Associations among Maternal Behavior, Delay of Gratification, and School Readiness across the Early Childhood Years

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Abstract

This study examined the developmental pathways from maternal behavior to school readiness within a sample of 1007 children, with a specific focus on the mediating role of delay of gratification (DoG). Maternal behavior across the first 36 months of age was explored as a predictor of children's DoG at 54 months as well as their behavioral and academic competence in kindergarten. Results support sensitivity as a predictor of children's DoG and indicate significant associations between DoG and teacher-reported externalizing behavior, social skills, and academic skills. Moreover, DoG partially mediated the associations between maternal sensitivity and school readiness skills, with the highest percentage of mediation reported for social skills. Findings indicate maternal sensitivity and DoG as potential targets for efforts aimed at enhancing school readiness among young children.

Keywords: self-regulation; school readiness; social behavior; parents/parenting

Introduction

Self-regulatory competence generally refers to the process of modulating systems of emotion, attention, and behavior in response to a given contextual situation, stimulus, or demand (Calkins & Fox, 2002; Posner & Rothbart, 2000). It is understood as an umbrella term that encompasses a wide range of subskills, many of which are necessary for handling socially relevant tasks and goal-directed activity. Not surprisingly, self-regulation has emerged as an important predictor of school readiness, as a growing body of research demonstrates links between its underlying components and early behavioral and academic competence (Blair & Razza, 2007; Valiente, Lemery-Chalfant, Swanson, & Reiser, 2008). One component of self-regulation that has received increased attention in recent years is delay of gratification (DoG), which refers to the child's ability and willingness to control the impulse to act immediately and wait as instructed for a more valued or desirable reward (Mischel, Shoda, & Rodriguez, 1989).

A child's ability to delay gratification emerges in the first year of life and continues to develop across the childhood years (Kopp, 1982; Mischel et al., 1989). Like other self-regulatory skills, DoG is learned, in part, through early parent–child interactions (Campos, Campos, & Barrett, 1989; Kopp, 1982; Rothbart & Bates, 2006). Although

past studies have shown that maternal behavior has an important influence on the development of DoG (Eisenberg, Cumberland, & Spinrad, 1998; Kochanska & Knaack, 2003; Olson, Bates, & Bayles, 1990), the independent contributions of sensitivity and intrusiveness are unclear. Also unknown is whether DoG is a key mechanism underlying the association between maternal behavior and school success, as the majority of previous studies in this area focused on school-aged children (Eisenberg et al., 2001; Valiente et al., 2006) or used composite scores of self-regulation (Chang, Olson, Sameroff, & Sexton, 2011; Eiden, Edwards, & Leonard, 2007). In addition, research on DoG has focused predominantly on its implications for early socioemotional development and relied on maternal reports of child behavior (Eiden et al., 2007; Houck & LeCuyer-Maus, 2004). The present study addressed these limitations by considering the independent effects of two fundamental maternal behaviors (sensitivity and intrusiveness) on DoG and by exploring DoG as a mediator of the maternal behavior–school readiness link using teacher-reported behavioral and academic outcomes.

The Association between Maternal Behavior and DoG

The critical role of the family in the development of children's self-regulation is inherent in Bronfenbrenner's bioecological model of human development, which considers person–environment interactions as the key to understanding development (Bronfenbrenner & Morris, 2006). Maternal behavior, specifically in the context of mother–child interactions, has been widely demonstrated as a key factor in the development of children's self-regulatory skills (Eisenberg et al., 1998; Kochanska, Forman, Aksan, & Dunbar, 2005). In particular, sensitivity and intrusiveness have been identified as two key maternal behaviors that promote and hinder self-regulation, respectively (Burchinal, Campbell, Bryant, Wasik, & Ramey, 1997; Tamis-LeMonda, Bornstein, & Baumwell, 2001).

Sensitive parenting reflects the caregiver's ability to accurately interpret children' cues and to respond promptly and appropriately to these signals (Ainsworth, Blehar, Waters, & Wall, 1978). Sensitivity prevents overarousal and allows children to respond to caregivers' attempts to focus attention and control behavior; thus, it is associated with increased levels of DoG (Eisenberg et al., 2005; Kochanska, Murray, & Harlan, 2000). Moreover, sensitivity fosters a connectedness between the mother and the child that facilitates the internalization of the mother's rules and thus increases child compliance (Hoffman, 1983; Kochanska et al., 2005). In fact, maternal sensitivity has been proposed as the mechanism that underlies the positive association between secure attachment and DoG (Jacobsen, Huss, Fendrich, Kruesi, & Ziegenhahn, 1997).

Although sensitivity is undoubtedly important for children's DoG, it is possible that the intrusive form of insensitivity has a unique adverse effect on DoG. Whereas warm control is associated with positive self-regulation in children (Bernier, Carlson, & Whipple, 2010; Moilanen, Shaw, Dishion, Gardner, & Wilson, 2010), there is evidence that maternal intrusiveness, or overcontrol, is negatively related to self-regulatory behaviors (Cabrera, Shannon, & Tamis-LeMonda, 2007; Egeland, Pianta, & O'Brien, 1993). Specifically, intrusiveness may restrict children's autonomy and weaken their motivation to take responsibility for their own behaviors, thus disrupting the process of the development of self-regulation during which control is transferred from the parent to the child (Bronson, 2000; Grolnick & Farkas, 2002). It also limits children's ability to exercise control over interactions and establish successful patterns of regulation

(Egeland et al., 1993). Although research examining the effect of intrusiveness on children's DoG is limited, there is evidence that power-based patterns in maternal limit setting during toddlerhood are associated with reduced levels of DoG in early childhood (Houck & LeCuyer-Maus, 2004).

There are two important limitations of previous studies examining associations between parental behavior and children's self-regulatory skills. Specifically, studies either focus exclusively on the implications of a single dimension of parenting or use a multifaceted composite of family environment. Thus, the independent contributions of unique maternal behaviors to DoG remain unclear. Such information is particularly important for interventions promoting children's self-regulation, as there are potentially multiple pathways between parenting and DoG. To our knowledge, this is the first study to consider whether sensitivity and intrusiveness make simultaneous and individual contributions to children's DoG.

The Association between DoG and School Readiness

Self-regulatory skills have been implicated as being predictive of a variety of both behavioral and academic outcomes associated with school readiness, as these skills are necessary for peer acceptance and social success, as well as academic performance in school (Blair & Razza, 2007; Ladd, Birch, & Buhs, 1999; McClelland, Morrison, & Holmes, 2000). Extant research indicates that individual differences in young children's ability to delay gratification had important implications for their school success. Consistent with conventional wisdom regarding the broad benefits of impulse control and compliance, studies have shown that DoG protected against behavioral problems and promoted academic competence (Flynn, 1985; Funder, Block, & Block, 1983; Mischel, Shoda, & Peake, 1988).

At present, the majority of research examining the link between DoG and school readiness has focused on behavioral outcomes. Specifically, a well-established literature reveals that children with lower levels of DoG demonstrated decreased levels of prosocial behaviors (Kochanska et al., 2000; Valiente et al., 2004), as well as increased levels of problem behaviors (Kochanska & Knaack, 2003; Murray & Kochanska, 2002). Although the implications of DoG for children's early academic competence have been less widely addressed, research among older children suggests that DoG during preschool is predictive of long-term academic achievement, independent of other self-regulatory skills such as impulsivity and attention (Campbell & von Stauffenberg, 2009). Moreover, Mischel et al. (1988) found that preschoolers with greater DoG demonstrated higher levels of achievement and were rated as more academically and socially competent by their parents during high school. Together, these studies are consistent with the broader literature supporting associations between early self-regulation and academic skills in young children (Blair & Razza, 2007) and suggest that DoG, in particular, may influence the patterns of academic behavior established in early childhood. Thus, the present study examined the implications of preschoolers' DoG for their academic and behavioral competence in kindergarten.

In addition to its direct implications for school readiness, DoG may mediate the well-established association between family processes and school readiness (Supplee, Shaw, Hailstones, & Hartman, 2004). Given the above-identified pathways, it is plausible that early maternal behavior influences children's DoG, which in turn affects their behavioral and academic competence. Although we are unaware of previous research examining DoG as a specific mechanism through which maternal behavior impacts

school readiness during early childhood, mediation models using composite measures of self-regulation that include DoG suggest that such a pathway is plausible (Chang et al., 2011; Eiden et al., 2007). Moreover, other facets of self-regulation, particularly attention, have been identified as partial mediators of this association [Belsky, Fearon, & Bell, 2007; National Institute of Child Health and Human Development (NICHD) Early Child Care Research Network (ECCRN), 2003; Razza, Martin, & Brooks-Gunn, 2010]. If DoG is a key developmental process underlying the early maternal behavior–school readiness link, then it may also serve as a target for prevention and/or intervention programs seeking to alleviate early behavioral and academic problems. Therefore, the current study examined DoG within a mediational framework.

The Current Study

The overall aim of this study was to increase our understanding of DoG and its role in development across early childhood. DoG is a foundational skill that has its roots in early family processes and important implications for school success across childhood. Thus, knowledge of the predictors and consequences of individual differences in DoG may have important implications for enhancing children's school readiness. The first aim of this study was to examine the longitudinal association between maternal behavior and DoG. In particular, we were interested in the independent contributions of early sensitivity and intrusiveness on preschoolers' DoG. Although both of these factors have been implicated in the development of DoG, they have not been examined as independent predictors in comprehensive models that account for other key family and child characteristics. We expected both maternal behaviors to make unique contributions to children's DoG.

   The second aim was to examine the longitudinal association between preschoolers' DoG and their behavioral and academic school readiness. Given that early DoG has been established as a predictor of prosocial behaviors and a protective factor against behavior problems, we were particularly interested in examining its implications for early academic competence. We hypothesized that DoG would predict both aspects of school readiness. Finally, given the importance of maternal behavior as a salient predictor of both self-regulation and school readiness, a related and third aim was to examine DoG as a mediator of the parenting–school readiness link. Specifically, we expected DoG in preschool to partially mediate the association between early maternal behavior and school readiness in kindergarten, such that greater sensitivity would promote children's DoG, which in turn would lead to higher levels of both behavioral and academic competence. Similarly, it was expected that intrusiveness would hinder children's DoG, resulting in lower levels of school readiness. We were particularly interested in whether mediation models would vary across maternal behaviors and/or school readiness outcomes. Given the link between sensitivity and socioemotional development, we expected DoG to account for a greater percent of mediation for behavioral outcomes compared with academic outcomes.

Method

Participants

This study utilized a subsample of families participating in the NICHD Study of Early Child Care and Youth Development, which followed a birth cohort of children in 10

Table 1. Child and Family Characteristics

Variable	M	SD	%
Male			50.84
Child race/ethnicity			
White			79.44
Black			10.43
Hispanic			5.66
Other			4.47
Maternal education			
Less than high school			7.94
High school graduation/GED			20.36
Some college or more			71.70
Maternal marital status			87.39
Child : adult ratio	1.42	0.79	
Income-to-needs ratio	2.94	2.56	
Hours in childcare (average per week)	23.04	15.75	
Maternal depression	9.61	6.63	
Child cognitive ability	100.46	15.06	

Note: Calculations are based on five multiple imputed datasets. N = 1007.

locations across the USA, recruited through hospital visits shortly after the birth of a child in 1991. During selected 24-hr intervals, all women giving birth (N = 58 986) were screened for eligibility. Of the initial pool of eligible families, 1364 families were enrolled in the study when the infant was one-month-old (for additional details of the sampling plan and further information on sample selection see NICHD ECCRN, 2001). The study was conducted in four phases with data collection continuing through the child's ninth-grade year in school. We drew on data from the first two phases of the project: Phase 1 (birth to three years) and Phase II (54 months to first grade).

Of the 1364 families from Phase I, 1226 (90 percent) participated in Phase II and were eligible for inclusion in our analytic sample. An additional 219 children were excluded from our sample because they were missing data on at least one of the three outcome measures of interest. Excluded families were slightly more at risk (e.g., higher likelihood of being an ethnic minority and having lower household income) than those who were retained in the sample. As shown in Table 1, similar to the families in the larger study, the children in the final analytic sample (N = 1007) were predominantly white (80 percent) and from middle-class backgrounds, as indexed by a modest income-to-needs ratio (*M* = 2.94; *SD* = 2.56). Seventy-two percent of mothers had more than a high school degree and 87 percent were married. Children were evenly split by sex.

Procedure

Demographic characteristics and maternal behaviors were assessed during home and/or laboratory visits that occurred when children were 6, 15, 24, and 36 months of age. During these visits, mothers were interviewed, mother–child interactions were

videotaped, and children's cognitive and behavioral skills were directly assessed. Children's DoG was directly assessed during the 54-month home visit, and teachers reported on children's behavioral and academic competence in kindergarten (approximately 60 months).

Measures

Maternal Behavior. Two maternal behaviors were included in the present study. Both sensitivity and intrusiveness were assessed via videotaped interactions of the mother and the child during a semi-structured play session that took place in the home (6 and 15 months) or laboratory (24 and 36 months). At each session, mothers showed children age-appropriate toys in three containers in a set order and played with them for 15 min. The exception to this format was the 6-month visit, in which the mother–child dyad played with any toy/object in the home for the first 7 min, followed by a standard set of toys for the remaining 8 min.

Qualitative ratings of maternal behavior were made by trained observers who received training and ongoing supervision at regular meetings to ensure the reliability of coding of the tapes. Additional details on the interaction tasks, rating scales, and reliability procedures can be found in prior publications (NICHD ECCRN, 1999). After viewing the interaction, observers completed global ratings of maternal behavior across a set of defined scales; each maternal behavior was represented by its own scale, which was rated as '*not at all characteristic of the interaction*' to '*highly characteristic of the interaction*'. The intra-class correlation coefficients averaged across pairs of raters ranged from .83 to .87 across time-points. For the present study, we used two global scales representing sensitivity and intrusiveness. Although the 36-month scales differ slightly from those at earlier waves as described below, they represent analogous constructs (NICHD ECCRN, 1999).

Sensitivity was assessed using the sensitivity/responsivity to non-distress scale at 6, 15, and 24 months; this 4-point scale focused on how mothers observed and responded to children's social gestures, expressions, and signals. At 36 months, a 7-point supportive presence scale was used, which tapped mothers' encouragement and acknowledgment of the child's accomplishments. The correlations across waves were significant across 6–15 ($r = .36$), 15–24 ($r = .29$), and 24–36 ($r = .39$) months. Scores were standardized at each time-point and averaged to create a sensitivity composite.

Intrusiveness was assessed using the intrusiveness scale at 6, 15, and 24 months: this 4-point scale reflected mothers' insensitive interactions that included overstimulation and controlling behavior. At 36 months, the inverse of a 7-point mother's respect for child's autonomy was used, which reflected the degree to which the mother's behavior recognized and respected the child's individuality motives and perspectives. The correlations across waves were significant across 6–15 ($r = .33$), 15–24 ($r = .31$), and 24–36 ($r = .38$) months. Scores were standardized at each time-point and averaged to create an intrusiveness composite.

DoG. Children's ability to delay gratification was observed in the laboratory at 54 months using a standard delay task (Mischel et al., 1989). During the procedure, the child was presented with two plates of snacks (candy or other preferred food), one with a large portion and one with a small portion. The child was also given a bell that he or she could ring to summon the experimenter, who temporarily left the room. The task was presented as a 'waiting game' in which the child was offered the choice of eating

the small reward immediately (after he or she rang the bell and the experimenter returned) or waiting until the experimenter returned to the room at the end of the game (7 min) and receiving the larger food prize. The waiting time (in minutes) was calculated as the time from when the experimenter left the room until the child either rang the bell or ate the snack.

Behavioral Competence. Kindergarten teachers reported on two aspects of children's behavioral competence: externalizing behavior and social skills. Externalizing behavior was assessed via the teacher report form (Achenbach, 1991). Specifically, we used the externalizing problems scale, which consists of 9 items from the delinquent behavior and 25 items from aggressive behavior subscales. Teachers rated the extent to which each of the 34 items described the target child on the following 3-point scale: 0 = *not true*, 1 = *somewhat or sometimes true*, and 2 = *very true or often true*. The test–retest reliability for the externalizing scale is .93, and the average inter-rater agreement is .80 (Achenbach, 1991). The externalizing T-score ($M = 50$, $SD = 10$) was used for analysis, with higher scores indicating a greater affinity to display delinquent and aggressive behaviors.

Social skills were measured using the Social Skills Rating System (SSRS; Gresham & Elliott, 1990) and reflect socially acceptable, learned behaviors that enable a person to interact effectively with others and to avoid socially unacceptable responses. Teachers rated children on 30 items that documented the perceived frequency of positive social behaviors tapping co-operation, assertion, and self-control using the following 3-point scale: 0 = *never*, 1 = *sometimes*, and 2 = *very often*. The social skills total standard score was used for analysis, with higher scores reflecting greater social competence. This scale had high internal reliability ($\alpha = .93$).

Academic Competence. Academic competence was also measured using the SSRS (Gresham & Elliott, 1990). The academic competence scale includes nine items that reflect the teacher's judgment of the student's academic or learning behaviors as observed in the classroom. The behaviors of each child were classified relative to his or her peers using the following 5-point scale: 1 = *lowest 10 percent*, 2 = *next lowest 20 percent*, 3 = *middle 40 percent*, 4 = *next highest 20 percent*, and 5 = *highest 10 percent*. The standardized academic competence total score was used for analyses, with higher scores reflecting the highest or most favorable performance as compared with other children in the classroom. This scale had high internal reliability ($\alpha = .95$).

Control Variables. Characteristics of the child and his or her family that have a history of being associated with maternal behavior, DoG, and/or school readiness were included as controls in all models. Family demographics were collected at baseline (one month), except where noted below. Indicators were created to reflect the child's sex and race (White, Black, Hispanic, or other). Maternal education was coded as less than high school, high school graduation or GED, or some college or more, and marital status was coded as married/cohabiting or single. A ratio of children to adults living in the household was calculated based on a household roster. The income-to-needs ratio was calculated based on total family income relative to the poverty threshold for a household. City indicators were also included.

Maternal depression was measured using the Center for Epidemiological Studies depression scale (Radloff, 1977); the mean composite across the Phase I time-points (1–36 months) was used. The number of hours the child spent in childcare was the

mean composite across Phase I (6–36 months). Children's general cognitive ability was directly assessed using the Picture Vocabulary task from the Woodcock–Johnson psycho-educational battery—revised, tests of cognitive ability (Woodcock & Johnson, 1989) at 54 months; the standardized score was used in analyses.

Missing Data

Complete demographic data were available for the 1007 families in the analytic sample, with the exception of the income-to-needs ratio, which was missing for 6 percent of cases. DoG was missing for 13 percent of cases, and school readiness outcomes were missing for less than 2 percent of the sample. Based on the assumption that data were missing at random (Allison, 2009), we used multiple imputation in Stata 10 (StataCorp, College Station, TX) to create five complete datasets with control, predictor, and outcome variables. The ICE command in Stata (Royston, 2007) conducts multiple imputation based on a regression switching protocol using chained equations. The five datasets were analyzed using the MIM prefix for regression analyses in Stata (Royston, 2007), which combines coefficients and standard errors across imputed datasets.

Results

Child and family characteristics are presented in Table 1. The means or percentages, standard deviations, and inter-correlations among the key variables are presented in Table 2. As expected, the associations among maternal behavior, DoG, and school readiness outcomes were significant and in the expected directions. Given the high correlation between sensitivity and intrusiveness ($r = .72$, $p < .001$), we made an informed choice to average these scales (with intrusiveness reflected) and use a broader maternal sensitivity construct in analyses. The longitudinal association between early maternal sensitivity and children's DoG at 54 months was examined via ordinary least squares regression. Results supported sensitivity ($\beta = .18$, $p < .05$) as an independent predictor of DoG (with all controls in the model).

Hierarchical regressions were conducted to examine whether early maternal behavior and DoG at 54 months predicted children's school readiness outcomes in the fall of kindergarten. Our interpretation of these models was consistent with Baron and Kenny's (1986) four criteria for mediation: (1) maternal behavior should predict school readiness; (2) maternal behavior should predict DoG; (3) DoG should predict school readiness; and (4) the association between maternal behavior and school readiness should be reduced or non-significant when parenting and DoG are entered simultaneously in the model. In Step 1, the school readiness outcome was regressed on both maternal behaviors as well as the controls. In Step 2, DoG was added as a predictor. The coefficients for the maternal behaviors were compared across the two steps; if the coefficient decreased between steps, a Sobel test (Sobel, 1982) was run to determine whether DoG mediated the link between maternal behavior and the school readiness outcome. Formal mediation tests were conducted in STATA (10.1) using *sgmediation* (Dearing & Hamilton, 2006). This program uses bootstrap analyses to estimate the indirect effect of the predictor variable on the dependent variable, through the mediator. The bootstrap technique consists of drawing a large number of samples (with replacement) from a dataset, computing the indirect effect for each sample, and then generating an average indirect effect across all samples. Control variables were added in Step 1, and the results of all three models are displayed in Table 3.

Table 2. Summary of Inter-correlations, Means, and Standard Deviations for Key Variables

Variables	Sensitivity	DoG	Externalizing behaviors	Social skills	Academic skills
Controls					
Male child	−.11***	−.08**	.01	.02	−.01
Child ethnicity: white	.40***	.22***	−.11**	.13***	.16***
Child ethnicity: black	−.41***	−.24***	.15***	−.17***	−.18***
Child ethnicity: Hispanic	−.06*	−.03	.01	.01	−.05
Child ethnicity: Other	−.10*	−.04	−.02	−.01	.02
Maternal ed: <HS	−.31***	−.17***	.09**	−.18***	−.25***
Maternal ed: HS or GED	−.29***	−.10**	.07*	−.12***	−.18***
Maternal ed: >HS	.45***	.19***	−.12***	.21***	.31***
Married	.35***	.22***	−.16***	.16***	.19***
Child : adult ratio	−.04	.02	.04	−.01	.09**
Income-to-needs ratio	.35***	.19***	−.08*	.13***	.18***
Hours in child care	.01	.00	.16***	−.04	.04
Maternal depression	−.32***	−.16***	.11***	−.15***	−.17***
Child cognitive ability	.42***	.28***	−.18***	.28***	.37***
Predictors					
Maternal sensitivity	—				
Delay of gratification (DoG)	.34***	—			
Externalizing behaviors	−.23***	−.18***	—		
Social skills	.25***	.22***	−.55***	—	
Academic skills	.33***	.27***	−.33***	.58***	—
M	.02	4.41	49.73	103.43	98.53
SD	.64	2.95	8.86	14.06	11.75

Note: Calculations are based on five multiply imputed data sets. N = 1007. DoG = delay of gratification.
* $p < .05$, ** $p < .01$, *** $p < .001$.

   Behavioral outcomes were examined first. In Step 2, sensitivity ($\beta = −.15$, $p < .001$) was significantly associated with externalizing behavior, such that children whose mothers demonstrated higher sensitivity were rated as being lower on problem behaviors. In Step 3, DoG ($\beta = −.10$, $p < .05$) was negatively associated with externalizing behavior and the coefficient for sensitivity was reduced ($\beta = −.14$, $p < .01$). The Sobel test was significant ($z = −2.53$, $p < .05$) and indicated that DoG mediated 13.09 percent of the total effect of maternal sensitivity on children's externalizing behavior.
   Similar analyses were conducted for social skills, the second measure of behavioral competence. In Step 2, sensitivity ($\beta = .09$, $p < .05$) predicted social skills, such that children whose mothers demonstrated higher sensitivity were rated as exhibiting higher levels of social competence. In Step 3, DoG ($\beta = .11$, $p < .05$) was positively associated with social skills and the coefficient for sensitivity was reduced to non-significant ($\beta = .07$, NS). The Sobel test was significant ($z = 2.84$, $p < .01$) and indicated that DoG mediated 26.33 percent of the total effect of sensitivity on children's social skills.

Table 3. Results of Hierarchical Models Predicting School Readiness

| | School readiness | | | | | |
| | Externalizing behaviors | | Social skills | | Academic skills | |
Predictor	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step 1						
Control variables[a]	.07***		.10***		.18***	
Step 2						
Maternal sensitivity	.01*	−.15***	.01*	.09*	.02*	.15**
Step 3						
Delay of gratification	.01*	−.10*	.01*	.11*	.01*	.13*
Total R^2	.09***		.12***		.21***	

Note: N = 1007.
[a] Control variables included child sex, child race, maternal education, maternal marital status, maternal depression, income ratio, household child : adult ratio, hours in childcare, and child cognitive ability.
* $p < .05$, ** $p < .01$, *** $p < .001$.

The final set of regressions examined predictors of academic skills. In Step 2, sensitivity (β = .15, $p < .01$) significantly predicted academic skills, such that children whose mothers demonstrated higher sensitivity scored higher on academic competence in kindergarten. In Step 3, DoG (β = .13, $p < .05$) was positively associated with academic skills and the coefficient for sensitivity was reduced (β = .13, $p < .01$). The Sobel mediation test was significant ($z = 3.23$, $p < .01$), indicating that DoG mediated 15.34 percent of the total effect of sensitivity on children's academic skills.

Discussion

This study extends our understanding of the developmental pathways to school readiness by highlighting the role of DoG in this process. Put simply, broader maternal sensitivity across the first three years predicted individual differences in children's DoG at 54 months, which in turn was associated with behavioral and academic competence in kindergarten. Thus, DoG was supported as an important mediator of the well-established parental behavior–school readiness link.

This study makes three important contributions to the self-regulation literature. Firstly, it increases our knowledge regarding the nature of the longitudinal association between early maternal behavior and children's DoG. Results identified sensitivity, defined as a broad measure of both responsivity and lack of intrusiveness, as a significant contributor to DoG. Secondly, this study extends our understanding of the specific role that DoG plays in both the behavioral and academic school readiness of children. Results indicate significant associations between DoG and all three teacher-reported outcomes in kindergarten including externalizing behavior, social skills, and academic skills. Third, our study furthers the examination of DoG as a mechanism underlying the association between family environment and school readiness.

Specifically, results identify DoG as a partial mediator of the association between maternal sensitivity and school readiness, with the highest percentage of mediation reported for social skills.

The Association between Maternal Behavior and DoG

As expected, early maternal behavior was associated with individual differences in children's DoG. Specifically, sensitivity proved to be important for the development of DoG, as it emerged as a significant predictor in our model. This finding reflects the critical role that early responsivity plays in development and is consistent with research suggesting that sensitive parenting fosters self-regulation in children by preventing overarousal and providing opportunities for them to practice behavioral control (Eisenberg et al., 2005). Given that warm and responsive parenting is also associated with increased internalization of rules and the development of conscience (Kochanska et al., 2005; Maccoby & Martin, 1983), it is likely that these processes also contribute to the link between maternal sensitivity and DoG. This possibility is consistent with research on the pathways from the early mother–child relationship to children's conscience, which finds that mutual responsiveness promotes moral conduct by increasing children's enjoyment of interactions with the mother and by enhancing committed compliance (Kochanska et al., 2005).

Although we were interested in examining sensitivity and intrusiveness as unique predictors of DoG, correlation analyses indicated that these two constructs were not orthogonal in our sample; rather, intrusiveness appeared to be one form of insensitive maternal behavior with a strong inverse association with responsivity. Thus, we were unable to explicitly consider whether this intrusive form of insensitivity had a unique adverse effect on DoG. A possible explanation for our results focuses on measurement issues. Specifically, both maternal behaviors were assessed during the same play-oriented mother–child interaction. Thus, it is possible that these maternal behaviors were highly correlated due to shared method variance. Moreover, the play context may have restricted the independence of these behaviors. Thus, it is plausible that intrusiveness assessed within more goal-oriented contexts, such as a challenging puzzle task, may emerge as a unique maternal behavior that is more relevant for children's developing self-regulation.

Associations among Maternal Behavior, DoG, and School Readiness

Results support both direct and indirect effects of early maternal behavior on children's school readiness. With respect to direct effects, sensitivity had significant implications for children's externalizing behavior, social skills, and academic skills in kindergarten. These results suggest that sensitivity plays a central role in both children's behavioral and academic competence.

As expected, DoG predicted behavioral and academic school readiness. In fact, DoG was a significant predictor of all three outcomes, even after accounting for maternal behaviors. This pattern of results highlights the importance of DoG for multiple domains of school readiness. Specifically, our findings add to the well-documented literature suggesting that DoG has important implications for behavioral outcomes, as the ability to resist temptation and control actions can help children both avoid displaying problem behaviors and increase their likelihood of engaging in prosocial interactions (Fabes & Eisenberg, 1992; Murray & Kochanska, 2002). Moreover, the

significant association between DoG and academic skills suggests that the long-term link between these constructs reported in previous studies (Mischel et al., 1989; Shoda, Mischel, & Peake, 1990) is also reflected in early childhood. Thus, the ability to delay gratification may allow children to resist temptation and stay focused in academic spheres as well as in social spheres, which is consistent with its protective benefits for later attention difficulties in school (Campbell & von Stauffenberg, 2009).

Finally, our results support DoG as a mediator of the longitudinal links between maternal behavior and both behavioral and academic competence. Specifically, DoG partially mediated associations between sensitivity and all three kindergarten outcomes. As noted, the percent of mediation varied across outcomes, with the highest value reported for social skills, followed by similar values for academic skills and externalizing behavior. We expected DoG to mediate a greater percentage of the effect of sensitivity on behavioral competence than on academic competence given the conscience and moral underpinnings of DoG and its predominant link with children's socioemotional development (Kochanska et al., 2000, 2005). Our results were largely consistent with this pattern, as the largest mediation was reported for social skills, which was almost twice that reported for the other two outcomes. The difference in the mediation between social skills and externalizing behavior was somewhat surprising and may suggest that DoG plays a particularly important role in the development of prosocial behavior. Additional analyses examining the link between DoG and the individual subscales of the SSRS revealed that it was more highly correlated with children's co-operative behavior than with their assertive behavior or self-control (results not reported here). Although replication of these findings is needed, this study highlights DoG as an important facet of self-regulation that has important and possibly varying implications for multiple domains of children's school readiness. They also suggest that interventions targeting maternal sensitivity may be particularly effective in promoting children's DoG, and consequently their behavioral and academic competence.

Conclusions and Limitations

Although this study adds to our understanding of DoG and its mediating role in the association between early maternal behavior and children's school readiness, it is not without limitations. Firstly, the results could have been impacted by measurement issues. As previously discussed, a mother–child play interaction may not be the ideal context to elicit intrusiveness. Rather, it is possible that intrusiveness, when assessed in a more demanding context such as a puzzle or challenge task, does emerge as an independent facet of maternal behavior that adversely impacts children's DoG. In addition, approximately 50 percent of the children waited the full 7 min for the experimenter to return before eating the snack. Thus, it is possible that associations among DoG and behavioral and academic competence are even stronger but were reduced in our study due to restricted variance on the delay score. Thus, the small increases in variance accounted for by DoG in our regression models (as evidenced by the low adjusted R-squares reported in Step 2) may be underestimates of the contribution of DoG to these school readiness outcomes.

A second limitation is that the sample was predominantly advantaged (e.g., middle income, well educated, and married) and lacking in racial/ethnic diversity. Given that low-income populations typically score lower on measures of the family environment (Bradley, Corwyn, McAdoo, & García Coll, 2001; Hart & Risley, 1995), have reduced

self-regulatory skills (Evans & English, 2002; Raver, 2004), and enter school with fewer behavioral and cognitive skills (Denton & West, 2002) than their more affluent peers, it is possible that the links among these variables differ for this population. Moreover, given that parenting practices are impacted by sociocultural context, it is possible that associations between maternal behavior and children's behavioral competence may vary by race/ethnicity (Hill, Bush, & Roosa, 2003). This normative, community sample was also low risk with respect to child characteristics. For example, less than 3 percent of the children's scores fell more than two standard deviations from the mean on externalizing problems. Thus, the associations reported in this study and/or their magnitudes may not generalize to at-risk samples. For example, recent research investigating a different facet of self-regulation (i.e., sustained attention) suggests specificity in the associations among attention and its correlates, such that different patterns were reported for the poor and near-poor groups (Razza et al., 2010). Therefore, the associations reported in the current study need to be examined in more at-risk and minority samples.

A third limitation focuses on our exclusive focus on maternal behaviors as indicators of the family environment, when aspects of the broader home environment may also be important. For example, quality of the home environment, as indexed by both the physical and the social resources available to children, predicts behavioral and academic performance (for review, see Bradley & Corwyn, 2006) and other aspects of self-regulation, such as sustained attention (Dilworth-Bart, Khurshid, & Vandell, 2007; NICHD ECCRN, 2003). There is also evidence that exposure to cumulative risks in the home, such as violence, is associated with reduced DoG among school-aged children living in poverty (Evans & English, 2002). A related issue is that our measure of sensitivity is limited to socioemotional aspects of this behavior whereas a recent review of the literature suggests that there are also cognitive aspects of parental contingency that make unique contributions to children's self-regulation and academic achievement (Pino Pasternak & Whitebread, 2010). Thus, future studies should include more comprehensive batteries of the family environment.

Finally, a fourth limitation of our study is its restricted focus on DoG as the mechanism through which maternal behavior impacts children's school readiness. As previously noted, DoG is just one of a suite of self-regulatory abilities that develop during early childhood. Moreover, there is evidence that another facet of self-regulation, specifically attention, also mediates the family environment–school readiness link (NICHD ECCRN, 2003; Razza et al., 2010). Thus, future research needs to address the overlap among the different facets of self-regulation and examine them simultaneously within mediation models. Interestingly, the limited research in this area predicts specificity in such models, as different facets of self-regulation have unique family predictors (Li-Grining, 2007) and make independent contributions to school readiness outcomes (Blair & Razza, 2007; NICHD ECCRN, 2003).

In sum, the current study adds to the self-regulation literature by highlighting the role of DoG in the association between early maternal behavior and children's school readiness. In particular, DoG partially mediated the links between sensitivity across the first three years and both behavioral and academic competence in kindergarten. It is critical that we understand the antecedents of children's school readiness skills, as socioemotional adjustment shows strong continuity from preschool through adolescence (Broidy et al., 2003; Moffitt & Caspi, 2001) and behavior in the classroom at school entry influences their later academic achievement (Ladd et al., 1999; Spira & Fischel, 2005). Our results have the potential to inform early intervention, as they

indicate two strategies for the promotion of school readiness via self-regulation. Firstly, interventions could promote DoG indirectly by targeting maternal sensitivity, which has proved a successful target for many programs (Klein Velderman, Bakermans-Kranenburg, Juffer, & van IJzendoorn, 2006; Moss et al., 2011). Secondly, interventions could target DoG directly, as the ability to delay gratification has been suggested to be a form of cognitive control (Eigsti et al., 2006). In fact, there is evidence suggesting that it is possible to dramatically enhance children's DoG performance in the laboratory through the use of simple attention control and cognitive reappraisal manipulations (Mischel et al., 1989). These strategies need to be tested in the future, as both may be successful avenues for promoting children's school readiness.

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