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Specific Learning Behaviors as Mediators of the Association between Teacher-Child Attachment and School Readiness

Janna M. Fuccillo

University of Miami, j.fuccillo@umiami.edu

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UNIVERSITY OF MIAMI

SPECIFIC LEARNING BEHAVIORS AS MEDIATORS OF THE ASSOCIATION
BETWEEN TEACHER-CHILD ATTACHMENT AND SCHOOL READINESS

By

Janna M. Fuccillo

A THESIS

Submitted to the Faculty
of the University of Miami
in partial fulfillment of the requirements for
the degree of Master of Science

Coral Gables, Florida

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Janna M. Fuccillo

Approved:

Daryl B. Greenfield, Ph.D.
Professor of Psychology

Terri A. Scandura, Ph.D.
Dean of the Graduate School

Heather A. Henderson, Ph.D.
Assistant Professor of Psychology

Maria S. Carlo, Ph.D.
Associate Professor of Teaching
and Learning

FUCCILLO, JANNA

(M.S., Psychology)
(December 2008)

Specific Learning Behaviors as
Mediators of the Association between
Teacher-Child Attachment and School Readiness

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A great deal of research suggests that a close relationship with a teacher in preschool plays a significant role in promoting school readiness (Mashburn & Pianta, 2006). How exactly this relationship might impact children's acquisitions of skills, however, is not well understood. Strong theoretical arguments suggest both children's motivation and attention control as likely explanatory mechanisms in this association. These two learning-related behaviors have been described for preschoolers within the framework of Approaches to Learning as Competence Motivation and Attention/Persistence (McDermott, Leigh, & Perry, 2002). To test these variables as potential mediators, data were analyzed from 115 Head Start children scheduled to enter kindergarten the following year. Teachers completed a measure of teacher-child attachment in the fall, and a measure of Approaches to Learning in the winter. Children were directly assessed on school readiness at the end of the year. Regression analyses were conducted to test two mediation models. Results indicated Attention/Persistence but not Competence Motivation as a significant mediator in the association between teacher-child relationships in preschool and school readiness. Implications for intervention with low-income preschoolers are discussed.

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CHAPTER 1: INTRODUCTION

It is clear that young children's relationships with adults, both inside and outside the home, meaningfully impact the course of their development across various domains, including the academic competencies associated with school readiness. Mashburn and Pianta (2006) asserted that children's social relationships, including those with teachers, are the "primary mechanism through which children acquire readiness-related competencies" (p.151). It is not clear, however, how these relationships impact school readiness. Some likely mediators of this association include children's learning-related behaviors, such as competence motivation, task persistence, preference for challenge, and attention control. Although the propensity for such behaviors is often assumed to be inherent in children (Harter, 1978), certain social and environmental factors either fan this flame or extinguish it. Individual differences in learning-related behaviors emerge as early as preschool (Deci & Ryan, 2000; Smiley & Dweck, 1994; Stipek & Green, 2001) and may have significant implications for children's school readiness.

The purpose of this study is to explore distinct learning-related behaviors as potential mechanisms through which preschoolers' relationships with teachers might impact school readiness at the end of preschool. The relevance of this research to low-income populations will be briefly discussed, followed by a review of research on the associations between early teacher-child relationships on academic achievement and learning-related behaviors in preschool. The construct of Approaches to Learning will then be introduced as a framework for examining specific behavioral mechanisms through which teacher-child relationships in preschool might impact academic achievement. Finally, two components of this construct, Competence Motivation and

Attention/Persistence, will be considered more closely as potential mediators of this association.

Relevance for low-income children

It has long been established that low-income children are at risk for poor academic outcomes, and they may be at particular risk for poor learning-related behaviors as well (Malakoff, Underhill, & Zigler, 1998; Zigler & Butterfield, 1968;). Chang and Burns (2005) examined several of these behaviors in three groups of preschoolers: low-income children not attending Head Start, low-income children attending Head Start, and middle-income children. They found that low-income children not attending Head Start were less likely to choose challenging tasks and show persistence than low-income children attending Head Start. These children, in turn, were less likely to choose challenging tasks and show persistence than middle-income children. This suggests both that low-income children are at risk for poor learning-related behaviors and, on a more hopeful note, that some aspect of participation in an intervention such as Head Start may reduce that risk by promoting positive learning-related behaviors. Studying specific aspects of this classroom-based intervention that might be producing this effect is critical for improving its effectiveness.

Teacher-child relationships and school readiness

The quality of a child's relationship with his teacher in early education may be an important variable in promoting positive learning-related behaviors and academic achievement. Preschool children in classrooms characterized by high warmth have been shown to have both higher motivation and higher academic achievement (Stipek et al., 1998). In regards to individual teacher-child relationships in kindergarten, children with

relationships characterized by high closeness and low conflict have been shown to have greater self-directedness in the classroom as well as higher academic performance (Birch & Ladd, 1997). Furthermore, it has been demonstrated that these relationships may have lasting effects on children's acquisition of new skills. Pianta and Stuhlman (2004) documented that the quality of teacher-child relationships in preschool predicted children's skill levels in first-grade even after controlling for preschool skill levels.

The positive relationships among teacher-child relationships, learning behaviors and academic outcomes suggest that learning behaviors might play a mediating role in the association between teacher-child relationships and achievement outcomes. O'Connor and McCartney (2007) tested this relationship longitudinally by examining teacher-child relationships in preschool and children's classroom engagement and achievement in third grade. They found that the quality of teacher-child relationships in preschool significantly predicted achievement in third grade and that classroom engagement in third grade was a significant partial mediator of this association.

Identifying classroom engagement as a potential mediator was an important step in understanding the association between teacher-child relationships in preschool and children's achievement. The construct of classroom engagement, however, requires further dissection. In order for a child to engage in learning activities, he must be able to attend to the task at hand and also be motivated to do so. Research concerning the construct of "Approaches to Learning" has sought to parse apart these distinct behavioral components involved in preschoolers' classroom engagement. This construct may be helpful in identifying more specific learning-related behaviors as mediators of the relationship between teacher-child relationships and academic outcomes in preschool.

Approaches to Learning as a framework

The National Education Goals Panel included Approaches to Learning as one of the five essential domains of school readiness (Kagan, Moore, & Bredecamp, 1995). This domain encompasses the attitudes that children have towards learning, their inclinations towards learning activities and their learning styles. Teacher report of children's Approaches to Learning has been shown to predict academic achievement in elementary school after controlling for the effect of intelligence (Schaefer & McDermott, 1999). This domain is thought to be distinct from other domains of school readiness such as language, cognition, and general knowledge, but importantly related to their development. Approaches to Learning is believed to be influenced by certain innate predispositions and characteristics but is also believed to be malleable through the influence of environmental factors (Kagan et al., 1995).

McDermott, Leigh, and Perry (2002) created the Preschool Learning Behavior Scale (PLBS), a measure of Approaches to Learning comprised of 29 items describing behaviors believed to be related to academic outcomes. Factor analysis revealed three distinct components: Competence Motivation, Attention/Persistence, and Attitudes toward Learning. Using this framework, it is possible to consider variation among these components in relation to other environmental factors and child outcomes. Previous research on constructs related to Competence Motivation and Attention/Persistence indicate both factors as potential mediators of the association between teacher-child relationships and academic achievement.

According to the PLBS (McDermott et al., 2002), low Competence Motivation is defined by behaviors such as showing little interest in activities, being reluctant to tackle

new activities, giving up easily, and displaying negative affect in the face of difficulty. This construct appears to be more affective in nature, and related to approach/withdrawal behaviors. Low Attention/Persistence is defined in this scale by behaviors such as being easily distracted, acting without taking time to think, having a don't-care attitude to success or failure, and trying but not being able to sustain concentration. This construct appears to be related to abilities of cognitive self-regulation and attention control. It involves the ability to selectively attend to important stimuli, to sustain attention, and to avoid distraction and impulsive behavior.

Both Competence Motivation and Attention/Persistence in young children have been shown to be related to academic outcomes (Schaefer & McDermott, 1999). Other research has linked very similar constructs to children's academic outcomes as well. Elliott and Dweck (1988) characterized a type of motivation that is closely allied with the construct of Competence Motivation, termed "mastery motivation". This type of motivation, based on the goals of learning and achieving competence, has been shown to be predictive of higher academic achievement (Dweck & Leggett, 1988). Attention control has also been shown to predict children's outcomes. Duncan and colleagues (2007) showed that children's attention skills in preschool were among the strongest predictors of academic gains in early elementary school.

Although Competence Motivation and Attention/Persistence have been shown to be significantly correlated, they have also been shown to have significant levels of unique variance (McDermott et al., 2002). These learning-related behaviors, therefore, are believed to represent distinct learning-related behaviors and may have distinct antecedents and consequences. Low Competence Motivation according to the PLBS, on

the one hand, is characterized by reluctance to try new activities or tendency to withdraw from novelty rather than approach it. Low Attention/Persistence, on the other hand, is characterized not in terms of approach and withdrawal but in terms of an inability to sustain engagement with an activity through concentration. Furthermore, low Competence Motivation is characterized by negative affect following failure while low Attention/Persistence is characterized by a flat affect with regards to success or failure. Related research supports the functional independence of these constructs as well. Lahaderne (1968) showed that, although sixth-graders' attention skills were related to their academic achievement, they were unrelated to their attitudes toward school. This suggests that children who are able to attend to learning activities are not necessarily motivated to learn, and children who are not able to attend are not necessarily unmotivated to learn. These two constructs reflect distinct skills and, therefore, may be differentially impacted by teacher-child relationships and may differentially impact school readiness outcomes.

Approaches to Learning and children's relationships with adults

Research has provided some evidence that the quality of children's relationships with adults influence behaviors related to both competence motivation and attention control. For example, McClelland, Morrison, and Holmes (2000) examined family characteristics related to kindergarteners' work-related skills, including their independence and self-regulation in the classroom. They found that children living in single-parent homes were more likely to be low in work-related skills, suggesting that exposure to adults is related to the development of the capacity for independence and self-regulation. In an observational study, Main (1983) showed that secure attachment

was associated both with longer attention span during a play activity and also more intense engagement in exploratory behavior. Although these studies provide initial support linking children's relationships with adults and competence motivation and attention control, other studies have shown mixed results.

Central to the construct of Competence Motivation is an inclination to explore and engage with the environment in order to master it. According to Attachment Theory, children's relationships to adults form the foundation of this motivation to explore (Bowlby, 1969). Maslin-Cole and Spieker (1990) postulated possible mechanisms through which attachment might influence motivation to explore, including the role of the attachment figure as a secure base, as a provider of physiological and emotional homeostasis, as a promoter of an internalized sense of effectance, and as a source of encouragement during exploration. Despite strong theoretical arguments for a relationship between quality of attachment and motivation, empirical support has been mixed. Maslin-Cole and Spieker (1990) examined this relationship using two longitudinal studies of toddlers and their mothers. Although they found that attachment and motivation were related, the results were not consistent across measures or over time and the nature of the relationship was not entirely in line with their hypotheses. They found that although securely attached children had higher motivation than insecure-anxious/resistant children, they had lower motivation than insecure-avoidant children, contrary to the predictions of the theory.

Strong theoretical arguments have also been made linking children's relationships with adults and the development of abilities related to attention and persistence (Bowlby, 1969; Vygotsky, 1978). Main (1983) found that securely attached three-year-olds had

longer attention spans during play relative to insecurely attached children. Longitudinal studies looking at both attachment classification and other measures of dyadic interaction have provided mixed evidence for an association between children's early relationships with caregivers and their abilities to attend and persist. Fearon and Belsky (2004) found that children who were securely attached at 15 months had higher scores on an attentional performance task in preschool relative to children who were insecurely attached. Raikes and colleagues (2007) found that high-quality mother-child interactions, characterized by affective synchrony and mutual enjoyment, during play at 14 and 24 months predicted children's ability to focus attention and persist during a cognitive assessment at 36 months. On the other hand, Wijnroks (1998) found that mothers' involvement, responsive sensitivity, and intrusiveness with their pre-term infants (who are at risk for poor attention), were not related to the length of time children spent attending to a task at age two.

This body of evidence provides some support for the hypothesis that teacher-child relationships in preschool impact Competence Motivation or Attention/Persistence. Attempts to link related constructs to early relationships with caregivers, however, have not always garnered expected results. Furthermore, these studies focus on mother-child relationships during infancy. It is not clear whether these effects generalize to teacher-child relationships or extend to the preschool age.

Additional support for this hypothesis comes from studies examining parent-child relationships in preschool, and teacher-child relationships in preschool as they relate to behaviors later in childhood. For example, a study with 4-year-old, at-risk African-American preschoolers demonstrated a mediating effect of child mastery motivation in

the association between parent-child relationships and academic gains (Turner and Johnson, 2003). This suggests that motivational variables might mediate the association between teacher-child relationships in preschool and academic gains as well but this has not yet been tested. Another study examined teacher-child relationships in preschool and demonstrated a mediating effect of third-grade classroom engagement on third-grade academic gains (O'Connor & McCartney, 2007). This mediating relationship has not yet been tested within the span of the preschool years. It is not yet clear, then, if any effects of the teacher-child relationship on learning behaviors, and in turn on achievement, are manifested early or emerge only later. Continued research on child variables related to classroom engagement is needed to test this mediation effect within the critical year preceding entry into kindergarten.

Purpose of current study

The primary aim of this study was to test two components of Approaches to Learning, Competence Motivation and Attention/Persistence, as mediators of the association between teacher-child relationships in preschool and school readiness. Inherent in that aim, it was first necessary to meet a secondary aim of replicating the association between early teacher-child relationships and academic outcomes (Birch & Ladd, 1997; Mashburn & Pianta, 2006; O'Connor & McCartney, 2007).

Previous analyses on a large extant database provide some support for a mediating effect of motivation (Fuccillo & Greenfield, in preparation). In a sample of 1,372 preschoolers participating in Head Start, measures of attachment, initiative, and math and language achievement were obtained. Children's attachment and initiative (a construct similar to motivation) were assessed with the Devereux Early Childhood Assessment

(DECA; LeBuffe & Naglieri, 2002), and achievement was assessed with the Galileo System for the Electronic Management of Learning (Bergan, Bergan, Rattee, & Feld, 2003). Analyses revealed a positive relationship between attachment and achievement, completely mediated by initiative. There were some limitations in this study, however, in the measures used and the timing of their administration. First, all of the data were based on teacher-report. Teacher's general perceptions of individual children may have caused them to rate attachment behavior, initiative, and cognitive gains in an overall positive or negative way. Second, measures of attachment and initiative were taken at the same time. This precludes the possibility of deciphering a causal relationship between the two constructs.

The current study extends the aforementioned study by providing a stronger test of child motivation as well as child attention and persistence as mediators of the association between teacher-child attachment and academic growth in preschool. Although classroom engagement has been shown to mediate this relationship (O'Connor & McCartney, 2007), the current study serves to parse apart the different components of engagement in the preschool classroom by considering separately these two learning-related behaviors.

This study will be conducted with low-income children attending a Head Start program. It has long been established that low-income children are at risk for poor academic outcomes and recent evidence suggests that they may also be at risk for both low motivation and low persistence (Chang & Burns, 2005). For these reasons, it is important to study the variables that may influence these learning-related behaviors in a low-income sample.

CHAPTER 2: METHOD

Procedures

In the current study, data were obtained from 245 children ages 4 to 5 years who were participating in Head Start and were scheduled to enter kindergarten the following year. Five Head Start centers were selected based on the following two criteria: geographic location and predominant ethnicity of students. Centers were considered that were within a 20 mile radius of the University, for feasibility of traveling to the centers with groups of University students. Additionally, in order to create a sample that was demographically representative of the Miami-Dade Head Start population, centers were selected so that roughly half of the sample would be African American and half would be Hispanic.

After selecting centers that met these criteria, study personnel met first with Center Directors to discuss involvement in the study and obtain consent to seek the participation of individual teachers and classrooms. Study personnel then met with teachers and teacher assistants to explain the study and obtain consent. In total, consent was obtained from teachers and teacher assistants from 29 classrooms. Within classrooms, children were selected based on birth date in order to include children who would be eligible to enroll in kindergarten the following fall. Teachers who consented were given information forms to distribute to the parents of children selected for the study. This letter was intended both to inform parents of the nature of the study and how it would impact their child, and also to provide an opportunity to decline permission for their child to be included.

In accordance with Miami-Dade Head Start procedures, teachers completed the Devereux Early Childhood Assessment (DECA), (LeBuffe & Naglieri, 2002) for each child in their class within the first 45 days of the school year. These data were then obtained from a central office for participating children. A team of graduate students was trained on the administration of the Learning Express and then trained a team of undergraduates receiving research course credit. Both graduate and undergraduate students administered this measure individually to each child in the study at three times throughout the year (fall, winter, and spring). In the middle of the year, teachers were given a copy of the PLBS (McDermott et al., 2002) for each of their students participating in the study along with instructions for filling them out. They were asked to complete the scales in the span of two weeks and were compensated with a \$10 gift card when the scales were collected.

Measures

Teacher-Child Attachment. The Devereux Early Childhood Assessment (DECA; LeBuffe & Naglieri, 2002) is a measure designed for both teachers and parents to assess children ages 2 through 5 years on behaviors known to be either protective or concerning for development. It includes sub-scales for Attachment, Initiative, Self-Control, and Behavioral Concerns. Teachers are asked to rate how often each student displayed certain behaviors over the previous four week period using a 5-point likert-scale ranging from “Never” to “Very Frequently”. The Attachment scale includes eight behaviors such as “respond positively to adult comforting when upset”, “show affection for familiar adults”, and “trust familiar adults and believe what they say”. Teachers are asked to consider children’s behaviors toward all adults that might be present in the classroom.

Raw scores for each scale are totaled and then converted into *t*-scores according to the test manual. Cronbach's alpha was .85 for the Attachment subscale when this measure was normed on a nationally representative sample of preschool children.

Learning Behaviors. The Preschool Learning Behavior Scale (PLBS; McDermott et al., 2002) is a nationally standardized, teacher-report measure of learning-related behaviors for children three to five and a half years of age. The scale includes 29 items which each represent a specific behaviors related to learning. Teachers are asked to consider the behavior of a child over the previous two months and indicate if each behavior "Most Often Applies", "Sometimes Applies", or "Never Applies". Raw scores for each scale are totaled and then converted into *t*-scores according to the test manual. Factor analysis of these items yielded three distinct and reliable dimensions of Competence Motivation, Attention/Persistence, and Attitude Toward Learning. Both Competence Motivation and Attention/Persistence will be included in the current analysis. Competence Motivation includes 11 behaviors such as "Says tasks too hard, makes no attempt", "Resistant or fearful about new activities", and "Too unenergetic for interest or effort". Cronbach's alpha was .85 across a nationally representative sample of preschool children, and .89 for a Head Start sample. Attention/Persistence includes 9 behaviors such as "Cannot settle into an activity", "Easily distracted or seeks distraction", and "Acts without taking time to look or think". Cronbach's alpha was .83 across a nationally representative sample of preschool children, and .85 for a Head Start sample. Competence Motivation and Attention/Persistence overlap in one item, "Easily gives up activities".

School Readiness. The Learning Express (McDermott, Angelo, Waterman, & Gross, 2005) is an Item-Response-Theory (IRT)-based test designed to detect growth of school readiness in the Head Start population. The test includes four subscales, Vocabulary, Math, Listening Comprehension, and Alphabet Knowledge, always administered in this order. Children are assessed individually by a trained assessor using a large flip-book of pages depicting pictures, letters, or numbers such that the assessor reads a prompt and asks the child to respond either by pointing or verbalizing. Each subscale includes a set of items ordered by difficulty according to IRT analysis. Each item is scored as either correct or incorrect. The assessor begins each subscale at a designated starting item and continues either forward or backward in order to establish a “basal” of five correct responses. If a basal is not reached, the assessor continues testing backwards to the first (easiest) item of the subscale. The assessor then continues administering items forward either until the child reaches a “ceiling” of five incorrect responses or continues to the last (hardest) item. It is then assumed that the child would have responded correctly to all items before his/her basal and would have responded incorrectly to all items after his/her ceiling. Total correct responses (including those assumed to be correct according to basal) are then totaled and converted to an interval-level score according to IRT analysis.

Both early math and early literacy skills at the end of preschool have been shown to be strong indicators of later academic success (Duncan et al., 2007). Gains in these areas have also been shown to be associated with close teacher-child relationships (Howes et al., 2008). For these reasons, end-of-the-year scores on both Math and Alphabet Knowledge were chosen as the outcome measure in these analyses.

Participants

In order to create a sample that was representative of the ethnic and racial make-up of the population of Miami-Dade Head Start centers, data were collected from both centers that had predominantly African-American students (greater than 85% African-American) and centers that had predominantly Hispanic or Latino students (greater than 85% Hispanic or Latino). Twelve of the 29 participating classrooms came from three predominantly African-American centers and the remaining 17 classrooms came from predominantly Hispanic or Latino centers. Measures included in the study were carefully selected in order to capture pertinent constructs (at appropriate levels of ability) for the Head Start population. Unfortunately, equivalent versions of these measures for Spanish-speakers have not been created or validated. After data collection had begun and assessors observed the level of English-proficiency of teachers and students in predominantly Hispanic or Latino centers, some concern arose regarding the validity of these measures for use with teachers and students for whom English was not a first language. During the school readiness assessment, for example, many children answered questions in Spanish and appeared to have difficulty understanding directions in English. Although children may have had strong knowledge of numbers and letters when speaking in Spanish, their scores may not have accurately reflected this knowledge using an English-language based assessment. For this reason, correlations for the variables of interest were run separately for children in predominantly African-American centers and children in predominantly Hispanic or Latino centers.

Correlation analyses revealed an important difference between these two samples. Although teacher-child attachment had a marginally significant relationship to Math and

Alphabet Knowledge outcome scores for the African-American center sample, ($r(111) = .161, p < .091$ with Math and $r(111) = .165, p = .083$ with Alphabet Knowledge), this association was nonexistent for the Hispanic or Latino center sample, ($r(125) = -.041, p = .650$ with Math and $r(125) = .023, p = .802$ with Alphabet Knowledge). The association between close teacher-child relationships in early education and academic outcomes has been demonstrated in several previous studies (Birch & Ladd, 1997; Mashburn & Pianta, 2006; O'Connor & McCartney, 2007) and no evidence currently exists to suggest that the presence of this association should vary as a function of center ethnicity. The absence of an association between these variables in the Hispanic or Latino centers was interpreted as an indication that these data were not valid measures of the intended constructs and therefore not appropriate for these analyses. It was decided to continue analyses with the sample from African-American centers only.

This reduced sample included 115 children in 12 classrooms and three centers. Fifty-eight of these children were male and 57 were female. The majority of the children included in the study were African-American (90.4%), with a minority of Hispanic or Latino children (5.2%) and children listed as biracial or "Other" (4.3%). The average age at the start of the school year ranged from 48 to 61 months with a mean of 55.4 months ($SD = 3.30$). All children included in the sample had Attachment data and at least one other variable of interest. PLBS data were missing for 18 children in this sample due to misplacement of questionnaires. Outcome scores were missing from 4 additional children due to prolonged absence from school during the assessment period.

Data analysis

The mediation models presented in Figures 2 and 3 were tested using linear regression analysis and the criteria for mediation presented by Baron and Kenny (1986). Baron and Kenny (1986) stipulate four steps for establishing a mediation effect, using three regression analyses. First, the dependent variable is regressed on the hypothesized independent variable in order to test for a direct effect of the independent variable on the dependent variable (Step 1). Second, the mediator variable is regressed on the independent variable in order to test for a direct effect of the independent variable on the mediator (Step 2). Third, the dependent variable is regressed on both the mediator and the independent variable in order to test for the effect of the mediator on the dependent variable while controlling for the independent variable (Step 3). Finally, to establish that the mediator variable completely mediates the relationship between the independent variable and the dependent variable, the effect of the independent variable on the dependent variable should be reduced to zero when the mediator is included in the model (Step 4).

CHAPTER 3: RESULTS

Math and Alphabet Knowledge subscale scores were found to be highly correlated, $r(111) = .705, p < .001$. Since these scores are calculated according to an interval scale, it was decided to sum Math and Alphabet Knowledge scores to create a Combined School Readiness Score.

In order to determine if the data were normally distributed and appropriate for regression analysis, the variables of interest (Attachment, Competence Motivation, Attention/Persistence, and the Combined School Readiness Score) were examined for outliers, homoscedasticity, and kurtosis. All variables were found to be sufficiently normally distributed. Descriptive statistics are reported in Table 1 and correlations in Table 2.

To test the current mediation model, a regression analysis was first performed with Attachment as the independent variable and the Math and Alphabet Knowledge combined school readiness score as the dependent variable (*Figure 1, path "c"*). Then, the steps 2 and 3 were performed twice: once with Competence Motivation as the mediator and once with Attention/Persistence as the mediator. Competence Motivation was regressed onto Attachment (*Figure 2, path "a"*), and the combined school readiness score was regressed onto both Attachment and Competence Motivation (*Figure 2, path "b"*). Attention/Persistence was also regressed onto Attachment (*Figure 3, path "a"*), and the combined school readiness score was regressed onto both Attachment and Attention/Persistence (*Figure 3, path "b"*). Gender was included as a covariate in all regressions but was not significant in any and so was removed.

Total effect of Attachment on School Readiness

Attachment was a marginally significant predictor of the combined school readiness score, $\beta = 1.26$, $SE = .675$, $t(109) = 1.87$, $p = .064$, accounting for 3.10% of variance. This regression, presented in Figure 1, captured the total effect of Attachment on the combined school readiness score. Although this regression did not meet the standard significance level of .05, it was decided to continue with mediation analyses. Kenny, Kashy, and Bolger (1998) stated that a significant relationship between the independent variable and the dependent variable (Step 1) is not necessary for mediation. Significant relationships between the independent variable and the mediator (Step 2) and between the mediator and the dependent variable (Step 3) imply a relationship between the independent variable and dependent variable. Although Step 1 traditionally establishes a relationship to be mediated, Steps 2 and 3 are the primary requirements for mediation.

Competence Motivation as mediator

First, Competence Motivation was tested as a mediator of the relationship between Attachment and the combined school readiness score. Attachment was not a significant predictor of Competence Motivation, $\beta = .118$, $SE = .096$, $t(96) = 1.24$, $p = .218$. The nonsignificance of this relationship indicated a failure to meet the requirement of Step 2. Further mediation analyses for Competence Motivation were not conducted.

Attention/Persistence as mediator

Next, Attention/Persistence was tested as a mediator of the relationship between Attachment and the combined school readiness score. Attachment was a significant

predictor of Attention/Persistence, $\beta = .381$, $SE = .105$, $t(97) = 3.62$, $p < .001$, accounting for 1.19% of the variance. The significance of this relationship indicated that this model met the requirement of Step 2. The combined school readiness score was then regressed onto both Attachment and Attention/Persistence. Attention/Persistence was a significant predictor of the combined school readiness score when controlling for Attachment, $\beta = 3.16$, $SE = .604$, $t(92) = 5.23$, $p < .001$. Attachment was no longer a significant predictor of the combined school readiness score when controlling for Attention/Persistence, $\beta = .388$, $SE = .676$, $t(92) = .575$, $p = .567$. Attachment and Attention/Persistence accounted for 2.69% of the variance in the combined school readiness score, $F(92) = 16.9$, $p < .001$. The significance of Attention/Persistence but not Attachment in predicting the combined school readiness score when both predictors are included in the model indicate that this model met the requirements of both Steps 3 and 4. Additionally, the Sobel test was used to determine the significance of the indirect effect of Attachment on the combined school readiness score through Attention/Persistence. This test confirmed Attention/Persistence as a significant mediator, $z = 2.98$, $p = .003$.

CHAPTER 4: DISCUSSION

General conclusions

Previous research suggests both Competence Motivation and Attention/Persistence as behaviors that develop as a function of children's relationships with adults and also impact school readiness. Thus, both were hypothesized as variables mediating the association between close teacher-child relationships and school readiness. Teacher-child attachment marginally predicted the combined school readiness score. Teacher-child attachment significantly predicted Attention/Persistence but not Competence Motivation. Attention/Persistence also significantly predicted the combined school readiness score while controlling for the effect of teacher-child attachment. The current study, therefore, indicated Attention/Persistence, but not Competence Motivation, as a mediator of the association between teacher-child attachment and school readiness.

These results suggest that teacher-child relationships are more directly related to the skills described in the Attention/Persistence scale than those described in the Competence Motivation scale. Attention/Persistence includes items referring to a child's ability to persist in challenging activities by focusing attention and resisting distraction. This scale might be best characterized as a measure of attention control or attention regulation. Rothbart, Posner, and Kieras (2006) described early interactions with caregivers as important precursors to the development of these skills. For example, one technique a caregiver employs to sooth an upset infant is to redirect his attention away from upsetting stimuli, engaging him with more pleasant stimuli. The caregiver acts, in this case, as the regulator of the child's attention. As children develop, they become increasingly able to self-regulate attention without the help of adults. This ability,

however, continues to develop throughout the preschool years and beyond (Simonds, Kieras, Rueda, & Rothbart, 2007). This study suggests that teacher-child relationships in the preschool classroom might play an important role in supporting the continued development of attention regulation. Preschool teachers, for example might help children to develop attention regulation by asking questions to focus attention, verbally praising and encouraging persistence, and by providing help or hints during challenging tasks. In addition to the general quality of teacher-child relationships, these specific types of teacher-child interactions should be explored as part of a research agenda to elucidate the mechanisms through which these relationships might promote attention and persistence.

Although Competence Motivation was hypothesized to be associated with teacher-child attachment, no association was found between these variables. One possible explanation for this null finding is a lack of power; a larger sample size might have yielded a small but significant association between these variables. This distinction between Competence Motivation and Attention/Persistence may also be explained by a possible difference in teachers' emphasis on different learning behaviors. Teachers who need to manage large numbers of young children within a classroom may be less concerned about increasing motivation and more concerned about improving attention skills and self-control. A child's motivation to engage with learning tasks may not be an area of concerted effort on the part of the teacher and, therefore, may be less directly impacted by the closeness of the teacher-child relationship.

The Attention/Persistence model accounted for 2.69% of the variance in children's school readiness scores, representing a significant proportion of variance but a small effect (Cohen's $f^2 = .028$) according to Cohen's (1992) estimation of effect sizes

for multiple regression. This may be attributable in part to measurement error incurred by using fairly brief measures to approximate rather complex interpersonal and behavioral constructs. Obtaining a small effect size in predicting early academic outcomes, however, is consistent with other studies using other measures of similar constructs (Birch & Ladd, 1997; Turner & Johnson, 2003). Furthermore, it is important to note that even small differences in academic competence early in childhood may be very meaningful over time. Early childhood is a critical period of development for skills related to math and language; children's mastery or lack of mastery in these areas may pave the way for positive or negative trajectories, respectively.

Association between Attention/Persistence and Competence Motivation

The relationship between Attention/Persistence and Competence Motivation requires further exploration as well. In the literature, the definitions of motivation, persistence, and attention often overlap. For example, the length of time spent persisting on a task is often used as a behavioral marker of mastery motivation (Gilmore, Cuskelly, & Hayes, 2003). It has been suggested that the constructs reflected by Attention/Persistence and Competence Motivation are intricately intertwined throughout development. Motivation is necessary for a child to approach a challenging task, but attention and persistence are necessary to execute the steps to follow through in completing that task. This relationship becomes cyclical as success or failure on challenging tasks impacts the child's sense of competence which in turn impacts his motivation to seek challenge in the future (Bronson, 2000).

Teacher-child attachment, as measured in the beginning of the year, predicted Attention/Persistence but not Competence Motivation. These two learning behaviors,

however, were highly correlated, $r(98) = .779, p < .001$. These findings may be explained by a developmental progression of these two learning behaviors. For example, teacher-child relationships might have a primary impact on children's ability to attend and persist in the classroom and development of this learning behavior might, in turn, impact children's competence motivation. Deci and Ryan (1985) described motivation as determined by the degree to which the universal needs for autonomy and competence are met. A task that is too difficult for a child will not support his sense of competence, thus decreasing his motivation to engage in the task. For a child with poor attention skills, many learning tasks in the preschool classroom might be rightly perceived as too difficult, resulting in decreased motivation to engage. A close teacher-child relationship, however, might help a child to regulate his attention in the classroom and to regulate his frustration during challenging activities. When that child is able to persist during learning activities with this support from adults, he will have greater opportunity to experience success in the classroom. This experience of success might lead to increased motivation to engage in future learning activities, and ultimately, to increased learning. Future research is necessary to examine this and other possible models of the developmental course of learning behaviors.

Socioeconomic differences

The study of these two components of Approaches to Learning is particularly relevant for low-income populations. Since the early years of Head Start, researchers have suggested that socioeconomic differences in achievement may be attributable to differences in motivation (Malakoff, Underhill, & Zigler, 1998; Zigler & Butterfield, 1968). There has been some disagreement since then about this relationship. Stipek and

Ryan (1997) found that socioeconomic status was not consistently predictive of preschoolers' motivation across of a variety of measures including children's feelings about school, emotions in task settings, expectations for success, and preference for challenge. Although they found some evidence of lower preference for challenge in low-income children, they concluded that, overall, motivation is not an important area of difficulty in this population and therefore not an important area for intervention. The authors recommended an emphasis in early education on basic skills, stating that "most young children, whatever their family economic situation, enter school with considerable enthusiasm, self-confidence, and willingness to take on learning challenges" (p. 721).

Howse, Lange, Farran, and Boyles (2003) sought to replicate this finding and also test if attention control and self-regulation might better explain socioeconomic differences in achievement. In this study, motivation was assessed by children's self-report of desire to succeed at school and enjoyment of school, perceived competence and preference for challenge. Self-regulation was assessed by children's ability to resist distraction and maintain attention during a computerized task. Both motivation and self-regulation were assessed by teacher report. Children ages 5 to 8 years were tested from both low-income and middle- to upper-income samples. The authors found that the younger children (ages five to six) did not differ across income groups on teacher report of self-regulation or motivation or in child report of motivation. The self-regulation task, however, did show a socioeconomic difference in young children. Low-income young children were significantly more distractible during the task than higher-income young children. This indicates that self-regulation and attention skills, in comparison to motivation, may be a more critical target of intervention for low-income children. Based

on the results of the current study, these skills may be more directly impacted by student-teacher relationships as well.

Low-income children might not only be at-risk for poor learning behaviors but also for weaker attachments to adults who could support that development. Zigler and Butterfield (1968) suggested that the ecology of poverty might impact a child's orientation to adults outside the home, such as teachers, impairing their ability to benefit from this resource. For example, child maltreatment is more likely to occur in low-income populations (Coulton, Korbin, Su, & Chow, 1995). A child who enters the preschool classroom with a history of maltreatment might have difficulty in trusting unfamiliar adults. Such a situation poses significant challenges to a teacher in establishing a close relationship with a child. This challenge, however, also represents the potential for significant impact. Cicchetti, Toth, and Hennessy (1989) suggested that secure attachments to teachers may have the potential to play a compensatory role for children with insecure attachments to parents. For example, O'Connor and McCartney (2007) found that although insecure maternal attachment was associated with low achievement, high quality relationships with teachers buffered this negative effect. Preschool teachers, particularly those working with low-income populations, must be equipped to maximize this potential to support their students' development through supportive relationships.

Potential effects of child characteristics

Close teacher-child relationships might differentially impact the learning behaviors measured in this study depending on other child characteristics. There is some evidence from infant research that child temperament might be one such characteristic. In

a longitudinal study, Feldman and colleagues examined the association between affective synchrony in mother-infant interactions and children's self-control at two years of age (Feldman, Greenbaum, & Yirmiya, 1999). Self-control is described as the ability to both comply with adult demands and inhibit other behaviors when instructed, similar to the Attention/Persistence subscale, which measures children's ability to persist during a learning activity when instructed to do so and inhibit responses to distracting stimuli. Overall, quality mother-infant interactions assessed at three and nine months of age were associated with self-control at two years of age (Feldman et al., 1999). Interestingly, this effect was stronger for children who exhibited high negative emotionality in infancy. For these children (who showed lower self-control on average), high quality interactions with a caregiver might have been particularly important for developing self-control.

A similar effect might be at play in the preschool classroom as well. The impact of teacher-child relationships on the development of Attention/Persistence might be greater for preschoolers with high negative emotionality. Children who enter the classroom with this kind of temperament might be more likely to have difficulty inhibiting negative emotional reactions to frustrating activities. For these children, closeness with a teacher who can help to regulate these negative emotions might be particularly important for building the capacity to persist and stay engaged with learning activities.

Another major child variable that might have moderated the associations tested in this study is parental attachment. Children's attachments to parents or other caregivers are likely to have impacted each of the variables measured—attachment behavior in the classroom, learning behaviors, and school readiness outcomes. For example, children

with secure parental attachments are more likely to be able to regulate the negative emotions that threaten motivation and persistence in the classroom (Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002). Children's attachment security with parents is also likely to impact the way they relate to teachers. Attachment theory posits that children construct a working model or systematic way of perceiving the supportiveness of adults based on socialization experiences with parents early in life (Pianta & Steinberg, 1992). The attachment scale included in this study assesses the way children relate to teachers early in the school year. It is therefore highly likely that this score reflects, in part, the impact of children's previous experiences with adults on how they have learned to relate to novel adults. It is also expected, however, that this scale reflects the unique relationships between teachers and children.

In future research, measuring both children's attachment to a parent and to a teacher would make it possible to determine any differential effects of relationships inside and outside the classroom. Although parental attachment is likely to influence attachment to teachers, research suggests that children's attachment relationships to different adults are formed somewhat independently and have independent effects. Secure and insecure attachment classifications to parental caregivers have been shown, in some cases, to be non-concordant with attachment classifications to non-parental, professional caregivers (Goossens & Van Ijzendoorn, 1990). For example, a child with an insecure attachment to a parent might have a secure attachment to a teacher, or vice versa. This lack of concordance is likely due to the possibility of very different caregiving styles between a child's parents and other caregivers. The independence of these

relationships suggests that children's relationships with teachers have the potential to impact children's outcomes independently from their relationships with other adults.

Research currently in progress will hopefully address some of these issues using observational data. Teachers rated children's attachment behavior at the beginning of the school year. Children were then observed, during one day in the fall and one day in the spring, and rated on the quality of their interactions with teachers. These observations will not only provide independent ratings of the teacher-child relationship but will also allow us to examine the association between teacher-child attachment ratings early in the year and the quality of teacher-child interactions across the year.

Limitations

Although the mediation model proposed in this study is theorized to be causal in nature—with teacher-child relationships impacting learning behaviors and learning behaviors impacting acquisition of school readiness skills—this is a correlational study and so is limited in its ability to support claims of causality. For example, regression analyses showed that Attachment predicted Attention/Persistence, suggesting that the level of Attachment might have had some effect on the level of Attention/Persistence. It is not possible, however, to make a strong causal inference because the quality of teacher-child relationships were not and could not have been randomly assigned. Furthermore, Attention/Persistence was measured at only one time and change in this variable cannot be inferred. Because causal relationships cannot be demonstrated here, it is important to consider alternative possibilities. It is possible that Attention/Persistence is stable over time and was not affected by the student-teacher relationship or by other environmental variables for that matter. It is also possible that there is a causal relationship between

Attachment and Attention/Persistence but that it is in the opposite direction. Arguably, children who lack attention control might be more likely to have behavioral problems that disrupt classroom activities, and frustrate teachers. Children low on this dimension at the start of the school year, then, might be more at risk for teacher-child relationships characterized by conflict. Likewise, this study included a measure of school readiness at the end of the year but did not control for children's basic skills at the beginning of the year. Longitudinal data examining change in these variables are necessary to make stronger claims of causality in this model.

Another limitation of this study is that measures of both teacher-child attachment and learning behaviors were based solely on teacher report. This introduces the possibility of shared method variance which is potentially problematic in two ways. First, there might be systematic differences in the way that teachers make ratings, regardless of the scale. For example, one teacher might tend to make higher ratings in general. Second, teachers might tend to rate individual children globally high or globally low. For example, a child who is well-liked by his teacher might be rated as high in attachment and high in positive learning behaviors as well. Without accounting for these added sources of variance, associations among teacher-rated variables would likely be inflated (Kenny, Kashy, & Bolger, 1998). Based on the results of this study, however, shared method variance appears not to be a critical issue. Among the teacher-rated variables, Attachment was associated with Attention/Persistence but was not associated with Competence Motivation. This suggests some degree of independence between teachers' ratings of different behaviors within children.

Finally, this study was limited in its sample size and in its representation of the ethnic diversity of low-income preschoolers. A larger sample that included valid data from multiple ethnic groups would have provided more reliable estimation of effects and more generalizable results.

Closing remarks

Children's development of school readiness skills is largely determined by the extent to which they are motivated to acquire those skills and the extent to which they are able to attend to skill-building activities. This study indicates that children's relationships with teachers during preschool might be more directly related to their ability to attend to and persist in learning activities than their motivation to learn. Children in preschool are being referred in growing numbers for attention problems (McGoey et al., 2006). This study provides evidence that teacher-child relationships might be a seminal point of intervention for bolstering children's attention regulation, and in turn, their acquisition of school readiness skills. Such intervention might be particularly important for children at risk for poor attention regulation due to factors related to poverty.

Future research should address specific teacher-child interactions that are related to the development of positive learning behaviors. Teaching techniques, professional development programs, and curricula should be evaluated for their ability to promote such interactions. Preschool teachers' relationships with their students are a powerful channel for providing support to those at risk for poor learning behaviors and poor academic outcomes. Uncovering the mechanisms through which these effects are transmitted is critical for optimally preparing each child for success in kindergarten and beyond.

TABLES

Table 1. Descriptive statistics

	N	Mean	Std. Deviation	Skewness	Std. Error	Kurtosis	Std. Error
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
Attachment	115	51.1	9.13	-.067	.226	-.085	.447
Competence Motivation	102	51.6	8.36	-.482	.244	-.866	.483
Attention/Persistence	103	51.1	10.0	-.697	.243	-.395	.481
Combined School Readiness Score	115	482	65.1	-.442	.229	-.292	.455

Table 2. Correlations

	Attachment	Competence Motivation	Attention/ Persistence	Combined School Readiness Score
Attachment	-	.125	.345***	.176 [†]
Competence Motivation		-	.779***	.549***
Attention/ Persistence			-	.516***
Combined School Readiness Score				-

*** $p < .001$. ** $p < .01$. * $p < .05$. [†] $p < .10$.

FIGURES

Figure 1. Direct effect of Attachment on Combined School Readiness Score

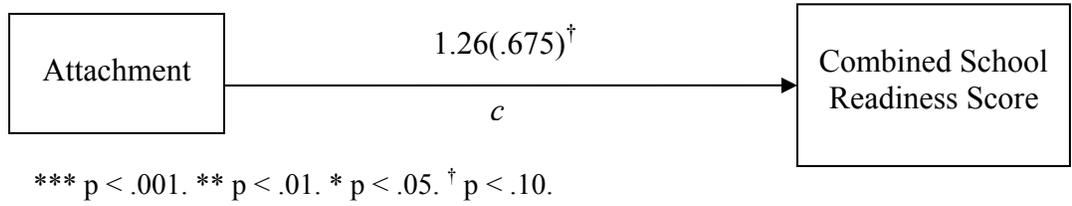


Figure 2. Mediation model with Competence Motivation as mediator

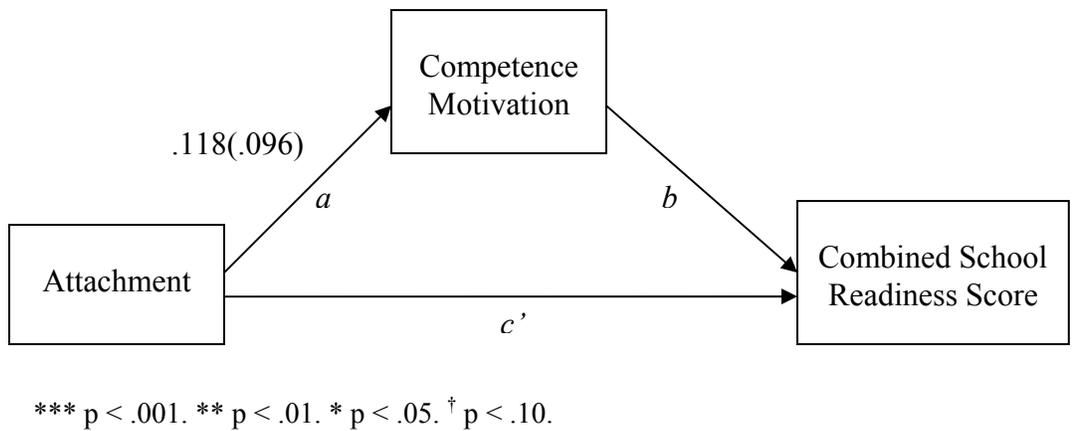
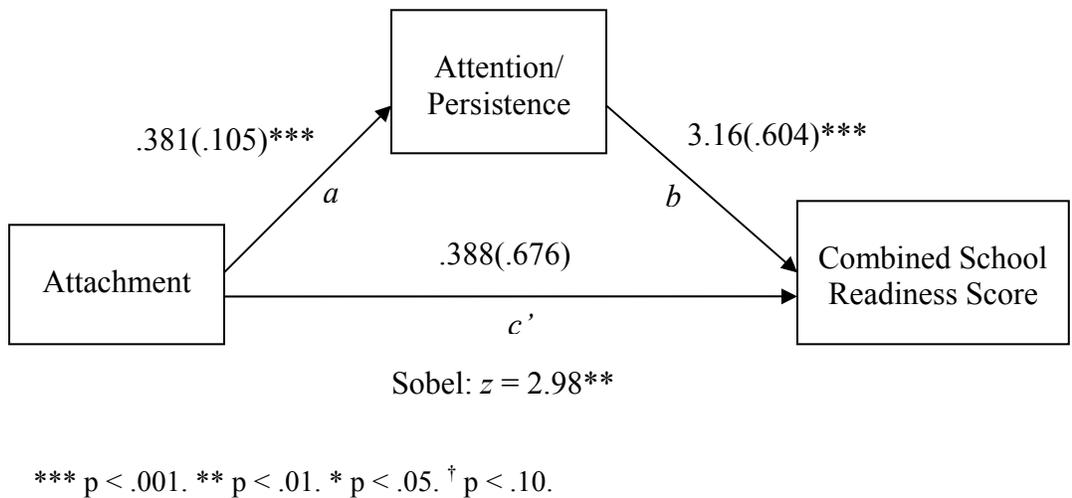


Figure 3. Mediation model with Attention/Persistence as mediator



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