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Parenting in Infancy and Self-Regulation in Preschool: An Investigation of the Role of Attachment History

R.S. Birmingham,

Northeastern Illinois University, Chicago, IL, USA

K.L. Bub, and

University of Illinois, Urbana-Champaign, Champaign, IL, USA

B.E. Vaughn

Auburn University, Auburn, AL, USA

Abstract

Parenting and attachment are critical in the emergence of self-regulation (SR) in preschool. However, most studies use general indexes of parenting quality, failing to explore the unique contributions of sensitivity and home quality to SR. Further, the nature of the interplay between parenting and attachment history is not well understood. Using a sample of 938 children from The NICHD Study of Early Child Care and Youth Development, a series of structural equation models were fit to determine whether sensitivity and home quality concurrently predicted SR at 54 months, and whether attachment mediated or moderated these pathways. Results suggest that both sensitivity and home quality uniquely predict SR. Further, these early parenting variables were each indirectly associated with SR through children's attachment history. That is, higher levels of sensitivity and home quality predicted secure attachment history, which, along with parenting, predicted more advanced SR skills at 54 months. No moderated pathways emerged, suggesting attachment history may be best conceptualized as a mediating mechanism.

Keywords

Attachment; Self-Regulation; parenting; sensitivity; home quality

Self-regulation (SR, alternatively, Executive Control), broadly defined to include skills such as attention focusing, planning, persistence, delay of gratification, and impulse control (Blair, Denham, Kochanoff & Whipple, 2004; Raver, et al., 2009), is considered critically important for understanding development during early childhood (Bernier, Carlson, Deschenes, & Matte-Gagne, 2012; Posner & Rothbart, 2000). Children who are better able to self-regulate perform better on tests of cognitive ability and achievement, are more socially skilled, and exhibit fewer problem behaviors than do their peers who are less able to regulate their behaviors, thoughts, and emotions (Blair & Razza, 2007; Raver, Jones, Li-Grining, Zhai, Bub, & Pressler, 2011). Because SR is an essential component of children's

adaptive functioning, considerable research has been devoted to identifying its developmental antecedents, including early parenting and attachment relationships.

Research suggests that sensitive caregiving in the early years supports the growth of SR skills (e.g., Carr & Pike, 2012; Hustedt & Raver, 2002). The effects of insensitive parenting may be especially problematic during preschool years when children are expected to behave “appropriately” in social settings (e.g., Rueda, Posner, & Rothbart, 2004; Volling, Blandon, & Kolak, 2006). However, even though links between parenting and SR are established, relatively few studies have moved beyond general indexes of parenting quality to examine pathways from different aspects of infant caregiving, including maternal sensitivity and home quality, to SR at 54 months (e.g., Lan, Legare, Pointz, Li, & Morrison, 2011). These two domains of parenting are moderately correlated (i.e., r s range from 0.4 to 0.6) within the NICHD dataset (Bindman, Pomerantz, & Roisman, 2015; NICHD ECCRN, 1997). However, because they are usually combined to create a single parenting quality composite (NICHD ECCRN, 1997; 2002), less is known about their unique contributions to SR and/or attachment history.

Attachment theory suggests that infants and young children organize their proximity seeking and exploratory behavior with reference to one or a few adult figures by the end of the first year of life (Ainsworth, Blehar, Waters & Wall, 1978; Bowlby, 1969). Moreover, this organized pattern of behavior reflects the operation of an evolved behavioral system designed to promote the survival of the child as well as to enhance his/her feelings of wellbeing (Ainsworth et al., 1978; Sroufe, 2005). Ainsworth and colleagues (e.g., Ainsworth et al., 1978) argued that the balance of attachment (i.e., proximity seeking, contact) and exploratory behavior away from the caregiver (collectively, “secure base behavior”) was the single best indicator that the child and caregiver had constructed an “attachment relationship.” Furthermore, they demonstrated that individual differences in attachment relationships, usually characterized along a “security vs. insecurity” dimension, were associated with the quality of maternal behaviors in the context of infant/mother interactions (e.g., Ainsworth et al., 1978). Bowlby (1973) argued that early attachments, so co-constructed by the child/caregiver dyad, constitute the source of the child’s emerging mental representations of that relationship and also contribute to related mental models of the self, the larger social world (e.g., as benign or dangerous), and of the self in relation to others.

Infants and young children with more secure attachment relationships appear more relaxed and confident in novel contexts, when the caregiver is present, suggesting their confidence in the caregiver’s availability if the child requires assistance. Secure children are subsequently able to explore both familiar and novel environments more thoroughly than do more insecurely attached children (e.g., Waters, Wippman, & Sroufe, 1979). Several investigators have suggested that engagement with the physical and social environments in both familiar and novel contexts promote the development of SR skills, and that securely attached children will advance more rapidly in the domain of SR than will insecurely attached children (e.g., Kochanska, Pilbert & Barry, 2009; Shaver & Mikulincer, 2010; Viddal, Berg-Nielson, Wan, Hygen, & Wichstrom, 2015). Thus, it is not surprising that attachment security has been linked to advanced emotion regulation and greater self-control skills in later childhood (e.g., Bauminger & Kimhi-Kind, 2008; Sroufe, Egeland, Carlson, & Collins, 2005).

Bowlby (1973) argued that although attachment security was often stable, it also was open to change contingent on new experiences (e.g., Sroufe, 2005; Vaughn, Egeland, Sroufe, & Waters, 1979; Waters, Hamilton, & Weinfield, 2000; Waters, 1978), suggesting that the quality of caregiver/child interactions continues to shape attachment security and organization of behaviors after infancy. For example, a period of change or upheaval in a family's life may underlie a shift in child attachment status from secure to insecure; this relationship could then return to secure status at some later time point if the upheaval is itself short-lived (e.g., Sroufe et al., 2005). Because such transitions can occur multiple times, examining attachment history, as indexed by the proportion of time a child is securely vs. insecurely attached across infancy and toddlerhood, with respect to later SR may be important.

Links between early parenting, attachment and indicators of self-regulation have been previously studied using the NICHD data. For example, higher levels of both parenting sensitivity and cognitive stimulation (averaged across 6-54 months) have been shown to predict several aspects of self-regulation (e.g., greater sustained attention, lower levels of impulsivity, delay of gratification) in preschool (Bindman, Pomerantz & Roisman, 2015; NICHD ECCRN, 2003) but no study has linked these parenting variables to a comprehensive construct of self-regulation marked by multiple indices of these skills. Importantly, sensitive parenting (e.g., sensitivity to distress, positive regard, low intrusiveness, and cognitive stimulation) across 6 and 15 months is linked to secure attachment at 15 months (McElwain & Booth LaForce, 2006; NICHD ECCRN, 1997) but not to attachment history across the first 36 months of life. Finally, studies using data from the NICHD study have linked attachment with markers of self-regulation; secure attachment in infancy predicts both attention focusing and impulsivity at 54 months (Fearon & Belsky, 2004), as well as greater self-control across elementary school (Drake, Belsky & Fearon, 2014). It is important to note that the studies described here rely on indicators of a broad set of SR skills and do not take attachment history into consideration.

Although attachment security is linked with both parenting quality and SR (e.g., Sroufe et al., 2005), it remains unclear whether (and if so, how) the interplay between parenting and attachment predict SR. In some studies (e.g. Fearon & Belsky, 2004) the data suggest that attachment security may moderate effects of early parenting, with parenting quality leading to different developmental outcomes for securely versus insecurely attached children. However, data from other studies (e.g., Toth, Rogosch, Sturge-Apple, & Cicchetti, 2009) suggest that attachment mediates the effects of parenting influences on later outcomes (i.e., parenting effects are indirect rather than direct influences on SR). To our knowledge, no single study has examined whether attachment security is a mediator or a moderator of the association between parenting and SR in preschool age children. To address this gap, we will investigate whether the relations between early parenting (i.e., maternal sensitivity and home quality) and SR at 54 months are best understood when attachment history is a mediator or when it is a moderator.

Maternal Sensitivity and Home Quality

Maternal sensitivity is generally defined as the degree to which a mother is aware of and responds appropriately to a child's communicative signals (Ainsworth et al., 1978). Others expand the term sensitivity to include warmth, reinforcement (physical or verbal), or openness to a child's requests and feelings (Hirsh-Pasek & Burchinal, 2006). Unlike other parenting behaviors that are usually domain specific, such as feeding, clothing, or hygienic maintenance, sensitivity can be assessed across all domains of parent/child interaction (Combs-Orme, Wilson, Cain, Page, & Kirby, 2003). Whereas maternal sensitivity is a generalized descriptor of interaction quality, home quality indicators (encompassing both enrichment behaviors and stimulating environment) have the express purpose of stimulating cognitive growth or language growth, providing a safe, supportive and developmentally appropriate environment for exploration and learning, as well as actively participating in activities that promote cognitive growth in a developmentally appropriate manner (Carr & Pike, 2012; Zevalkink, Riksen-Walraven, & Bradley, 2008). Examples include providing a child with a developmentally appropriate and stimulating toy, reading to/with a child, and scaffolding language development. These behaviors are argued to be especially impactful during infancy when the brain is developing rapidly (Landry, Smith, & Swank, 2003).

Studies examining links between sensitivity and SR suggest that young children who experience sensitive caregiving have more advanced SR skills than children who experience lower levels of sensitivity (Keller, 2008; Volling, McElwain, Notaro, & Herrera, 2002). Moreover, intrusive, harsh, and inconsistent parenting tends to undermine child attention focusing and impulse control, interferes with the emergence of autonomous self-regulation, and increases reliance on external regulators (Colman, Hardy, Albert, Rafaelli, & Crockett, 2006; Gustafson, Cox, & Blair, 2012). Similarly, children whose parents maintain a stimulating environment, encourage focusing on certain objects, provide positive feedback when they focus on a given task, or wait to provide assistance until a child absolutely needs it, tend to have more advanced cognitive skills in toddlerhood and preschool than do children whose parents offer less support for these skills (Carr & Pike, 2012; Kiernan & Mensah, 2011). Further, children whose parents actively provide safe and enriching home environments (Zevalkink et al., 2008), as well as assistance when necessary are more likely to internalize regulatory processes and social expectations, which increases the likelihood of positive interactions at home, with peers, and in the classroom (e.g., Karreman, van Tuijl, van Aiken, & Dekovic, 2006; Lorber & Egeland, 2011).

The Role of Attachment History

Direct links between early attachment and later developmental outcomes are well established (e.g., Goldberg, 2000; Sroufe, 2005). Children experiencing secure attachments in infancy tend to attain more positive social, emotional, and academic outcomes compared to their insecure peers. On the other hand, studies have repeatedly indicated that children who are insecurely attached demonstrate a variety of poor outcomes. For example, in a pair of meta-analytic studies on scholarly activity spanning more than twenty years, insecure attachment was found to be a robust predictor of later externalizing behaviors (e.g., Fearon, Bakermans-Kranenburg, van Ijzendoorn, Lapsley & Roisman, 2010), as well as internalizing

behaviors (Groh, Roisman, van Ijzendoorn, Bakermans-Kranenburg & Fearon, 2012). Although links from early attachment to later social and emotional outcomes are well established, most studies considering attachment as a predictor of development focus on attachment at a single time point, without considering the potential discontinuity in attachment status over time. Additionally, the nature of how parenting and attachment work together remains somewhat unclear. Some studies suggest that children exposed to high levels of stress during prenatal development and early in infancy are at greater risk for negative outcomes if they are also insecurely attached (Bergman, Sarkar, Glover, & O'Connor, 2008). Additionally, Kochanska and colleagues (2004) found that attachment security at 14 months moderated the effects of positive parenting, as indexed by responsiveness and power assertion across infancy on the emergence of child conscience at 56 months. That is, children who experienced positive parenting and who were securely attached demonstrated higher levels of moral behaviors and cognitions than did children who were insecurely attached (Kochanska, Aksan, Knaack, & Rhines, 2004).

Although ample evidence suggests that attachment security may moderate relations between parenting and a range of child outcomes, there are also studies suggesting that attachment can mediate the link between early parenting and later development. For example, Toth et al. (2009) found that maternal depression in toddlerhood predicted child self-concept at age four indirectly through attachment security at age three. That is, children exposed to higher levels of maternal depression as toddlers were insecurely attached at age three, and this insecure attachment in turn predicted poorer self-concept in preschool. They also found that attachment security fully mediated effects of maternal depression on children's perceptions of their parents at the same age. Evidence supporting the conceptualization of attachment as a mediator of early parenting experiences is present in older children as well (e.g., Hocking, Simmons, & Surette, 2016; Muller, Thornback, & Bedi, 2012). For example, Hocking and colleagues (2016) found that attachment mediated pathways from maltreatment across childhood and adolescence to experience of later adult maltreatment and trauma (Hocking et al., 2016).

Although studies have examined the interplay between parenting and attachment (McElwain & Booth LaForce, 2006), we found no studies investigating whether the role of attachment history in the links between various domains of parenting, including sensitivity and home quality, and SR might differ. Further, previous studies examining early parenting and later developmental outcomes evidence attachment as a moderator in some cases (e.g., Kochanska et al., 2004) but as a mediator in others (Toth et al., 2009). Because evidence for both exists in relation to other developmental outcomes, exploration of the role of attachment in the current study can expand on our understanding of the interplay between parenting and attachment with relation to self-regulation outcomes specifically. That is, research examining whether attachment history is best conceptualized as a mediator or a moderator of the effects early parenting on later SR is lacking, and we seek to address this paucity here. Finally, given that sensitivity and home quality are conceptually distinct nature, and offer potentially unique contributions to later SR, it is possible that attachment history may play also play a differing role in the association between each of these domains of parenting and later self-regulation.

The Current Study

Despite evidence linking parenting with the development of SR, much of the work in this area has relied on global indices of parenting rather than examining distinct but related parenting domains. Additionally, despite research demonstrating that children experiencing insecure attachment relationships have poorer outcomes relative to securely attached children (e.g., Goldberg, 2000; Kochanska et al., 2009), most studies have not examined the interplay between positive early experiences with attachment history in the prediction of early childhood SR. To address these gaps, we used data from the NICHD SECCYD to address the following questions: (1) Do maternal sensitivity, home quality and attachment history each uniquely predict children's SR at 54 months?; and (2) Does attachment history mediate or moderate the relations between parenting and SR? We expected that each parenting domain would uniquely predict SR with higher sensitivity and better home quality predicting higher SR skills, even after controlling for the correlation between these domains. Additionally, we predicted that attachment history would play a vital role in this association. However, the nature of this role (i.e., as a mediator or moderator) unclear and thus we considered our second research question partially exploratory.

Methods

Sample

Data from the *National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development (SECCYD)*, a comprehensive, longitudinal study on various aspects of children's development, were used for this study. More than 1,300 children, their families, and their teachers were recruited from ten locations around the United States. Using a conditional random sampling plan, 1,525 of the 8,986 women who gave birth during the sampling period were selected to participate in the study. A total of 1,364 completed the 1-month home interview and were enrolled in the study (NICHD ECCRN, 2004). Of these, 53% of the children were male, 24% were ethnic minorities, 11% of mothers had not completed high school, 14% were single mothers, and the average family had an income of over three times the poverty threshold. Because numerous exclusion criteria were used during recruitment and enrollment (e.g., mothers under the age of 18, infants from multiple births, infants who were born with disabilities, mothers who did not speak English, and families that lived in dangerous neighborhoods) the sample is not nationally representative and is comprised of relatively low-risk families. Nevertheless, participating families were similar to other families in the catchment areas on typical demographic variables with two exceptions; mothers in the sample were slightly more educated and families had slightly higher income levels.

Of the 1,364 families enrolled at the start of the study, 938 were still participating at 54 months, had a minimum of two attachment scores, and had at least some data on the variables of interest; these individuals comprise the analytic sample. Just under half of the participants were male and just over 11% were African American. Mothers had an average of 14.5 years of education. At 15 months, approximately 70% of children were classified as securely attached while 54% were classified as securely attached at 24 months and 63% were classified as securely attached at 36 months. Finally, across the three assessments (i.e., 15,

24, and 36 months) approximately 8% of participating children were never secure, 25.5% were secure at either one of two assessments or one of three assessments, 39.5% were secure at two of three assessments, and just under 27% were secure at all assessments. Mean comparisons between participants ($n = 938$) and non-participants ($n = 426$) on a range of child and family factors (i.e., child sex, race, temperament, maternal age at birth, education, socioeconomic status), revealed that compared with participants, non-participants were more likely to be male ($M = 49.2\%$ vs. 57.6% ; $t = 2.78$, $p < .01$), African American ($M = 11.5\%$ vs. 16.5% ; $t = 2.52$, $p < .01$), and from families who experienced chronic working poverty ($M = 12.5\%$ vs. 20.1% ; $t = 2.43$, $p < .01$).

Procedures

Demographic data were collected via maternal report when children were 1, 15, 24, 36, and 54 months old. That is, direct assessments and maternal reports of a range of self-regulatory processes were gathered when children were 54-months of age. Maternal sensitivity was observed in the home during a structured play interaction when children were 6- and 15-months old. Research assistants observed the quality of the home environment during home visits at 6 and 15 months; in cases where an item was not observed, mothers were asked directly about the presence and/quantity of the item. Note that we opted to use the 6- and 15-month assessments of our parenting variables in order to maintain the temporal ordering recommended for rigorous tests of medication. Finally, child attachment was measured when children were 15- and 36-months old via a laboratory assessment and at 24 months during a home visit. For a detailed description of the SECCYD, see NICHD ECCRN (2001) or visit the study website at <http://www.nichd.nih.gov/research/supported/seccyd.cfm>.

Measures

Outcome Variable

Self-regulation: A total of five observed indicators were used to create a latent construct representing self-regulation at 54 months. Of the five variables, three were directly assessed and two were mother reported. Children's ability to *delay gratification* was assessed using Mischel's (1974, 1981) self-imposed waiting task. During this task, children were offered a choice between receiving a small immediate reward of their favorite food (e.g., M&Ms, animal crackers, pretzels) or waiting (for a total of 7 minutes) for a larger reward later on. Plates containing the smaller portion of food that could be eaten immediately or the larger portion of food that could not be eaten until the waiting period was over were placed in front of the children. They were taught to ring a bell to bring the experimenter back to the room and where then left alone to play. The number of minutes the child waited before touching either plate of food was recorded.

Children's *impulsivity* was assessed using the *Children's Stroop Task* (Gerstadt, Hong, & Diamond, 1994). Children were given a deck of 18 cards. Nine of the cards were black and had a picture of moon and stars on them. The other 9 cards were white with a yellow sun. The child was instructed to say, "day" when he/she saw a black card and "night" when he/she saw a white card. Instructions were given up to three times. Each child was given a two-card practice round; the remaining 16 cards were used as test rounds. A total score reflecting the percentage of incorrect responses out of the total number of non-missing

responses was calculated. The *Stroop Task* has adequate reliability in this sample ($\alpha=0.79$) and has been shown to correlate with the frontal lobe development that inhibits impulsive behavior (Gerstadt et al., 1994).

Children's *sustained attention* was assessed using the *Continuous Performance Task* (CPT; Mirsky, Anthony, Duncan, Ahearn, & Kellam, 1991; Rosvold, Mirsky, Sarason, Bransome, & Beck, 1956). In the CPT task, the child is shown a series of familiar pictures (e.g., butterfly, fish, flower) along with a critical stimulus picture (a chair) and is instructed to press a button when the chair appears. For a total of 7 minutes and 20 seconds the child views pictures; the session is structured into 22 blocks of 10 pictures. The chair picture appears twice during each block at random. A single variable representing the number of times the child's attention waivered and needed to be refocused on the task while remaining seated was created. The CPT is one of the most widely used measures of sustained attention and has adequate test-retest reliability as well as high predictive and content validity (Halperin, Sharma, Greenblatt, & Schwartz, 1991). More specifically, the CPT has been shown to predict school achievement and cognitive functioning among school-aged children (e.g., Barkley, 1994; Barkley, Grodzinsky, & DuPaul, 1992).

Finally, two subscales from the *Child Behavior Questionnaire* (CBQ; Rothbart, Ahadi, Hershey, & Fisher, 2001) were used: *attention focusing* and *inhibitory control*. For each scale, mothers responded on a seven-point scale (1= extremely untrue to 7=extremely true) to questions reflecting their child's self-regulatory skills in the past 6 months. The attention focusing subscale examines the ability to focus, sustain attention, and complete assigned tasks. Sample items include: child has a hard time keeping their mind on an activity, child moves from one task to another without completing it, child can concentrate while drawing or coloring, and child becomes absorbed in picture book. This subscale demonstrates adequate reliability ($\alpha=0.74$) and has been used in previous studies to measure self-regulation (Clark, Prior, & Kinsella, 2002; Langua, 2003). The inhibitory control subscale examines how well a child can delay impulses. Sample items include: child can lower voice when asked to, child has difficulty waiting in line, child has trouble sitting still when told, child good at following instructions, and child is able to resist temptation. This subscale has adequate reliability ($\alpha = 0.75$) and has been used in previous studies to measure self-regulation (Clark et al., 2002; Langua, 2002).

Key Predictor Variables

Maternal sensitivity: Maternal sensitivity at 6 and 15 months was assessed using the *Mother-Child Structured Play Observation Procedure* (Egeland & Farber, 1984). In this procedure mothers were instructed to play with their children using a series of toys during brief videotaped interactions in the home or laboratory setting. Observers coded interactions with a focus on how mothers engaged children in play, as well as the nature of mothers' responses to the child's gestures, expressions, and signals (Egeland & Farber, 1984). Observers used a 4-point scale (1= *not at all characteristic* to 4= *highly characteristic*) to rate maternal sensitivity to non-distress, intrusiveness, and positive regard. Scales at each age were summed (with intrusiveness and hostility reverse scored) to create a maternal sensitivity composite (Cronbach's α were .75, and .70 at 6 and 15 months, respectively).

Scores were then standardized and averaged to create an overall maternal sensitivity score across 6 and 15 months. Higher scores indicate greater maternal sensitivity in the context of these assessments. This method of quantifying maternal sensitivity has been used to measure parenting sensitivity in many studies (Bradley, 1994; NICHD SECCYD, 2003; Potharst et al., 2013).

Home quality: The *Home Observation for Measurement of the Environment (HOME) Inventory* (Caldwell & Bradley, 1984) was used to assess overall quality of the home environment when children were 6 and 15 months of age. The infant/toddlerhood version consists of 45 items on six subscales: parental responsiveness, acceptance, organization of the environment, learning materials, parental involvement, and variety of experiences. Sample items include: “Ten or more children’s books are available to the child,” “Mother caresses, cuddles, or kisses child during visit,” and “Child is encouraged to learn the alphabet”. Items that were observed or reported by mothers were given a score of 1 while all other items were given a score of 0. Items were summed at each age to create a total score; higher scores indicate greater overall home quality. The HOME has been extensively validated (NICHD SECCYD, 2003; Bradley, Caldwell, & Rock, 1988) and has a reliability of $\alpha=0.89$ at 6 and 15 months. For the current study, the total scores were standardized and then averaged to create a single score reflecting average home quality across 6 and 15 months.

Moderator/Control Variables

Child attachment: Three assessments of children’s attachment status were used to create an index of the study child’s attachment history across early childhood: 1) the *Strange Situation Paradigm* (Ainsworth et al., 1978; Main & Solomon, 1990) at 15 months; 2) the *Attachment Q-Set* (Waters & Deane, 1985) at 24 months; and 3) a modified version of the *Strange Situation Paradigm* based on recommendations by Cassidy, Marvin, and the MacArthur Working Group on Attachment (1992) at 36 months. The 15-month Strange Situation procedure is a 25-minute procedure consisting of increasingly stressful separations and reunions (Main & Solomon, 1990). The 36-month modified *Strange Situation* procedure, designed to be moderately stressful for the child, also involves a series of separations and reunions. Mothers and children were invited to make themselves comfortable in a room. After 3 minutes, the mother was signaled to leave. The first separation lasted 3 minutes, unless the child was overly distressed. After a 3-minute reunion, the mother left again. The second separation lasted for 5 minutes. During both procedures, the child’s behavior during the separation and reunion was coded according to the system developed by the MacArthur Working Group on Attachment (Cassidy & Marvin, 1992). Specifically, children were classified as avoidant (category A), secure (category B), resistant (category C) or disorganized (Category D). Inter-rater reliabilities for this categorical variable were 84%. In the current study, dummy codes representing secure (1 or category “B”) vs. insecure (0 or categories “A”, “C” or “D”) were created for both the 15 and 36 months assessments.

When children were 24 months, trained observers completed the *Attachment Q-set* within two hours after a home visit. The Q-set consists of 90 behavioral characteristics typical of young children. Cards are sorted into fixed piles ranging from most to least descriptive of the child. The resulting sort provides a profile summary of a child’s observed behavior. This

profile is correlated with the profile of a prototypically secure child, as assessed by experts in the field. Data collection sites received three days of on-site training and were subsequently certified to conduct the Q-set by a team of experts (inter-rater reliability was .77). The Q-set has modest convergent validity and has been shown to be predictive of children's social competence (van IJzendoorn, Vereijken, & Riksen-Walraven, 2004). As we did with the *Strange Situation* assessments, we dichotomized the q-set correlation to indicate whether the child was secure (q-set correlation $\geq .33$) or insecure (q-set correlation $< .33$).

To characterize the child's attachment history, we used the binary indices of attachment security (i.e., secure vs. insecure) at each age to compute a continuous index of attachment history reflecting the proportion of times the child was secure, with possible scores ranging from 0 to 100. Recall that only those children with at least two attachment assessments were included in the current analyses. Children who were not secure at any assessment were given a score of 0. Children who were secure at one of three assessments were given a score of .33 (or 33%) while children who were secure at one of two assessments were given a score of .50 (or 50%). Children who were secure at two of three assessments were given a score of .66 (or 66%). Finally, children who were secure at all assessments were given a score of 1.0. Because children who were secure at only one time point could receive a score of .33 or .5, depending on the number of assessments in which they participated, we collapsed into one group those receiving scores of .33 and .50. Higher scores on this variable indicate that the child was secure for a greater proportion of the assessments three assessments.

Child sex: Maternal reports of children's sex were collected when children were one month of age. Females were coded as 0 and males were coded as 1.

Child race/ethnicity: Maternal reports of children's race/ethnicity were collected when children were one-month of age. A single dummy variable reflecting whether or not the child was African American was included in all analyses.

Child temperament: When the children were one and six months old, mothers completed the 55-item *Infant Temperament Questionnaire* (Medoff-Cooper, Carey, & McDevitt, 1993). An index of difficult temperament was constructed by averaging responses to items from the activity, adaptability, approach, mood, and intensity subscales. Because the one and six month assessments were moderately correlated, we averaged the two scores to create a single composite score.

Chronic working poverty status: Maternal reports of the family income were collected when children were 1, 6, 15, 24, 36, and 54 months of age. An income-to-needs ratio was then computed by taking family income, not including federal aid, and dividing this by the federal poverty threshold (US Bureau of the Census, 2004). This continuous index of socioeconomic status was dichotomized at each age such that families with an income-to-needs ratio less than 1.85 (working poverty status) were given a score of 1 while all others were given a score of 0. Finally, to create an index reflecting the chronicity of a family's poverty status, families who were working poor (i.e., had a score of 1 on the dichotomous indicators) for at least five of the six epochs assessed were given a score of 1 while families who experienced working poverty status four or fewer times were given a score of 0.

Maternal education: Maternal reports of the number of years of education were collected when the child was one-month of age.

Site: Nine dummy variables representing the ten data collection sites were also included as controls in our model to account for possible variation across data collection locations.

Data Analysis Plan

We began by examining descriptive statistics and bivariate correlations for all outcome, predictor, and control variables. In addition, to investigate whether the five indicators we identified to reflect children's self-regulation at 54 months were best represented by a single underlying construct or multiple constructs (e.g., executive functioning and effortful control), we conducted a set of confirmatory factor analyses in MPlus. All indicators within a latent construct were allowed to correlate to account for any overlap in the constructs measured. Next, we fit a structural equation model to explore the direct effects of early parenting on children's later SR as well as the direct effects of early parenting on our variable representing children's attachment history. That is, to determine whether early parenting predicts later SR (or attachment history), we regressed SR at 54 months (or attachment history between 15 and 36 months) on average maternal sensitivity across 6 and 15 months and average home quality across 6 and 15 months. Separate models were estimated for SR and attachment history but because few studies have explored the effects of multiple early parenting indicators on either outcome (i.e., SR or attachment history), we estimated separate but concurrent associations between the two parenting variables and each outcome. We allowed the predictor variables to correlate, thereby accounting for the bivariate associations among these indicators of the early home environment. Control variables for the direct effects models included child sex (1=male), African American status (1=African American), infant temperament, chronic working poverty status between 1 and 54 months, maternal education, and nine site dummy variables.

To determine whether early parenting is indirectly associated with SR via children's attachment history (i.e., mediation) or whether attachment history moderates the association between early parenting and SR, we fit two additional models. First, we simultaneously estimated the direct pathways from early parenting to attachment history, from early parenting to SR, and from attachment history to SR. We then compared the magnitude and significance of the pathways from early parenting to SR to the magnitude and significance of the coefficients for these pathways obtained from the model that did not include attachment history (i.e., the direct effects model). Finally, to investigate the possibility that attachment history moderates the association between early parenting and SR, we regressed SR on the main effects of early parenting (i.e., sensitivity and home quality) and attachment history as well as on the interactions between each early parenting variable and attachment history. All models controlled for the effects of child sex (1=male), African American status (1=African American), infant temperament, chronic working poverty status between 1 and 54 months, maternal education, and nine site dummy variables on SR.

Models were estimated in MPlus version 7.0 and missing data was handled using full information maximum likelihood procedures (the default in MPlus). For the mediation/

indirect effects models, bootstrapping methods (1,000 draws) were used. Model fit was examined using goodness of fit statistics such as chi-square, comparative fit index (CFI), the Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA). We considered model fit to be good if we obtained a non-significant chi-square, CFI and TLI statistics between .90 and 1, and a RMSEA that was close to zero (<.08) with a non-significant p -value (Hu & Bentler, 1999). Note, however, that chi-square estimates are commonly sensitive to large sample sizes and are thus considered quite conservative (Browne & Cudeck, 1993).

Results

Sample means and standard deviations for the full sample as well as by attachment history group are found in Table 1 below.

The table shows that, on average, children in the sample demonstrated relatively high levels of SR skills, although mean levels differed somewhat by attachment history. For example, children who were secure only once had the lowest delay of gratification scores while children who were never secure exhibited the lowest levels of sustained attention. Mean level of maternal sensitivity and the quality of the home environment differed by attachment history in the expected direction. Children who were never secure experienced the lowest levels of maternal sensitivity and poorest home quality across 6 and 15 months while the children who were always secure experienced high levels of maternal sensitivity and home quality across this period.

The pattern of bivariate correlations provides further evidence that SR and early parenting differ by attachment history (see Table 2 below).

The table notes that children with a higher proportion of secure attachments experienced greater maternal sensitivity and higher home quality across 6 and 15 months and demonstrated better regulatory skills at 54 months. Finally, results from the confirmatory factor analyses indicated that SR at 54 months was best described by a single latent construct comprised of delay of gratification ($B = 1.00$; $\beta = .597$, $p < .001$), attention focusing ($B = .176$, $p < .05$; $\beta = .318$), inhibitory control ($B = .189$, $p < .05$; $\beta = .332$), impulsivity ($B = -.241$, $p < .05$; $\beta = -.207$), and sustained attention ($B = .035$, $p < .001$; $\beta = .354$). Model fit was excellent ($\chi^2 = 11.85$, $p < .05$; CFI = .979; TLI = .948 RMSEA = .046, n.s.). Results from the two-factor model comprised of skills related to executive functioning (i.e., attention focusing and sustained attention) and skills related to effortful control (i.e., delay of gratification, inhibitory control, and impulsivity) indicate that the model did not fit the data as well ($\chi^2 = 23.77$, $p < .001$; CFI = .948; TLI = .869 RMSEA = .074, $p < .10$). Thus, for all subsequent analyses involving SR, we opted to use a single latent construct.

Direct Effects of Early Parenting and Attachment History on Self-Regulation

Parameter estimates and goodness of fit statistics from the structural equation model examining the simultaneous effects of early maternal sensitivity and home quality on SR at 54 months are presented in Figure 1a below. Recall that this model controls for the effects of child sex, African American status, infant temperament, chronic working poverty status

between 1 and 54 months, maternal education, and nine site dummy variables on self-regulation.

Figure 1a demonstrates that both maternal sensitivity and home quality were significantly associated with children's SR skills. Children whose mothers were, on average, more sensitive between 6 and 15 months exhibited better SR at 54 months, even after accounting for the average quality of the home environment between 6 and 15 months as well as an extensive set of child and family covariates. Similarly, children who experienced higher quality home environments between 6 and 15 months had better SR skills at 54 months, controlling for average maternal sensitivity as well as the correlation between the two parenting variables. Model fit was good ($\chi^2 = 86.06$, $p < .001$; CFI = .92; TLI = .90; RMSEA = .041, n.s.) and both parenting variables as well as the control variables accounted for more than 55% of the total variance in SR at 54 months (just over 43% of this variance was attributable to sensitivity and home quality between 6 and 15 months). Results from the model predicting SR at 54 months from attachment history between 15 and 36 months are presented in Figure 1b below. Note that controls on attachment history included child sex, African American status, infant temperament, and maternal education.

Figure 1b indicates that children who were securely attached for a greater proportion of the attachment assessments between 15 and 36 months demonstrated better SR skills at 54 months compared with their peers who were securely attached for a smaller proportion of the attachment assessments. Model fit was adequate ($\chi^2 = 82.78$, $p < .001$; CFI = .91; TLI = .88; RMSEA = .047, n.s.) and the full model accounted for just under 50% of the variance in self-regulation. Of the total variance explained, approximately 14% was uniquely attributable to attachment history.

Early Parenting and Self-Regulation: Is Attachment History a Mediator or Moderator?

Results from the structural equation models investigating whether the attachment history mediates the association between early parenting and later SR are presented in Figure 2 below.

As was the case in the direct effects model, we controlled for the effects of child sex, African American status, infant temperament, chronic working poverty status between 1 and 54 months, maternal education, and nine site dummy variables on self-regulation. Results suggest that early maternal sensitivity and home quality are indirectly associated with SR at 54 months via children's attachment history across 15 to 36 months. That is, children who experienced greater maternal sensitivity as well as a better quality home environment across 6 and 15 months were also rated as secure for a greater proportion of assessments; in turn, a higher proportion of secure attachments between 15 and 36 months was associated with better SR skills at 54 months, even after controlling for our set of child and parent factors as well the correlation between the early parenting variables. The direct effects of early parenting on SR remained statistically significant, and thus there was no evidence of full mediation. Nevertheless, results suggest that the indirect effect from sensitivity to SR via attachment history was significant ($B = .03$, $\beta = .02$, $p < .05$) as was the indirect effect from home quality to SR via attachment ($B = .04$, $\beta = .03$, $p < .01$). The model fit the data well ($\chi^2 = 102.11$, $p < .001$; CFI = .91; TLI = .89; RMSEA = .041, n.s.) and accounted for

approximately 57% of the total variance in self-regulation. The control variables accounted for only about 10% of the total variance (R^2 from model without controls = .473).

Finally, to investigate whether attachment history moderated the association between early parenting and SR, we re-fit our structural equation model but included the direct effects of early parenting and attachment on SR as well as the effects of two interaction terms (one between sensitivity and attachment and one between home quality and attachment) on SR. Models again controlled for child and family factors on SR. Results suggest that attachment history does not significantly moderate the association between maternal sensitivity and SR ($B = .149, \beta = .185, p = .07$) nor does it significantly moderate the association between home quality and SR ($B = .066, \beta = .081, p = \text{ns}$). That is, children's SR skills appear to benefit from positive early parenting regardless of the child's attachment history.

Discussion

Early childhood is a developmental period characterized by growth in self-regulation that is unparalleled at any other point during the lifespan. The ability to self-regulate with regard to behavior, cognition, and affect expands rapidly over the early years of life and early experiences shape and guide this process (e.g., Goldberg, 2000; Raver et al., 2011). To address limitations in our understanding of individual differences in SR skills in early childhood and to investigate the concurrent effects of early maternal sensitivity, home quality, and attachment on SR, we fit a set of structural equation models that directly addressed our research questions.

Direct Effects of Sensitivity, Home Quality and Attachment History

First, we found that maternal sensitivity and home quality, aggregated across 6 to 15 months, each uniquely predicted SR in preschool age children, even after adjusting for the correlation between the two parenting domains. That is, higher levels of sensitivity and better home quality across infancy jointly and uniquely predicted more advanced SR skills in preschoolers, compared to children who experienced lower sensitivity and less supportive home quality. This finding is consistent with previous studies demonstrating that these aspects of parenting promote positive outcomes in children (Hirsh-Pasek & Burchinal, 2006; Lowe, Erickson, MacLean, Schrader, & Fuller, 2013) and adds to the limited body of work examining these parenting domains concurrently. Maternal sensitivity and home quality also had direct effects on attachment security in the expected direction, and attachment history positively predicted SR skills at the end of early childhood. These findings are in line with previous studies showing the influences of early parenting on attachment (Goldberg, 2000), as well as importance of attachment in predicting later SR skills (Dotterer & Pungello, 2012). They also highlight the importance of examining parenting as a multi-faceted construct, with various domains of parenting uniquely predicting developmental outcomes. In a meta-analysis on parenting sensitivity, Wolff and van Ijzendoorn (1997), argued that although sensitivity is a critical component of parenting, it is not the only component. Our finding that home quality uniquely predicts both attachment and SR outcomes along with sensitivity supports this claim. It also furthers the case for disentangling overarching constructs of parenting quality to examine other aspects of parenting (e.g., parent-child

synchrony, autonomy building behaviors or discipline techniques), in order to better understand unique influences of various parenting domains on attachment and self-regulation.

The Interplay between Maternal Sensitivity, Home Quality and Attachment History

We also tested indirect pathways from maternal sensitivity and home quality across infancy to SR in preschool through child attachment history. Our findings suggest that attachment history partially mediates, as opposed to moderates, the effects of maternal sensitivity and home quality in early childhood. That is, in addition to their direct effects on SR, maternal sensitivity and home quality also have indirect effects via their impact on attachment security. Conceptualizing attachment as a partial or full mediator has proven useful in other studies examining relations between early experience and later outcomes in early childhood as well (e.g., Hocking, Simmons & Surette, 2016; McGoran et al., 2012). Importantly, we assessed both sensitivity and home quality concurrently and our analyses show that they each contribute uniquely to both attachment security history and to SR, even though their correlation is controlled in our analyses. To our knowledge, this is the first study to identify simultaneous indirect pathways from two domains of parenting to SR through attachment history.

In relation to sensitivity, parents who are more aware of their infants' communicative signals and who respond to those signals in a consistent and appropriate manner foster the child's secure base understanding through providing reliable care (Ainsworth et al., 1978; Bowlby, 1973). This confidence in the reliability of the attachment figure underlies confidence in self, which in turn, promotes exploration. Thus, those with secure histories are likely to make the most from stimulating surroundings (Shaver & Mikulincer, 2010), whereas, children with histories of insecure attachments tend to be less able and willing to explore their environments in depth and detail (e.g., Goldberg, 2000). Aber and Allen (1987), used the phrase *Secure Readiness to Learn* to describe the notion that securely attached children tend to gain social and cognitive skills over time because they have a secure base to explore their environments.

In relation to home quality, by providing a rich and developmentally appropriate home environment, as well as promoting cognitive growth in a safe space through active engagement with infants, parents foster infant interaction with stimulating surroundings and promote growth via exploration and direct engagement with learning. Carr and Pike (2012) used the phrase *Contingent Shifting* to describe parents who are able to appropriately scaffold their child's exploration, and to adjust the intensity of scaffolding as need arises (see also, Evans, Moretti, Shaw, & Fox, 2010). From our perspective it is not surprising that parents behaving as described by Carr & Pike (2012) are more likely to have children that are securely attached (e.g., von der Lippe et al., 2010) and demonstrate more mature levels of SR. Thus, while sensitivity and home quality overlap in relation to fostering attachment in that both encompass qualities that promote secure base behavior, it also makes sense that these domains would uniquely contribute to SR indirectly through attachment history.

Limitations

Although this study adds to knowledge about early parenting, attachment history, and later SR, it is also limited in several respects. First, our use of attachment history as a proportion of times secure offers important insight into individuals' history of attachment behavior, this measure does not indicate precisely when children were secure *vs.* insecure. Further, due to relatively small sample sizes, and the use of different attachment assessments at different periods we do not know whether insecure children were resistant, avoidant, disorganized, or any combination of these statuses over time. Finally, our use of the dichotomous indicators of security could be seen as a limitation as it could reduce observed variability in attachment status at each time point. We argue, however, that our use of a continuous proportion variable reduces this limitation to some extent and better captures a child's attachment history, especially when different tools were used across time. An additional limitation of this study is that the exclusion criteria for the NICHD SECCYD reduced many of the contextual risk factors that have been identified as predictors of insecure attachment (e.g., poverty, low educational attainment, domestic violence and child maltreatment), limiting the generalizability of the study findings to populations different from those at the sites where data were collected. Finally, additional studies using both clinical and normative samples, as well as nationally representative samples, are needed to better understand the role of parenting on the development of SR for children from all backgrounds, as well as the nature of attachment across early childhood.

Conclusions

Although parenting quality has been established as a salient predictor of child SR, finding that sensitivity and home quality uniquely and differentially matter for children with varying attachment histories offers new insight into how early experiences promote children's SR in preschool. Additionally, acknowledging that attachment security can change by examining proportion of times a child is securely attached in early childhood offers a novel perspective concerning the role of attachment history in the development of SR. Furthermore, our data suggest that parenting domains have both direct and indirect effects (mediated through attachment security) on SR outcomes in preschool age children. However, even though we demonstrate that attachment history can mediate parenting effects on SF, we recognize that our data only scratch the surface of understanding the interplay between parenting, attachment history and SR. Studies using direct observations of exploratory behaviors may offer additional insights into how these domains of parenting directly influence child behaviors and predict (both directly and indirectly) SR. Finally, studies conceptualizing attachment history as a mechanism through which parenting affects SR can offer valuable insights for intervention. That is, targeting attachment security to encourage secure base behaviors in early childhood, as well as focusing on the promotion of maternal sensitivity and home quality through intervention programs in infancy and toddlerhood may prove beneficial in advancing SR skills in preschool.

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Figure 1a.

Path model displaying the direct effects of early parenting (i.e., maternal sensitivity and home quality) on self-regulation. Standardized coefficients are presented in parentheses. Model controls for child sex ($\beta = -.212, p < .001$), African American status ($\beta = -.154, p < .01$), temperament ($\beta = -.154, p < .01$), chronic working poverty status during early childhood ($\beta = -.082, p = \text{ns}$), and maternal education ($\beta = .284, p < .001$) on self-regulation; note that data collection site was also controlled.

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

Figure 1b.

Path model displaying the direct effect of attachment history on self-regulation.

Standardized coefficients are presented in parentheses. Model controls for child sex ($\beta = -.211, p < .001$), African American status ($\beta = -.285, p < .01$), temperament ($\beta = -.163, p < .01$), chronic working poverty status during early childhood ($\beta = -.130, p < .05$), and maternal education ($\beta = .426, p < .001$) on self-regulation; note that data collection site was also controlled.

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

Model Fit Statistics:
 $\chi^2 = 102.11, p < .001$
 CFI = .91
 TLI = .89
 RMSEA = .041, n.s.

Figure 2.

Path model displaying the indirect effects of early parenting on self-regulation via attachment history. Standardized coefficients are presented in parentheses. Model controls for child sex ($\beta = -.201, p < .001$), African American status ($\beta = -.140, p < .05$), temperament ($\beta = -.144, p < .01$), chronic working poverty status during early childhood ($\beta = -.070, p = \text{ns}$), and maternal education ($\beta = .270, p < .001$) on self-regulation; note that data collection site was also controlled.

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

Table 1

Descriptive Statistics for All Study Variables

	Attachment History					
	Full Sample	Never Secure	Secure 1 Time	Secure 2 Times	Always Secure	
	Mean/(SD)	Mean/(SD)	Mean/(SD)	Mean/(SD)	Mean/(SD)	Mean/(SD)
<i>Self-Regulation Indicators (54m)</i>						
Delay of Gratification	4.47 (3.00)	4.03 (3.13)	3.75 (3.10)	4.64 (2.97)	5.02 (2.79)	
Attention Focusing	4.71 (.86)	4.49 (.82)	4.53 (.83)	4.79 (.82)	4.84 (.90)	
Inhibitory Control	4.66 (.78)	4.39 (.81)	4.48 (.80)	4.74 (.74)	4.80 (.76)	
Impulsivity	25.11 (20.36)	26.04 (.21)	26.67 (21.89)	25.06 (20.26)	23.70 (19.56)	
Sustained Attention	.747 (.10)	.680 (.21)	.731 (.20)	.753 (.18)	.769 (.18)	
<i>Predictor Variables (6-15m)</i>						
Average Maternal Sensitivity	.053 (.81)	-.167 (.10)	-.121 (.06)	.090 (.04)	.234 (.05)	
Average Home Quality	.067 (.85)	-.224 (.11)	-.091 (.06)	.088 (.04)	.275 (.04)	
<i>Control Variables</i>						
Male	48.5%	52.6%	53.6%	48.5%	42.4%	
European American	82.3%	71.8%	77.4%	83.6%	88.4%	
African American	11.2%	17.9%	16.7%	10.2%	5.2%	
Hispanic	5.9%	7.8%	5.9%	6.2%	5.2%	
Temperament	3.25 (.43)	3.30 (.47)	3.33 (.44)	3.20 (.41)	3.23 (.43)	
Attachment History	1.85 (.91)	--	--	--	--	
Chronic Working Poverty from 1-54 months	12.3%	22.2%	19.1%	10.9%	5.8%	
Maternal Education	14.49 (2.41)	14.19 (2.87)	13.95 (2.32)	14.60 (2.39)	14.96 (2.25)	

Table 2
Intercorrelations among Indicators of Self-Regulation, Early Parenting, and Attachment History

	1	2	3	4	5	6	7	8
1. Delay of Gratification	--							
2. Attention Focusing	.20***	--						
3. Inhibitory Control	.18***	.53***	--					
4. Impulsivity	-.11**	-.13***	-.06	--				
5. Sustained Attention	.21***	.06	.14***	-.06	--			
6. Maternal Sensitivity	.27***	.27***	.18***	-.07*	.13***	--		
7. Home Quality	.26***	.30***	.21***	-.08*	.13***	.50***	--	
8. Attachment History	.15***	.15***	.18***	-.05	.11*	.18***	.19***	--

 p < .001,

**
 p < .01,

*
 p < .05