individually administered, norm-referenced, wide-range measure of listening comprehension for spoken words in Standard English and a screening test of verbal ability for ages 2-1/2 through 90+ years. It is available in two parallel forms, Form IIIA and Form IIIB. Each form contains four training items followed by 204 test items divided into 17 sets of 12 items each. The sets presented are progressively more difficult. The examinee's task is to select the picture considered to best illustrate the meaning of a stimulus word presented orally by the examiner. The subsample followed up around age seven completed this cognitive assessment.

Block Design. The WISC-III Block Design (Wechsler, 1991) is a performance task of intellectual functioning that tests for two main skills, (1) visual abstract ability and (2) spatial analysis and abstract visual problem-solving. This test measures the child's ability to look at the whole first, then break it into parts, and finally to reconstruct the whole. It provides blocks and pictures of geometric shapes, and the child must put the blocks together to re-create the design shown in the picture. Again, the followed-up sample performed this task.

Children's Preschool Readiness Scores

I applied the final cluster centers from the final cluster solution as determined by the teachers' Q-sorts from study one to an existing sample of children's actual scores on each of the items (as rated by parents on CBQ and experimenters on the

Bayley Mental Scale and BRS) to create readiness outcome scores corresponding to similarity to each of the readiness clusters.

To obtain a more comprehensive picture of child temperament at age 3, I averaged mothers' and fathers' scores on the CBQ items as the correlations were all positive and significant (range: r = .13 -.52), making item reversals as appropriate. I then converted the CBQ and BRS scales to a range of 0-1 so as to be on the same metric as the Bayley Mental Scale items. Therefore, instead of 1-7, the re-scaled CBQ scores were 0, 0.167, 0.334, 0.501, 0.668, 0.835, and 1. The re-scaled BRS scores were 0, 0.25, 0.50, 0.75, and 1. I multiplied the child's actual re-scaled score by the final cluster center (1-9) from the Q-sort. This was done for all 90 items from the sort and the new scores were added together for each child. Thus, to achieve a high score for similarity to a given readiness cluster, the child needed to have high item scores (near 1) for items that teachers ranked highly in the composite Q-sort that defined the readiness cluster. The final summary scores represented measures of that child's readiness for preschool. Higher readiness scores signified a child who more closely resembled the children teachers' identified as ready for preschool in study one; of course, children differed in their similarity to each cluster.

Formation of the Predictor Variables

Parent-Child Interaction. Given that social interactions in the early years are important for school readiness (Lally, 2010); I examined aspects of parent-child interactions during a laboratory teaching task (NCAST) as predictors of preschool readiness. Four subscales were formed from this observation: caregiver's sensitivity

to cues, caregiver's response to child's distress, caregiver's social-emotional growth fostering, and caregiver's cognitive growth fostering. These scale scores were computed separately for mothers and fathers.

Temperament at 12 months. I computed correlations for the six scale scores from the mothers' and fathers' data from the IBQ. The degree of agreement between mothers' and fathers' IBQ scales scores determined whether the scales were used separately for each parent or averaged into one parent score. Given that parents have differing experiences and interactions with their children, assuming shared temperament ratings is inappropriate.

Status variables. Lower SES and level of mother's education are risk factors for lack of early school readiness (Ferguson, Jimerson, & Dalton, 2001; Raver & Knitzer, 2002; Ramey & Ramey, 2004). SES scores were computed using an updated version of Hollingshead's (1957) index, based on parents' education levels and occupations (range: 12 – 66, M = 48, SD = 11.55). I examined SES and sex as potential predictors of children's readiness for preschool.

Cognitive Outcomes

A subsample of the children (N = 27) were studied in a follow-up analysis around seven years of age. Cognitive performance was measured using the PPVT and Block Design assessments. Children received an overall score on the PPVT, which indicated their receptive vocabulary skills and a score on the Block design assessment that represented their visual and spatial abstract problem-solving ability.

For this subsample, I analyzed whether earlier readiness scores were predictive of these later cognitive skills.

Analyses

Statistical Approach

I created readiness outcome scores using an algorithm to weight children's actual scores on the each of the 90 items by the items placement from the teachers' Q sorts. The sum of these 90 weighted items reflected the child's degree of similarity to a given readiness cluster created by the teachers in study one. I employed a multiple imputation procedure to ensure that each child had complete data. To examine potential predictors of these readiness outcome scores I used multilevel linear regression. Specifically, I used Hierarchical Linear Modeling (HLM) software (Raudenbush, Bryk, Cheong, Congdon, & duToit, 2004) with the five multiply imputed datasets to perform all regression models. Multilevel modeling is an appropriate statistical tool for this twin sample since the predictors of interest are measured at both the child and family levels. HLM appropriately accounts for the nesting of twins within families, which creates dependency in the data. Predictor variables at level-one (child) included parent-child interaction during a teaching task (NCAST), parent-rated temperament at 12 months, and sex. At level-two (family) the predictor of SES was considered. A 2-level random intercept model was used to investigate each outcome. Additionally, I descriptively explored the predictive effect of this measure of readiness for preschool at age 3, on future cognitive ability as

measured with the PPVT and Block Design assessments for the subsample around age seven.

CHAPTER 3: RESULTS

Study One

Cluster Analysis of the Teachers' Readiness Sorts

Creation of Different Clusters of Ready Children

Teachers sorted two sets of 90 index cards, once for a specific boy they recalled as being particularly ready for 4-year-old kindergarten, and once for a specific girl. I randomized the order of the sorts and cards to prevent order, or practice effects. Correlations examining the association between the boy and girl sorts for each teacher are presented in Table 1. Twenty out of the 29 teachers produced very similar sort results for both the boy and girl student chosen. This is evident by the moderate to high significant positive associations between the sorts (range: r = .30 – .78). Five other correlations were moderate and positive, although these failed to reach significance (r = .11 – .20). Merely three out of the 29 teacher sort correlations were near zero, and only one teacher significantly sorted the boy and girl characteristics differently (r = -.40). Based on this pattern of associations, overall teachers considered boys and girls similarly when asked to rate characteristics that were descriptive of a child who was ready for their preschool classroom.

Using K-means cluster analysis in SPSS, I explored solutions of differing numbers of clusters. Table 2 provides a detailed description of items that were

ranked as characteristic (high, sleeves 7-9) versus uncharacteristic (low, sleeves 1-3) of a ready child on each of the clusters for a two through a five cluster solution. Figure 1 depicts children's movement across these differing cluster solutions as the number of clusters increased from two to five. Across all of the solutions characteristics noted as highly descriptive for many of the clusters were high cognitive skills and following directions. Distinguishing the clusters from one another included items pertaining to activity level, sociability, shyness, enthusiasm, and patience (see Table 2).

I ultimately chose a five cluster solution based on the pattern of change in the R^2 value. R^2 represents the amount of variance in the data explained by the cluster groupings, which increases as the number of clusters increases. When the change in R^2 is minimal additional clusters are not needed to explain the variation in the data. From a four to five cluster solution R^2 increased from .24 to .25, while movement from a five to six cluster solution only increased the value of R^2 by .004. Based on the correlations between the boy and girl sorts as well as the representation of both boys and girls within each cluster, it did not appear as if the clusters differentiated by gender. Therefore, I did not establish the ready clusters separately for boys and girls.

Description of the Ready Clusters

As depicted in the last column of Table 2, the final five teacher-determined clusters resulting from K-means cluster analysis described five hypothetical children who were seen as ready for 4-year-old kindergarten by their teachers. Cluster one

(N = 17: 5 boys, 12 girls) identified a child who was cognitively skilled (e.g. knows colors, shapes, patterns), was on task, attended well, followed instructions, and was low on being comfortable with strangers and not becoming angry or frustrated. Cluster two (N = 13, 9 boys, 4 girls) identified a child who also had high cognitive skills and followed instruction. This child was also enthusiastic and cooperative. Cluster two was low on preferring quiet activities to active games and not becoming angry or frustrated. The hypothetical child identified on cluster three (N = 2, 1 boy, 1 girl) was highly positive, enthusiastic, persistent, inquisitive, social, and cooperative. This child was rated low on non-hyperactivity, preferring quiet games, friendliness toward strangers, and not becoming angry when provoked. Cluster four (N = 11, 3 boys, 8 girls) described a child who was rated as highly patient, cooperative, and focused. This child was also cognitively skilled and followed instruction. Cluster four was rated low on social items, especially with strangers. Finally, cluster five (N = 15, 11 boys, 4 girls) described a child who was highly social and cognitively skilled. This child was rated low on items dealing with patience, low activity, and not becoming angry.

Study Two

Formation of the Readiness Scores

Five readiness scores corresponding to each readiness cluster were computed for each child in our existing sample of 662 children. I created algorithms which weighted the child's actual score on each of the 90 items with the final

placement of that item from the cluster analysis of the teachers' sorts. The readiness scores were computed as a summation of the 90 weighted items. The resulting 5 readiness scores reflected the degree of that child's similarity to the particular readiness cluster determined by the teachers in study one. The five readiness scores measured how closely that child's characteristics resembled those of the hypothetical ready preschooler, where a higher score signified that the child's characteristics more closely matched those of the teacher-chosen ready child. Readiness scores ranged from 212.5 to 403.4 for all clusters. Average readiness scores for each of the clusters were as follows: similarity to cluster 1 (M = 298.08, SD = 24.14), cluster 2 (M = 301.55, SD = 23.38), cluster 3 (M = 305.30, SD = 26.89), cluster 4 (M = 286.07, SD = 25.42), and cluster 5 (M = 299.75, SD = 23.65).

Correlations among the five readiness scores were all positive, very strong, and significant (range: r = .87 - .98). This suggested that children who were similar to one of the ready child clusters were similar to the others as well. Therefore, while each child more closely resembled one out of the five clusters, it was not the case that completely different children were identified as appearing ready for each cluster. Rather, certain children in the existing sample possessed a set of characteristics common to each readiness cluster.

Multiple Imputation for Missing Data

I ran multiple imputation by chained equations (MICE, van Buuren & Groothuis-Oudshoorn, 2011) in R to account for missing data. This procedure produced five datasets of estimated missing values. The major concern was that if a

child was missing even one of the 90 items included in the algorithms used to create the readiness scores, no readiness scores could be computed for that child. This would have resulted in a loss of 129 children (N = 533 having readiness scores computed compared to the full sample size of N = 662).

The 90 items used to compute the readiness scores had very little data missing at random, which in part justified the use of multiply imputed scores for the subsequent analyses. The 90 items used for the readiness algorithms were missing in the following way: for the 9 items from the Bayley the percentage of cases missing data ranged from 1.2% to 8.2%, for the 21 BRS items 0.2% to 2.3% of the cases were missing data, and for the 60 CBQ items 0.2% to 3.8% of the cases had missing data.

Multiple imputation allowed for all the children in the dataset to have readiness scores, thus increasing the power for the subsequent analyses. Means and standard deviations for the multiply imputed readiness scores were very similar to those for the non-imputed data listed above, they were as follows: similarity to cluster 1 (M = 295.52, SD = 25.45), cluster 2 (M = 299.04, SD = 24.75), cluster 3 (M = 302.96, SD = 28.07), cluster 4 (M = 283.56, SD = 26.80), and cluster 5 (M = 297.58, SD = 24.50).

Identifying Predictors of the Readiness Scores

Hierarchical models using the five multiply imputed data sets were analyzed to examine potential predictors of each of the five readiness outcomes. Again, these outcomes represented the degree of similarity between children in the existing

sample and the clusters of ready children identified by the teachers. I formed the models separately for mothers and fathers. I based this decision to have parent-specific models statistically on the low to moderate correlations between mothers and fathers on the IBQ and NCAST assessments (range: r = .01 to .57, see Table 3), and theoretically on the basis that mothers and fathers perceive their children's behaviors differently and interact with their children in different manners and contexts.

Pattern of Association among Predictors

Prior to hierarchical modeling, I examined the patterns of associations among predictors for both the mother and father models. Correlations among the predictors for mother models revealed significant positive correlations of: SES with social-emotional growth fostering and cognitive growth fostering, distress to limitations with activity level and distress to novelty, duration of orienting with distress to novelty, smiling and laughter, and soothability, smiling and laughter with soothability and sensitivity to cues, and social-emotional growth fostering with sensitivity to cues, response to child's distress, and cognitive growth fostering. Significant negative associations included: sex with distress to novelty and duration of orienting, and distress to novelty with smiling and laughter (see Table 4).

The pattern of correlations for the predictors of the father models differed from that of the mother models, further justifying the decision to examine the parent models separately. Similar to the mother models, the father correlations showed significant positive associations of: SES with social-emotional growth fostering and

cognitive growth fostering, activity level with distress to limitations, distress to novelty with distress to limitations, duration of orienting with smiling and laughter and soothability, and cognitive growth fostering with social-emotional growth fostering. Also mimicking the mother models was the significant negative correlation of smiling and laughter with distress to novelty. Contrary to the mother models, the father models revealed significant positive associations of: SES with distress to novelty, activity level with distress to novelty and duration of orienting, sensitivity to cues with response to child's distress, and cognitive growth fostering with sensitivity to cues and response to child's distress. Uniquely significant negative associations included: SES with activity level, smiling and laughter with SES, and social-emotional growth fostering with sex and duration of orienting (see Table 5).

As shown in Tables 4 and 5, for both the mother and father models, patterns of correlations among the IBQ scales revealed that the items of activity level, distress to limitations, and distress to novelty were all significantly positively associated with one another (with the sole exception of activity level and distress to novelty for the mothers) and these associations were moderate in strength (range r = .24 – .47). Likewise, the items of duration of orienting, smiling and laughter, and soothability also exhibited moderate significant positive associations for both parent models (range r = .14 – .34). These sets of variables could have been factor analyzed into negative and positive affect factors respectively as an alternative, more concise approach to keeping the six variables separately in the models.

Pattern of Association among Predictors and Outcomes

I also examined how all of the predictors were associated with each of the five readiness outcomes for both mother and father models. Correlations of predictors with the five readiness outcomes revealed that SES was significantly positively correlated with all five readiness scores. Sex was significantly negatively associated with readiness outcome clusters one and four, meaning being female was predictive of readiness. For the mother models, distress to limitations was negatively associated with readiness outcomes three and four, distress to novelty was negatively associated with readiness outcome five, smiling and laughter was positively associated with readiness outcomes one, two, and five, while social-emotional growth fostering was positively related to readiness outcomes one and four. For the father models, distress to limitations was significantly negatively associated with readiness outcome four while duration of orienting was significantly positively associated with readiness outcome five (see Tables 6 and 7).

Discovering Significant Predictors using HLM

I used HLM with main effects only models with the five multiply imputed datasets to examine predictors of the five readiness outcomes for mothers and fathers separately. HLM with restricted maximum likelihood (REML) estimation was used to obtain the parameter estimates. The results presented are those with robust standard errors. Using estimates with robust standard errors protects against violations of normality among the random effects. The intercept values for the models (γ_{00}) refer to the average level of the readiness outcome when all of the

predictor variables are zero. Since the predictors were entered unstandardized, the zeros represented the lowest possible value for the scale scores and therefore are largely not meaningful. I ran 2-level random intercept models with 662 twins at level-1 and 331 families at level-2.

Tables 8 - 12 depict the results of the models examining the main effects for the outcomes of similarity to the readiness clusters for mother and father models separately using REML estimation. The only family-level predictor, SES, was a significant predictor of each of the five readiness outcomes for both the mother and father models. Children from families with higher SES were more similar to the children teachers identified as being ready for preschool. For all models, estimates of the variance at level-1, ranged from $\sigma^2 = 320.92$ to 428.60 and at level-2, from $\tau^2 = 226.32$ to 320.14 (for all $p < .01$). These variance estimates yielded intraclass correlation coefficients ranging from $\rho_I = 243.20/406.69 = .37$ to $\rho_I = 320.14/740.87 = .43$. This reflected the amount of the variance (37% to 43%) in children's level of readiness that was present at the family level. Family SES highly predicted children possessing the behaviors and temperament characteristics teachers noted as characteristic of ready children.

Controlling for SES, sex was a significant predictor of readiness scores one, two, three, and four in both the mother and father models. Being a girl was predictive of higher readiness scores, signifying that girls looked more like the readiness clusters identified by the teachers. Interestingly, no significant effect of sex was present for readiness cluster number five, for either parent model.

Finally, for the mother models only IBQ rated smiling and laughter was significantly predictive of all five readiness outcomes. Higher mother ratings of positive affect at 12 months indicated higher readiness similarity scores at age 3 years (see Tables 8-12). Some other potentially significant predictors of children's similarity to the readiness clusters were not apparent in any of the HLM models. Despite significant negative associations of distress to limitations with similarity to readiness clusters 3 (mother model) and 4 (mother and father models) and distress to novelty with similarity to cluster 5 (mother model), distress to limitations and distress to novelty were not significant predictors in any of the models. Correspondingly, significant positive associations of social-emotional growth fostering with similarity to clusters 1 and 4 (mother model), and duration of orienting with similarity to readiness cluster 5 (father model) did not translate into significant prediction in the HLM models. The presence of other, correlated predictors in the models is likely responsible for this lack of significance in prediction.

Association of Readiness Scores with Later Cognitive Performance

Given that a subsample of the children (N = 27) were followed up at approximately age seven years (*M* = 88.37 months, *SD* = 5.30), it was possible to examine the correlation of these readiness similarity scores with later cognitive performance. All five of the readiness scores were significantly positively correlated with performance on the block design assessment (range: *r* = .44 – .47, see Table 13). Readiness scores were positively correlated with performance on the PPVT

(range r = .21 – .24), but due to a lack of power none of these reached statistical significance.

I also ran a series of bivariate regressions examining each readiness outcome as a potential predictor of performance on the Block Design and PPVT cognitive assessments. As expected based on the pattern of correlations described above, each of the readiness scores did significantly predict scores from the Block Design assessment. None of the readiness scores significantly predicted performance on the PPVT.

CHAPTER 4: DISCUSSION

Multiple Pathways of Early School Readiness

As predicted, temperament and behavior differences existed among children teachers selected as especially ready for preschool. Although the literature widely recognizes one static profile especially equipped for success in school marked by low activity, high persistence, and low distractibility (Keogh, 1982, 1986a; Martin et al., 1988; Martin, 1989; Martin & Holbrook, 1985; Orth & Martin, 1994), the teachers in this study identified multiple clusters of children whom they believed were especially ready for 4-year-old kindergarten. This provides some encouraging evidence that, at least for 4-year-olds, different pathways toward becoming school ready exist. We should not expect children to align with one “teachable” profile to be ready for school. Children have vast individual differences, which experienced educators translated into different pathways of readiness for the early classroom.

Interestingly, the teacher-created readiness clusters were not gender-specific despite instructing preschool teachers to sort the characteristics of ready boys and girls separately. However, several teachers mentioned that it was much easier to select the female child. This is likely because girls possess the “teachable” temperament characteristics of lower activity level and higher regulation to a greater degree than boys at this age (Zahn-Waxler, Shirtcliff, & Marceau, 2008). Yet, for the majority of the teachers, their two sorts showed strong, statistically significant, positive correlations (Table 1). Moreover, the clusters did not differentiate by gender. As shown in Table 2, across all of the cluster solutions no single cluster was predominately male or female in composition. Therefore, upon selecting the most ready girl and boy, most teachers classified those two children as possessing a relatively common set of characteristics despite their difference in gender. While teachers often noted that more girls appeared ready than boys upon entering the 4-year-old classroom, the most ready girl and boy seemed to share characteristics related to being identified as ready.

These common characteristics of ready children grouped into five clusters. High cognitive skills were present in all but one of the five (cluster 3). Teachers consistently rated high cognitive skills among the most characteristic aspects of ready preschoolers compared to any other behavior or temperament item. It is important to recall that I specifically asked teachers to describe the children they considered ready, rather than note which characteristics were important to the concept of readiness. Unlike parents, only a small number of kindergarten teachers

believe cognitive knowledge is essential for early school success and generally rate social and communication skills as more important than cognitive skills (Davies & North, 1990; Harradine & Clifford, 1996; Heaviside, 1993; Lewit & Schuurmann Baker, 1995; Lin, Lawrence, & Gorrell, 2003; Welch & White, 1999; West et al., 1993). Several teachers asked for clarification when sorting the cards, verifying that I was asking for a description of the child rather than importance of the items. It is not surprising that the majority of teachers identified cognitively skilled children. Research shows that children who enter school with higher academic skills make greater achievements in elementary school (Duncan et al., 2007).

Along with cognitive skills, many of the clusters contained the ability to follow instruction and cooperate. This finding aligns with research on slightly older children which indicates that children who attend well, follow directions, and get along with others are better prepared for school (Arnold et al., 1999; McClelland et al., 2000; Raver & Knitzer, 2002). Cooperation is one necessary social skill for successfully adapting to the early classroom context (McClelland et al., 2000).

Clusters differentiated on children's degree of sociability, proneness to anger and frustration, activity level, enthusiasm, and patience. The finding that among the children identified as ready some were more social than others aligns with the finding that both inhibited and uninhibited temperament types are susceptible to difficulty with interpersonal relationship formation, a component of school readiness (Coplan & Arbeau, 2008; Kagan & Snidman, 2004). Differences evident in the expression of negative affect, activity level, enthusiasm, and patience were more

interesting. Under the assumption of a common profile of a “teachable” or ready child, one would expect low negative affect, low activity level, high enthusiasm, and high patience (Keogh, 1982, 1986a; Martin, 1989). Some of the children teachers identified as especially ready for preschool did not entirely fit this model, which indicated that at least at this early age, a single profile of early school readiness is inappropriate. While teachers generally classified ready preschoolers as cognitively skilled, cooperative, and able to follow instruction during the initial weeks of 4-year-old kindergarten, there did not appear to be consensus on the degree of sociability, proneness to negative emotionality, level of activity, enthusiasm, and patience these children displayed.

Important Predictors of Readiness: SES and Sex

Family SES significantly predicted similarity to all the readiness clusters for both the mother and father models. Children from higher SES families more closely matched those identified as ready for preschool. Given lower SES is a risk factor for lack of early school readiness (Ferguson et al., 2001; Raver & Knitzer, 2002; Ramey & Ramey, 2004), I predicted this finding. Preschool children raised in a context of poverty are much more likely to experience academic difficulty and failure (Reynolds & Temple, 2008). Neighborhood economic hardship significantly predicts poor mathematic and letter knowledge at age four (Hanson et al., 2011). Language competencies and pre-literacy capabilities in preschool-aged children, which are poorer in families of low social class, are the most influential factors in early school

readiness according to recent research (Cristofaro & Tamis-LeMonda, 2011; Prior, Bavin, & Ong, 2011).

SES affects school readiness both directly and indirectly through family factors. Two predominant models illustrate how family factors related to low SES impact the child. The cognitive stimulation model posits that low-income families cannot easily invest in materials and experiences to support and stimulate learning. The stress model hypothesizes that less optimal parenting as a result of the stress of living in poverty results in poor school readiness (Chazan-Cohen et al., 2009). It is noteworthy that SES significantly predicted similarity to every cluster while controlling for sex, earlier temperament, and parent-child interaction variables in the models.

In addition to SES, child's sex significantly predicted readiness scores one, two, three, and four for both the mother and father models. Girls more closely matched the ready clusters, with the exception of the cluster five. This is likely due to early childhood gender differences in activity level and the self-regulatory process of effortful control, important components of temperament for school readiness. Boys tend to have higher activity level, specifically viewed as less desirable by teachers in the classroom (Keogh, 1982, 1986a; Martin, 1989), than girls throughout childhood (Eaton & Enns, 1986). In a comprehensive meta-analysis of gender differences in temperament from the ages of 3 months to 13 years, factor-level results indicated that girls displayed higher effortful control and lower activity than boys (Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006).

While temperament literature suggests that girls are more ready for preschool, this may not necessarily be the case once we further classify specific pathways of early readiness. Sex did not significantly predict similarity to readiness cluster five, which described a more active ready child, with both low activity and high patience noted as uncharacteristic.

Positive Affect Predicts School Readiness

For the mother models only, as predicted, higher ratings of positive affect at 12 months signified greater similarity to all five readiness clusters. Positive affectivity early in development is associated with socially appropriate emotional expression and empathic responding, which can lead to positive social interactions (Goldsmith et al, 2001; Robinson, et al, 1994; Volbrecht et al., 2007). Engaging in positive social interactions with peers and teachers is an important component of early school readiness. Interestingly, fathers' reporting of their children's positive affect at 12 months of age was not associated with similarity to any of the readiness clusters. The correlation between mother and father ratings of positive affect was significant, but modest (see Table 3). More research is required to explore differences in mother and father ratings of early positive affect and the association with school readiness.

Other Associations of Temperament and School Readiness

Based on the literature with slightly older children, I expected that aspects of early negative affect (i.e. distress to novelty and distress to limitations) would negatively associate with school readiness. Heightened displays of fear and anger

might reflect a poorer ability to self-regulate and manage negative emotionality. Self-regulatory skills have major implications for early school success. Children with stronger emotion-related self-regulation skills develop and maintain supportive student-teacher relationships vital to school readiness and long term academic achievement (Denham, Warren-Khot, Bassett, Wyatt, & Perna, 2012; Eisenberg, Valiente, & Eggum, 2010). As predicted, distress to limitations significantly correlated negatively with readiness outcomes three and four for the mothers and readiness outcome four for the fathers. Additionally, distress to novelty negatively associated with readiness outcome five for the mother model.

Soothability, another component of being able to regulate the experience of negative emotionality, unexpectedly did not relate to similarity to any of the readiness clusters. This may be due to the particular measurement of this temperament construct. Parents indicated from a list of techniques (e.g. rocking, patting) which successfully reduced distress. For some parents, the use of multiple techniques may not be necessary. Thus, a higher soothability score did not necessarily mean the baby was easier to soothe. Therefore, I re-ran the hierarchical models without soothability and the pattern of findings was unchanged.

The ability to self-regulate is not only central to forming quality relationships, but also to processes of attention. The capacity to focus and pay attention translates into better performance in the classroom (Alexander et al., 1993). Regulation of emotions involves the ability to voluntarily shift and focus attention (Derryberry & Rothbart, 1997), a skill central to the executive functioning necessary to adapt to the

classroom environment (Eisenberg & Morris, 2002; Olson et al., 2005, Zhou et al., 2007). Therefore, I expected children's duration of orienting at 12 months to positively relate to school readiness. For the father models duration of orienting did significantly positively relate to similarity to readiness cluster five.

Additionally, I examined activity level as rated by the parents at 12 months as a potential predictor of similarity to the readiness clusters. I expected that lower activity level would be predictive based on the literature (Keogh, 1982, 1986a; Martin et al., 1988; Martin, 1989; Martin & Holbrook, 1985; Orth & Martin, 1994). However, activity level was not associated with similarity to any of the readiness clusters. This finding, although unexpected, was not that surprising given that the teacher-selected ready children differed in terms of their overall activity level.

Parenting Predictors of School Readiness

Early school readiness depends on family factors, such as aspects of parenting. A large body of research supports that warm, nurturing, and responsive parenting is optimal for children's development (e.g. Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000; Dodici, Draper, & Peterson, 2003; Maccoby, 1992; Petrill & Deater-Deckard, 2004), and social interactions between parents and children in the early years are especially important for school readiness (Parker, Boak, Griffin, Ripple, & Peay, 1999; Sheridan, Knoche, Edwards, Bovaird, & Kupzyk, 2010). The effects of parental involvement are especially important for the development of school readiness in low income families (Chazan-Cohen et al., 2009). Not surprisingly, social-emotional growth fostering and cognitive growth

fostering correlated positively with SES. Higher SES enables families to provide opportunities and experiences that enhance social-emotional and cognitive development.

Therefore, I hypothesized that higher scores on the scales of the NCAST laboratory teaching task with parents would predict higher school readiness scores. While social-emotional growth fostering did significantly positively associate with similarity to readiness clusters one and four in the mother models, these variables were not significant predictors in the HLM analyses. For the father models, unexpectedly none of the parenting variables predicted readiness. This may be due to the finding that fathers' supportiveness influences child development most when mother parenting is unsupportive (Martin, Ryan, & Brooks-Gunn, 2010), and this typical sample contained generally supportive mothers.

Also pertaining to the father data, interestingly social-emotional growth fostering correlated with sex (see Table 5). This suggested that in the present study fathers displayed higher social-emotional growth fostering with their girls versus their boys. This is somewhat surprising as literature suggests that while mothers are in general more emotionally supportive than fathers (Nakamura, Stewart, & Tatarka, 2000), fathers tend to be more personally involved (including enacting emotionally supportive interactions such as touching or praising) with their sons rather than daughters (Moon & Hoffman, 2008). Further investigation is needed to assess why fathers tended to engage in these NCAST emotional support behaviors more frequently with their daughters.

The lack of association between similarity to the readiness clusters and the parenting variables in this study likely resulted from both the implementation of the assessment and the characteristics of the sample. The examination of parenting behaviors during a teaching task with a typical sample in a controlled laboratory setting is not akin to assessing the full range of parenting behaviors evidenced in the home with a more diverse sample. The lack of variability in parenting behaviors in this specific sample also likely contributed to the low alphas of some of the NCAST scales. Another method of assessing parenting as a predictor of school readiness, such as in-home observations, may have been more appropriate for this sample.

Readiness for Preschool Predicts Later Cognitive Skills

As predicted, for the children followed up at approximately age seven, all five of the readiness scores significantly predicted performance on the Block Design assessment. Readiness scores did not predict scores on the PPVT, yet all of the readiness scores positively correlated with overall performance on the PPVT. I expected this finding as teachers consistently rated the cognitive items from the Bayley assessment as highly characteristic of ready children and earlier cognitive skills are the strongest predictors of later achievement (Duncan et al., 2007). However, the cognitive items in the teacher sorts were only one component of the readiness clusters, rendering the significant effects more than simply earlier cognition predicting later cognition. Moreover, significant prediction of spatial intelligence on the Block Design by all of the readiness scores was especially notable given the small sample size at follow-up.

Strengths

This project has obvious strengths concerning its design and measurement. I examined early school readiness using a multi-faceted approach. Teachers defined clusters of ready children using 90 items of temperament, behavior, and cognition, which allowed for a rich description of children identified as ready at age 4. The multi-source approach of the predictor variables should enhance validity because it incorporated mother-, father-, and experimenter-reported measures. Moreover, some of the children were followed up longitudinally with measures of cognitive performance, allowing for an initial exploratory look at the ability of similarity to the readiness clusters to predict later cognition. Also, the large size of the existing sample of children afforded high statistical power to reveal significant effects.

Limitations

A shortcoming of this project was that the full sample of children was not followed-up with academic achievement data. The choice to use an existing sample of children in conjunction with data from a new sample of teachers was based on obtaining high statistical power to find significant effects. Unfortunately, this meant the children were not studied within the context of their classroom settings with their own teachers. Although the significant findings of readiness scores predicting cognitive performance at age 7 are notable, performance on an experimenter administered cognitive assessment is not equivalent to teacher-rated academic achievement.

Other limitations include the possibility that findings with a sample of twins might not generalize to singletons. Twinship might have an undiscovered impact on the development or expression of early school readiness. Moreover, the shared environment relevant to the development of readiness for preschool could also conceivably differ between twins and nontwins. Additional factors compromising the generalizability of the findings were the lack of diversity in the samples of families and teachers. Families were primarily of middle to upper social class, and displayed a range of typical parenting behaviors in a controlled laboratory environment. A more variable range of parenting behaviors would be evident in the home with a more diverse sample of parenting behaviors. Likewise, the exclusively female and White teachers in study one represented the population of preschool teachers from local suburban areas. Results may differ substantially upon considering a more varied group of teachers and school contexts. Lastly, the predictors from the NCAST were examined concurrently at age 3 with the outcomes of similarity to readiness clusters. In these cases prediction is purely statistical and causal interpretation is hazardous.

Future Directions and Implications

The most obvious extensions of the current project are to longitudinally follow a large sample, with ample diversity in families and teachers, of children from infancy to school entry and beyond. It is especially important to consider a more diverse sample of schools, teachers, and families as expectations for and characteristics of school readiness may differ substantially. Information on children's temperament, behavior, and cognition should be obtained at various points in

development from their parents and teachers, as well as trained observers. It is essential that teachers not only report on children's academic achievements, but also on their behavior and temperament, using an assessment such as the Teacher Temperament Questionnaire (TTQ: Keogh, Pullis, Cadwell, 1982). Furthermore, experimenters should observe children's behaviors within the classroom environment in addition to the laboratory setting. Ideally, the sample would be followed extensively enough to analyze the predictive effects of early school readiness and academic success on graduation rates, decisions to pursue college degrees, and type of career attainment.

Another logical extension of the data presented would be to examine the genetic and environmental influences on school readiness and associated predictors. This sample lends itself to genetic modeling since data are drawn from twins. It would be especially informative to understand which components are most influenced by aspects of the shared and non-shared environment. These represent potential areas of focus when designing interventions for fostering the early development of school readiness skills.

This current examination of characteristics and predictors of school readiness earlier than most of the existing literature is especially relevant given the changing expectations for behavior and performance in the school context. In the United States, 5-year-old kindergartens are no longer seen as transitions from the home to formal schooling. Instead, in kindergarten children are expected to learn content formerly taught in grades 1 and 2 (Farran, 2011). Therefore, we need to consider

characteristics of school readiness earlier as well as explore how to best foster those characteristics in our young children.

It is also especially noteworthy that experts, teachers of 4-year-old kindergarten, defined the characteristics of ready preschoolers in this study. Student-teacher interactions are influenced by teachers' perceptions of children's school readiness, which directly and indirectly influence children's success in the classroom. Understanding which aspects of temperament and behavior teachers note as most characteristic of ready preschoolers can help identify predictors, allowing caregivers to prepare children to meet the demands of early schooling successfully.

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Table 1. *Correlations between Each Teacher's Boy and Girl Sorts*

Teacher	*r*
1	.46**
2	.43**
3	.57**
4	.49**
5	.42**
6	.07
7	.61**
8	-.06
9	.53**
10	.07
11	.12
12	.45**
13	.34**
14	.58**
15	.41**
16	.16
17	.30**
18	.76**
19	-.40**
20	.68**
21	.20
22	.78**
23	.20
24	.49**
25	.69**
26	.11
27	.74**
28	.32**
29	.69**

Note. **$p < .01$

Table 2. *Interpretations of the Clusters from 2 to 5 Cluster Solutions*

2 Cluster Solution:	**3 Cluster Solution:**	**4 Cluster Solution:**	**5 Cluster Solution:**
Cluster 1: 14 boys, 23 girls *Cluster 2: 15 boys, 6 girls*	*Cluster 1: 15 boys, 7 girls* *Cluster 2: 10 boys, 17 girls* *Cluster 3: 4 boys, 5 girls*	*Cluster 1: 8 boys, 5 girls* *Cluster 2: 8 boys, 2 girls* *Cluster 3: 3 boys, 5 girls* *Cluster 4: 10 boys, 17 girls*	*Cluster 1: 5 boys, 12 girls* *Cluster 2: 9 boys, 4 girls* *Cluster 3: 1 boy, 1 girl* *Cluster 4: 3 boys, 8 girls* *Cluster 5: 11 boys, 4 girls*
Cluster 1 *HIGH:* Correctly labels/names pictures, Correctly identifies colors, Knows shapes, Can make comparisons of size, Correctly labels/names colors, Completes basic patterns, Typically on task, attends well, Cooperates well, Follows instruction *LOW:* Not embarrassed when strangers pay a lot of attention to him/her, Often giggles and acts silly, Smiles at friendly strangers, Often does not seem to hear me when working	**Cluster 1** *HIGH:* Correctly identify pictures, Correctly labels/names pictures, Correctly identifies colors, Knows shapes, Correctly labels/names colors *LOW:* Does not always seem to be in a big hurry, Prefers quiet activities to active games, Does not become easily frustrated when tired, Rarely protests when another child takes his/her toy away, Likes to sit quietly and watch, Will not get mad when provoked by other children	**Cluster 1** *HIGH:* Correctly identifies pictures, Correctly labels/names pictures, Correctly identifies colors, Knows shapes, Correctly labels/names colors, Typically displays enthusiasm toward tasks, Follows instruction *LOW:* Prefers quiet activities to active games, Does not become easily frustrated when tired, Rarely protests when another child takes his/her toy away, Likes to sit quietly and watch	**Cluster 1** *HIGH:* Correctly identifies pictures, Correctly labels/names pictures, Correctly identifies colors, Knows shapes, Can make comparisons of size, Correctly labels/names colors, Can identify incomplete pictures, Completes basic patterns, Can classify, Typically on task, attends well, Follows instruction *LOW:* Joins others quickly and comfortably, even strangers, Does not become easily frustrated when tired, Rarely protests when another child takes his/her toy away, Smiles at friendly strangers, Likes to sit quietly and watch, Will not get mad when provoked by other children, Often does not seem to hear me when working

Table 2. *Continued*

2 Cluster Solution, Cluster 2	**3 Cluster Solution, Cluster 2**	**4 Cluster Solution, Cluster 2**	**5 Cluster Solution, Cluster 2**
HIGH: Correctly identifies pictures, Correctly labels/names pictures, Correctly identifies colors, Knows shapes, Correctly labels/names colors *LOW:* Does not always seem to be in a big hurry, Prefers quiet activities to active games, Does not become easily frustrated when tired, Rarely protests when another child takes toy away, Likes to sit quietly and watch, Will not get mad when provoked by other children	*HIGH:* Correctly identifies pictures, Correctly labels/names pictures, Correctly identifies colors, Knows shapes, Can make comparisons of size, Correctly labels/names colors, Completes basic patterns, Can classify, Typically on task, Attends well, Follows instruction *LOW:* Joins others quickly and comfortably, even strangers, Smiles at friendly strangers, Will not get mad when provoked by other children	*HIGH:* Correctly identifies pictures, Correctly labels/names pictures, Correctly identifies colors, Knows shapes, Can make comparisons of size, Correctly labels/names colors, Completes basic patterns, Can classify, Appropriate gross motor movement, Usually prefers to join other children playing rather than watch, Enjoys funny stories and usually laughs at them, Not shy around and talks easily to new people *LOW:* Not always seem to be in a big hurry, Not frustrated when prevented from doing something, Waits before entering new activities if asked, Prefers quiet activities to active games, Has no trouble sitting still when told to, Rarely protests when another child takes his/her toy away, Likes to sit quietly, Will not get mad when provoked by other children	*HIGH:* Correctly identifies pictures, Correctly labels/names pictures, Correctly identifies colors, Knows shapes, Can make comparisons of size, Correctly labels/names colors, Typically displays enthusiasm toward tasks, Cooperates well, Follows instruction *LOW:* Prefers quiet activities to active games, Does not become easily frustrated when tired, Rarely becomes discouraged when s/he has trouble, Rarely protests when another child takes his/her toy away, Likes to sit quietly and watch, Will not get mad when provoked by other children

Table 2. *Continued*

2 Cluster Solution	3 Cluster Solution, Cluster 3	4 Cluster Solution, Cluster 3	5 Cluster Solution, Cluster 3
	HIGH: Typically on task, Attends well, Cooperates well, Completes a task before moving to another, Follows instruction *LOW:* When s/he sees a toy s/he wants s/he gets very excited about getting it, When s/he wants to do something, s/he talks about little else, Not embarrassed when strangers pay a lot of attention to him/her, Sometimes smiles or giggles when playing by her/ himself, Is usually pretty excited before leaving on an outing, Often giggles and acts silly, Has difficulty leaving a project s/he has begun, Smiles at friendly strangers, Likes to sit quietly and watch people do things, Often does not seem to hear me when working	*HIGH:* Shows initiative with tasks, Typically on task, Attends well, Cooperates well, Keeps mind on activity, Completes a task before moving to another, Follows instruction, Not easily distracted during a story *LOW:* When s/he sees a toy s/he wants s/he gets very excited about getting it, When s/he wants to do something, s/he talks about little else, Not embarrassed when strangers pay a lot of attention to him/her, Sometimes smiles or giggles when playing by her /himself, Is usually pretty excited before leaving on an outing, Often giggles and acts silly, Likes to sit quietly and watch people do things	*HIGH:* Often displays heighted positivity, Displays interest in stimuli, Shows initiative and enthusiasm toward tasks, Explores objects and/or surroundings, Persistent, Attentive, Often attempts to interact socially, Cooperates, Good gross-motor, fine-motor, & coordination of movement, Prefers to join other children playing rather than watch, Completes task before moving on, Not mad if mildly criticized, Follows instruction *LOW:* Can identify incomplete pictures, Not hyperactive, Gets very excited about getting a toys/he wants, When s/he wants to do something, s/he talks about little else, Not embarrassed by attention from strangers, Prefers quiet activities, Shows concentration, Not easily frustrated when tired, Usually excited before an outing, Smiles a lot at people including strangers, Likes to sit quietly and watch, Not mad when provoked, Smiles when looking at a book, Often does not seem to hear me when working

Table 2. *Continued*

2 Cluster Solution	**3 Cluster Solution,**	**4 Cluster Solution, Cluster 4**	**5 Cluster Solution, Cluster 4**
		HIGH: Correctly identifies pictures, Correctly labels/names pictures, Correctly identifies colors, Knows shapes, Can make comparisons of size, Correctly labels/names colors, Completes basic patterns, Can classify, Typically on task, Attends well, Follows instruction *LOW:* Not embarrassed when strangers pay a lot of attention to him/her, Joins others quickly and comfortably, even strangers, Smiles at friendly strangers, Often does not seem to hear me when working	*HIGH:* Correctly identifies colors, Knows shapes, Cooperates well, Not hyperactive, Does not have difficulty waiting in line for something, Has no trouble sitting still when s/he is told to, Shows strong concentration, Follows instruction, Is not easily distracted when listening to a story *LOW:* When s/he sees a toy s/he want s/he, gets very excited about getting it, Not embarrassed when strangers pay a lot of attention to him/her, When outside, does not often sit quietly, Is not shy around new people, Sometimes smiles or giggles when playing by her/himself, Talks easily to new people, Is usually pretty excited before leaving on an outing, Often giggles and acts silly, Smiles at friendly strangers, Often does not seem to hear me when working

Table 2. *Continued*

2 Cluster Solution	**3 Cluster Solution,**	**4 Cluster Solution,**	**5 Cluster Solution, Cluster 5**
			HIGH: Correctly identifies pictures, Correctly labels/names pictures, Correctly identifies colors, Knows shapes, Correctly labels/names colors, Appropriate gross motor movement, Prefers to join other children playing, rather than watch *LOW:* Does not always seem to be in a big hurry, No difficulty waiting in line for something, Prefers quiet activities to active games, Has no trouble sitting still when s/he is told to, Is able to resist laughing or smiling when it is not appropriate, Rarely protests when another child takes his/her toy away, Likes to sit quietly and watch people do things

Table 3. *Correlations of Mothers and Fathers on IBQ and NCAST Measures*

Measure	*r*
IBQ: Activity Level	.35**
IBQ: Distress to Limitations	.46**
IBQ: Distress to Novelty	.57**
IBQ: Duration of Orienting	.35**
IBQ: Smiling and Laughter	.36**
IBQ: Soothability	.01
NCAST: Sensitivity to Cues	.04
NCAST: Response to Child's Distress	.13**
NCAST: Social-Emotional Growth Fostering	.06
NCAST: Cognitive Growth Fostering	.08

Note. **$p < .01$

Table 4. *Correlations among Predictors – Mother Models*

Predictors	2	3	4	5	6	7	8	9	10	11	12
1.SES	-.06	.00	-.03	-.08	-.03	-.04	.03	.08	.04	**.08***	**.18****
2.Sex	--	-.02	.08	**-.10***	**-.16****	-.01	-.05	-.05	.00	.01	-.02
3.IBQ: Activity Level		--	**.38****	.09	.05	**.10***	.01	-.03	-.02	-.05	.01
4.IBQ: Distress to Limitations			--	**.29****	.00	-.04	-.07	.02	.04	.02	.08
5.IBQ: Distress to Novelty				--	**.16****	**-.16****	.02	-.08	.00	.04	.07
6.IBQ: Duration of Orienting					--	**.32****	**.26****	-.01	-.08	.02	.05
7.IBQ: Smiling and Laughter						--	**.34****	**.14***	-.05	.05	.10
8.IBQ: Soothability							--	-.10	-.01	.03	-.07
9.NCAST: Sensitivity to Cues								--	.06	**.17****	.10
10.NCAST: Response to Child's Distress									--	**.16****	.04
11.NCAST: Social-Emotional Growth Fostering										--	**.23****
12.NCAST: Cognitive Growth Fostering											--

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

Table 5. *Correlations among Predictors – Father Models*

Predictors	2	3	4	5	6	7	8	9	10	11	12
1.SES	-.06	**-.12***	-.09	**.16****	-.02	**-.11***	-.08	.07	-.08	**.12***	**.21****
2.Sex	--	.08	.02	-.02	-.05	.06	.03	-.08	-.03	**-.13****	-.01
3.IBQ: Activity Level		--	**.47****	**.24****	**.13***	.07	.09	.00	.10	-.11	.07
4.IBQ: Distress to Limitations			--	**.28****	-.06	-.04	.01	-.01	-.08	-.09	-.05
5.IBQ: Distress to Novelty				--	.04	**-.20****	-.03	-.04	-.07	-.04	-.10
6.IBQ: Duration of Orienting					--	**.22****	**.14****	-.13	.03	**-.16****	-.07
7.IBQ: Smiling and Laughter						--	**.30****	.07	.07	-.06	.01
8.IBQ: Soothability							--	.13	.06	-.06	.02
9.NCAST: Sensitivity to Cues								--	**.24****	.02	**.56****
10.NCAST: Response to Child's Distress									--	-.04	**.19****
11.NCAST: Social Emotional Growth Fostering										--	**.23****
12.NCAST: Cognitive Growth Fostering											--

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

Table 6. *Correlations of Predictors with Outcome Variables – Mother Models*

	Outcomes: Similarity to Readiness Clusters				
Predictors	1	2	3	4	5
SES	**.20****	**.19****	**.16****	**.18****	**.18****
Sex	**-.10****	-.06	-.06	**-.12****	.00
IBQ: Activity Level	-.04	-.02	-.04	-.06	.00
IBQ: Distress to Limitations	-.11	-.01	**-.12***	**-.14***	-.08
IBQ: Distress to Novelty	-.05	-.08	-.08	-.03	**-.14***
IBQ: Duration of Orienting	.10	.12	.09	.10	.10
IBQ: Smiling and Laughter	**.11***	**.13***	.09	.09	**.13***
IBQ: Soothability	.00	-.01	-.04	.00	-.02
NCAST: Sensitivity to Cues	.02	.02	.00	.01	.01
NCAST: Response to Child's Distress	.01	.00	.00	.02	-.01
NCAST: Social-Emotional Growth Fostering	**.10***	.08	.07	**.11***	.03
NCAST: Cognitive Growth Fostering	.02	.01	.00	.02	-.01

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

Table 7. *Correlations of Predictors with Outcome Variables – Father Models*

	Outcomes: Similarity to Readiness Clusters				
Predictors	1	2	3	4	5
SES	**.20****	**.19****	**.16****	**.18****	**.18****
Sex	**-.10****	-.06	-.06	**-.12****	.00
IBQ: Activity Level	-.01	.02	.00	-.02	.04
IBQ: Distress to Limitations	-.10	-.08	-.11	**-.12***	-.07
IBQ: Distress to Novelty	-.02	-.04	-.05	-.01	-.08
IBQ: Duration of Orienting	.11	.12	.07	.09	**.12***
IBQ: Smiling and Laughter	.08	.07	.03	.05	.07
IBQ: Soothability	.06	.04	.04	.06	.03
NCAST: Sensitivity to Cues	-.01	-.03	-.02	.01	-.05
NCAST: Response to Child's Distress	.02	.01	.01	.04	-.01
NCAST: Social-Emotional Growth Fostering	.07	.05	.03	.07	.02
NCAST: Cognitive Growth Fostering	.10	.10	.10	.10	.10

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

Table 8. *Summary of Effects from Mother and Father Hierarchical Linear Models Predicting Similarity to Readiness Cluster 1 Using Multiply Imputed Data*

Mother Model Predicting Similarity to Readiness Cluster 1 (robust standard errors)

Fixed Effect	Coefficient	Std. Error	T-ratio
γ_{00} = Intercept	249.86	19.89	12.56
γ_{01} = **SES**	0.47	0.12	**4.09****
γ_{10} = **Sex**	-6.71	2.04	**-3.30****
γ_{20} = IBQ: Activity Level	-0.32	1.24	-0.26
γ_{30} = IBQ: Distress to Limitations	-2.11	1.72	-1.23
γ_{40} = IBQ: Distress to Novelty	1.78	1.38	1.29
γ_{50} = IBQ: Duration of Orienting	0.46	1.11	0.42
γ_{60} = **IBQ: Smiling and Laughter**	5.31	1.68	**3.16****
γ_{70} = IBQ: Soothability	-0.25	1.62	-0.15
γ_{80} = NCAST: Sensitivity to Cues	-0.24	0.99	-0.25
γ_{90} = NCAST: Response to Child's Distress	0.13	0.51	0.25
γ_{100} = NCAST: Social-Emotional Growth Fostering	1.23	0.80	1.54
γ_{110} = NCAST: Cognitive Growth Fostering	-0.03	0.46	-0.07

Father Model Predicting Similarity to Readiness Cluster 1 (robust standard errors)

Fixed Effect	Coefficient	Std. Error	T-ratio
γ_{00} = Intercept	264.49	21.95	12.05
γ_{01} = **SES**	0.57	0.14	**4.07****
γ_{10} = **Sex**	-7.01	2.11	**-3.33****
γ_{20} = IBQ: Activity Level	0.57	1.80	0.32
γ_{20} = IBQ: Distress to Limitations	-2.96	2.17	-1.36
γ_{30} = IBQ: Distress to Novelty	1.07	1.30	0.82
γ_{40} = IBQ: Duration of Orienting	1.85	1.20	1.54
γ_{50} = IBQ: Smiling and Laughter	1.93	1.51	1.28
γ_{60} = IBQ: Soothability	-1.11	1.53	-0.72
γ_{70} = NCAST: Sensitivity to Cues	0.03	0.56	0.05
γ_{80} = NCAST: Response to Child's Distress	0.12	0.56	0.21
γ_{90} = NCAST: Social-Emotional Growth Fostering	0.54	0.86	0.63
γ_{100} = NCAST: Cognitive Growth Fostering	0.22	0.40	0.56

Note. *p < .05, **p < .01, N = 662 children at level 1; 331 families at level 2

Table 9. *Summary of Effects from Mother and Father Hierarchical Linear Models Predicting Similarity to Readiness Cluster 2 Using Multiply Imputed Data*

Mother Model Predicting Similarity to Readiness Cluster 2 (robust standard errors)

Fixed Effect	Coefficient	Std. Error	T-ratio
γ_{00} = Intercept	256.10	17.92	14.30
γ_{01} = **SES**	0.44	0.12	**3.71****
γ_{10} = **Sex**	-4.51	2.00	**-2.25***
γ_{20} = IBQ: Activity Level	0.28	1.31	0.22
γ_{30} = IBQ: Distress to Limitations	-1.79	1.67	-1.07
γ_{40} = IBQ: Distress to Novelty	1.20	1.40	0.85
γ_{50} = IBQ: Duration of Orienting	0.37	1.07	0.35
γ_{60} = **IBQ: Smiling and Laughter**	5.50	1.63	**3.38****
γ_{70} = IBQ: Soothability	-0.32	1.51	-0.21
γ_{80} = NCAST: Sensitivity to Cues	-0.48	0.95	-0.51
γ_{90} = NCAST: Response to Child's Distress	-0.06	0.49	-0.12
γ_{100} = NCAST: Social-Emotional Growth Fostering	0.96	0.79	1.21
γ_{110} = NCAST: Cognitive Growth Fostering	-0.08	0.48	-0.17

Father Model Predicting Similarity to Readiness Cluster 2 (robust standard errors)

Fixed Effect	Coefficient	Std. Error	T-ratio
γ_{00} = Intercept	268.01	21.65	12.38
γ_{01} = **SES**	0.54	0.14	**3.90****
γ_{10} = **Sex**	-4.74	2.06	**-2.30***
γ_{20} = IBQ: Activity Level	0.96	1.63	0.59
γ_{30} = IBQ: Distress to Limitations	-2.56	2.36	-1.09
γ_{40} = IBQ: Distress to Novelty	0.67	1.32	0.50
γ_{50} = IBQ: Duration of Orienting	1.45	1.16	1.25
γ_{60} = IBQ: Smiling and Laughter	1.80	1.56	1.16
γ_{70} = IBQ: Soothability	-1.40	1.54	-0.91
γ_{80} = NCAST: Sensitivity to Cues	0.00	0.57	-0.01
γ_{90} = NCAST: Response to Child's Distress	0.07	0.55	0.13
γ_{100} = NCAST: Social-Emotional Growth Fostering	0.50	0.80	0.63
γ_{110} = NCAST: Cognitive Growth Fostering	0.27	0.41	0.66

Note. *$p < .05$, **$p < .01$, N = 662 children at level 1; 331 families at level 2

Table 10. *Summary of Effects from Mother and Father Hierarchical Linear Models Predicting Similarity to Readiness Cluster 3 Using Multiply Imputed Data*

Mother Model Predicting Similarity to Readiness Cluster 3 (robust standard errors)

Fixed Effect	Coefficient	Std. Error	T-ratio
γ_{00} = Intercept	262.51	21.28	12.34
γ_{01} = **SES**	0.43	0.13	**3.26****
γ_{10} = **Sex**	-5.11	2.29	**-2.23***
γ_{20} = IBQ: Activity Level	0.05	1.38	0.04
γ_{30} = IBQ: Distress to Limitations	-2.18	1.98	-1.10
γ_{40} = IBQ: Distress to Novelty	1.19	1.45	0.82
γ_{50} = IBQ: Duration of Orienting	0.03	1.30	0.02
γ_{60} = **IBQ: Smiling and Laughter**	5.93	1.87	**3.17****
γ_{70} = IBQ: Soothability	0.07	1.74	0.04
γ_{80} = NCAST: Sensitivity to Cues	-0.61	1.01	-0.61
γ_{90} = NCAST: Response to Child's Distress	0.16	0.57	0.29
γ_{100} = NCAST: Social-Emotional Growth Fostering	0.79	0.89	0.89
γ_{110} = NCAST: Cognitive Growth Fostering	-0.12	0.60	-0.20

Father Model Predicting Similarity to Readiness Cluster 3 (robust standard errors)

Fixed Effect	Coefficient	Std. Error	T-ratio
γ_{00} = Intercept	279.97	25.36	11.04
γ_{01} = **SES**	0.51	0.16	**3.18****
γ_{10} = **Sex**	-5.13	2.34	**-2.19***
γ_{20} = IBQ: Activity Level	0.92	1.80	0.51
γ_{30} = IBQ: Distress to Limitations	-3.41	2.92	-1.16
γ_{40} = IBQ: Distress to Novelty	0.79	1.72	0.46
γ_{50} = IBQ: Duration of Orienting	1.39	1.27	1.09
γ_{60} = IBQ: Smiling and Laughter	1.10	1.81	0.61
γ_{70} = IBQ: Soothability	-1.32	1.84	-0.72
γ_{80} = NCAST: Sensitivity to Cues	0.05	0.59	0.09
γ_{90} = NCAST: Response to Child's Distress	0.06	0.60	0.10
γ_{100} = NCAST: Social-Emotional Growth Fostering	0.50	0.83	0.61
γ_{110} = NCAST: Cognitive Growth Fostering	0.24	0.45	0.54

Note. *$p < .05$, **$p < .01$, N = 662 children at level 1; 331 families at level 2

Table 11. *Summary of Effects from Mother and Father Hierarchical Linear Models Predicting Similarity to Readiness Cluster 4 Using Multiply Imputed Data*

Mother Model Predicting Similarity to Readiness Cluster 4 (robust standard errors)

Fixed Effect	Coefficient	Std. Error	T-ratio
γ_{00} = Intercept	241.92	22.09	10.95
γ_{01} = **SES**	0.45	0.12	**3.78****
γ_{10} = **Sex**	-8.19	2.10	**-3.89****
γ_{20} = IBQ: Activity Level	-0.96	1.25	-0.77
γ_{30} = IBQ: Distress to Limitations	-2.54	1.96	-1.29
γ_{40} = IBQ: Distress to Novelty	1.92	1.29	1.49
γ_{50} = IBQ: Duration of Orienting	0.40	1.33	0.30
γ_{60} = **IBQ: Smiling and Laughter**	5.28	1.89	**2.80***
γ_{70} = IBQ: Soothability	0.00	1.75	0.00
γ_{80} = NCAST: Sensitivity to Cues	-0.26	1.02	-0.26
γ_{90} = NCAST: Response to Child's Distress	0.30	0.55	0.54
γ_{100} = NCAST: Social-Emotional Growth Fostering	1.33	0.84	1.60
γ_{110} = NCAST: Cognitive Growth Fostering	-0.02	0.53	-0.04

Father Model Predicting Similarity to Readiness Cluster 4 (robust standard errors)

Fixed Effect	Coefficient	Std. Error	T-ratio
γ_{00} = Intercept	256.21	25.33	10.11
γ_{01} = **SES**	0.55	0.15	**3.74****
γ_{10} = **Sex**	-8.42	2.18	**-3.86****
γ_{20} = IBQ: Activity Level	0.23	1.91	0.12
γ_{30} = IBQ: Distress to Limitations	-3.62	2.47	-1.47
γ_{40} = IBQ: Distress to Novelty	1.47	1.52	0.97
γ_{50} = IBQ: Duration of Orienting	2.21	1.29	1.71
γ_{60} = IBQ: Smiling and Laughter	1.86	1.59	1.16
γ_{70} = IBQ: Soothability	-0.94	1.65	-0.57
γ_{80} = NCAST: Sensitivity to Cues	0.01	0.54	0.02
γ_{90} = NCAST: Response to Child's Distress	0.22	0.58	0.38
γ_{100} = NCAST: Social-Emotional Growth Fostering	0.58	0.93	0.63
γ_{110} = NCAST: Cognitive Growth Fostering	0.17	0.43	0.39

Note. *$p < .05$, **$p < .01$, N = 662 children at level 1; 331 families at level 2

Table 12. *Summary of Effects from Mother and Father Hierarchical Linear Models Predicting Similarity to Readiness Cluster 5 Using Multiply Imputed Data*

Mother Model Predicting Similarity to Readiness Cluster 5 (robust standard errors)

Fixed Effect	Coefficient	Std. Error	T-ratio
γ_{00} = Intercept	261.62	16.59	15.77
γ_{01} = **SES**	0.41	0.13	**3.21****
γ_{10} = Sex	-1.75	2.07	-0.85
γ_{20} = IBQ: Activity Level	0.83	1.37	0.61
γ_{30} = IBQ: Distress to Limitations	-1.46	1.62	-0.90
γ_{40} = IBQ: Distress to Novelty	0.14	1.59	0.09
γ_{50} = IBQ: Duration of Orienting	0.19	1.00	0.19
γ_{60} = **IBQ: Smiling and Laughter**	5.26	1.60	**3.30****
γ_{70} = IBQ: Soothability	-0.25	1.39	-0.18
γ_{80} = NCAST: Sensitivity to Cues	-0.70	0.90	-0.78
γ_{90} = NCAST: Response to Child's Distress	-0.20	0.49	-0.41
γ_{100} = NCAST: Social-Emotional Growth Fostering	0.49	0.79	0.62
γ_{110} = NCAST: Cognitive Growth Fostering	-0.16	0.49	-0.33

Father Model Predicting Similarity to Readiness Cluster 5 (robust standard errors)

Fixed Effect	Coefficient	Std. Error	T-ratio
γ_{00} = Intercept	269.02	25.01	12.80
γ_{01} = **SES**	0.48	0.14	**3.49****
γ_{10} = Sex	-1.85	2.10	-0.88
γ_{20} = IBQ: Activity Level	1.25	1.60	0.78
γ_{30} = IBQ: Distress to Limitations	-1.94	2.36	-0.82
γ_{40} = IBQ: Distress to Novelty	-0.10	1.32	-0.08
γ_{50} = IBQ: Duration of Orienting	1.11	1.22	0.91
γ_{60} = IBQ: Smiling and Laughter	1.47	1.64	0.90
γ_{70} = IBQ: Soothability	-1.72	1.51	-1.15
γ_{80} = NCAST: Sensitivity to Cues	0.00	0.61	-0.01
γ_{90} = NCAST: Response to Child's Distress	-0.04	0.53	-0.08
γ_{100} = NCAST: Social-Emotional Growth Fostering	0.36	0.72	0.51
γ_{110} = NCAST: Cognitive Growth Fostering	0.35	0.43	0.81

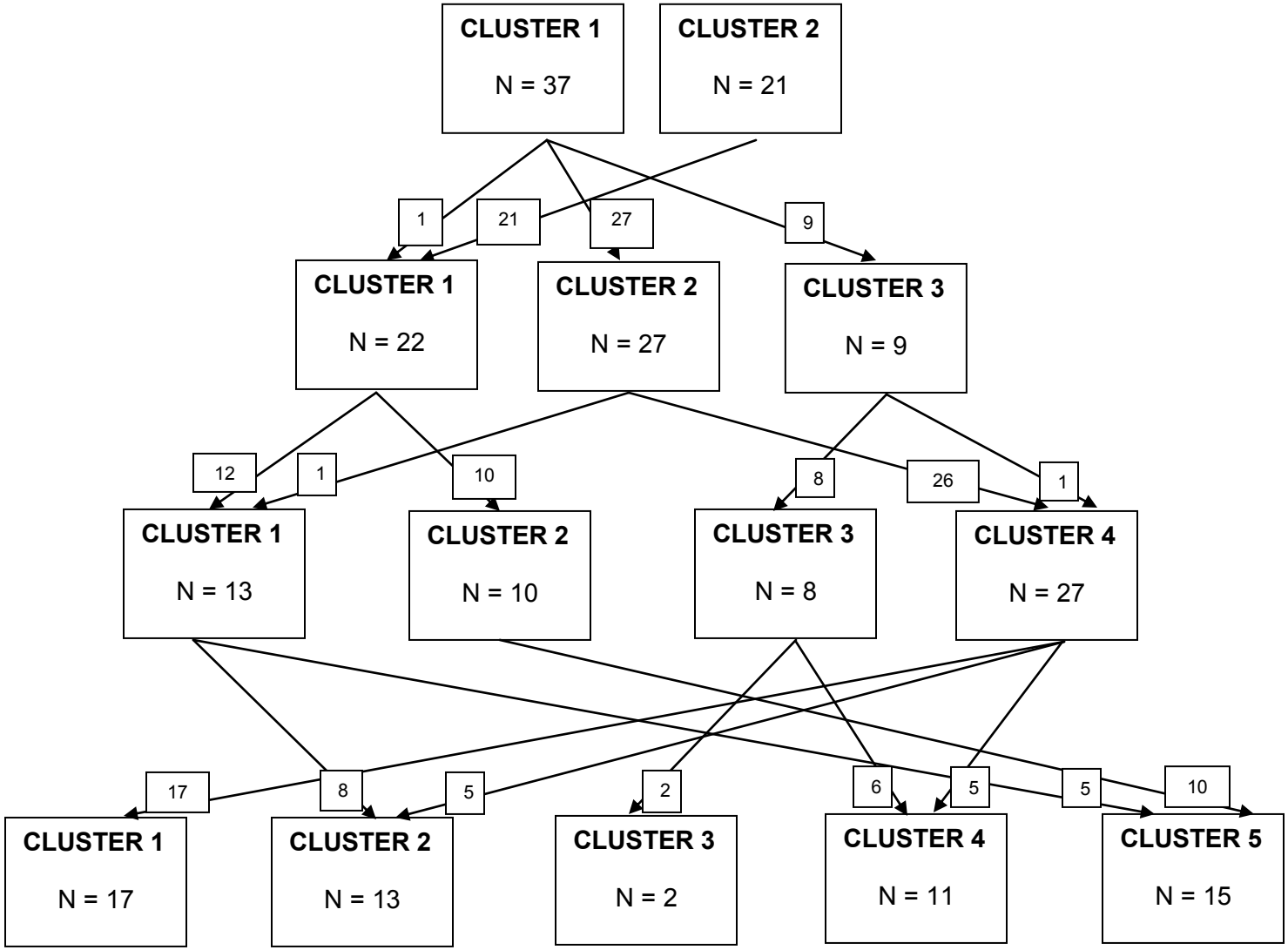
Note. *$p < .05$, **$p < .01$, N = 662 children at level 1; 331 families at level 2

Table 13. *Correlations among Ready Scores and Cognitive Outcomes*

	PPVT	Block Design	Ready 1	Ready 2	Ready 3	Ready 4	Ready 5
PPVT	--	.34*	.24	.24	.21	.21	.22
Block Design		--	.45*	.46*	.47*	.44*	.46*

* $p < .05$, ** $p < .01$, N = 27
Note: PPVT = performance on Peabody Picture Vocabulary Test

Figure 1. Movement across Clusters



Appendix

List of items for the teachers' Q-sorts (original measure in parentheses):

1. Can correctly identify pictures (of common objects). (Bayley Mental Scale)
2. Can correctly label/name pictures (of common objects). (Bayley Mental Scale)
3. Can correctly identify colors (primary colors). (Bayley Mental Scale)
4. Has knowledge of basic shapes (e.g. circle, square, triangle). (Bayley Mental Scale)
5. Can make comparisons of size. (Bayley Mental Scale)
6. Can correctly label/name colors (primary colors). (Bayley Mental Scale)
7. Can identify incomplete pictures. (Bayley Mental Scale)
8. Can complete basic patterns. (Bayley Mental Scale)
9. Can classify objects. (Bayley Mental Scale)
10. Often displays heighted positive affect. (BRS)
11. Rarely displays negative affect. (BRS)
12. Easily soothed when upset. (BRS)
13. Not hypersensitive to stimuli. (BRS)
14. Typically relinquishes materials and accepts new materials. (BRS)
15. Displays much interest in stimuli. (BRS)
16. Consistently shows initiative with tasks. (BRS)
17. Often explores objects and/or surroundings. (BRS)
18. Typically on task, attends well. (BRS)
19. Typically persistent. (BRS)

20. Typically displays enthusiasm toward tasks. (BRS)
21. Typically trusting, rarely fearful. (BRS)
22. Very rarely frustrated with inability to complete tasks. (BRS)
23. Typically responsive, rarely avoidant or resistant. (BRS)
24. Makes many attempts to interact socially. (BRS)
25. Cooperates well. (BRS)
26. Has appropriate gross-motor movement. (BRS)
27. Has appropriate fine-motor movement. (BRS)
28. Good coordination of movement. (BRS)
29. Typically has appropriate timing and pacing of movement. (BRS)
30. Not hyperactive, not fidgety or agitated in movement. (BRS)
31. Does not always seem to be in a big hurry to get from one place to another. (CBQ)
32. Can lower his/her voice when asked to. (CBQ)
33. Usually prefers to join other children playing, rather than watch. (CBQ)
34. Laughs a lot at jokes and silly happenings. (CBQ)
35. When picking up toys or other jobs, usually keeps at the task until it's done. (CBQ)
36. Rarely gets irritated when s/he makes a mistake. (CBQ)
37. Seems to be at ease with any person. (CBQ)
38. When s/he sees a toy s/he wants, gets very excited about getting it. (CBQ)
39. Tends to walk rather than run from room to room. (CBQ)

40. Does not have temper tantrums when s/he doesn't get what s/he wants. (CBQ)
41. When s/he wants to do something, s/he talks about little else. (CBQ)
42. Does not get embarrassed when strangers pay a lot of attention to him/her. (CBQ)
43. When practicing an activity, keeps his/her mind on it. (CBQ)
44. Does not seem to feel "down" at the end of an exciting day. (CBQ)
45. When outside, does not often sit quietly. (CBQ)
46. Enjoys funny stories and usually laughs at them. (CBQ)
47. Acts very friendly and outgoing with new children. (CBQ)
48. Completes a task before moving to another one. (CBQ)
49. Joins others quickly and comfortably, even when they are strangers. (CBQ)
50. Not frustrated when prevented from doing something s/he wants to do. (CBQ)
51. Does not usually become tearful when tired. (CBQ)
52. When mildly criticized will not get mad. (CBQ)
53. Can wait before entering new activities is s/he is asked to. (CBQ)
54. Does not have difficulty waiting in line for something. (CBQ)
55. Does not become tearful when told to do something s/he does not want to do. (CBQ)
56. Often laughs out loud during play with other children. (CBQ)
57. Prefers quiet activities to active games. (CBQ)
58. Is not shy around new people. (CBQ)

59. Has no trouble sitting still when s/he is told to. (CBQ)
60. Sometimes smiles or giggles when playing by her/himself. (CBQ)
61. Is able to resist laughing or smiling when it is not appropriate. (CBQ)
62. Is comfortable asking other children to play. (CBQ)
63. When drawing or coloring in a book, shows strong concentration. (CBQ)
64. Plays games slowly and deliberately. (CBQ)
65. Does not appear downcast for no reason. (CBQ)
66. Does not become easily frustrated when tired. (CBQ)
67. Talks easily to new people. (CBQ)
68. Is usually pretty excited before leaving on an outing. (CBQ)
69. Often giggles and acts silly. (CBQ)
70. Is good at following instructions. (CBQ)
71. When building or putting something together, becomes very involved in what s/he is doing, and works for long periods. (CBQ)
72. Approaches places s/he has been told are dangerous slowly and cautiously. (CBQ)
73. Gets very enthusiastic about the things s/he does. (CBQ)
74. Rarely becomes discouraged when s/he has trouble making something work. (CBQ)
75. Smiles a lot at people s/he likes. (CBQ)
76. Rarely protests when another child takes his/her toy away. (CBQ)
77. Has difficulty leaving a project s/he has begun. (CBQ)

78. Often laughs out loud in play with other children. (CBQ)
79. Can easily stop an activity when s/he is told "no." (CBQ)
80. Is not easily distracted when listening to a story. (CBQ)
81. Does not get easily irritated when s/he has trouble with some task. (CBQ)
82. Smiles at friendly strangers. (CBQ)
83. Does not get angry when called in from play before s/he is ready to quit. (CBQ)
84. Is usually able to resist temptation when told s/he is not supposed to do something. (CBQ)
85. Sometimes becomes absorbed in a picture book and looks at it for a long time. (CBQ)
86. Likes to sit quietly and watch people do things. (CBQ)
87. Will not get mad when provoked by other children. (CBQ)
88. Smiles when looking at a picture book. (CBQ)
89. Does not have a hard time concentrating on an activity when there are distracting noises. (CBQ)
90. Often does not seem to hear me when s/he is working on something. (CBQ)

Teacher Demographics Questionnaire

1.) Sex (circle one): Male Female

2.) Age: _____

3.) Ethnicity (check one): ____ Hispanic or Latino

____ Not Hispanic or Latino

4.) Race (check one): ____ White

____ Black or African American

____ American Indian and Alaska Native

____ Asian

____ Native Hawaiian and Other Pacific Islander

____ Some Other Race

____ Two or More Races

5.) Number of years teaching 4-year-old kindergarten: _____

6.) Total number of years teaching: _____