

Effortful Control Among Low-Income Preschoolers in Three Cities: Stability, Change, and Individual Differences

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Existing developmental models of effortful control focus more on the roles of child characteristics and parenting and focus less on the contributions of poverty-related stressors to individual differences in children's self-regulatory competence. Using a representative sample of low-income, predominantly African American and Latino children ($n = 439$), the author examined effortful control at ages 2–4 and again 16 months later. Delayed gratification showed moderate stability and improvement over time. Risk factors were associated with individual differences in these developmental patterns, net of child age, gender, temperament, and child–mother connectedness. Low birth weight compromised preschoolers' delayed gratification and executive control. Exposure to more sociodemographic and residential stressors jeopardized children's executive control but did not jeopardize delayed gratification.

Keywords: effortful control, low birth weight, low income, preschoolers, risk factors

Nearly two fifths of young children in the United States live in low-income families, and almost one fifth live in poverty (National Center for Children in Poverty, 2004). Exposure to poverty-related stressors appears to be a source of individual differences in children's behavior problems and social competence (Ackerman, Brown, & Izard, 2004; Lengua, 2002). Although little is known regarding the basic developmental processes that may underlie these linkages, poverty may adversely affect children's socioemotional adjustment via its impact on children's self-regulatory skills (Aber, Jones, & Cohen, 2000; Friedman & Chase-Lansdale, 2002; Raver, 2004). To advance understanding of the etiology of low-income children's behavior and attention regulation, the current study sought to embed developmental models of self-regulatory processes in the context of poverty using a within-group approach (García Coll et al., 1996).

A key self-regulatory mechanism is effortful control, which is viewed as central to whether a child is considered impulsive versus able to handle challenges. *Effortful control* is formally defined as children's active, voluntary capacity to withhold a dominant response in order to enact a subdominant response given situational demands (Eisenberg & Spinrad, 2004; Rothbart & Bates, 1998). In recent years, emergent research on effortful control has become more consolidated, in part because children's self-regulatory competence has been predictive of a diverse array of outcomes, including lower behavior problems, more successful interpersonal

functioning, and better scholastic performance (Eisenberg, Fabes, Guthrie, & Reiser, 2002; Marcynyszyn & Raver, 2006; Mischel, Shoda, & Rodriguez, 1989).

In the current study, I focused on two types of effortful control: delay of gratification and executive control. *Delay of gratification tasks* mainly demand that children inhibit impulsive behavior and shift attention away from tempting objects. Similarly, *executive control tasks* require children to control behavior and to focus attention. However, executive control tasks also require children to remember more complex rules, such as tapping a pencil once when an experimenter taps twice but tapping a pencil twice when an experimenter taps once (Blair, Granger, & Razza, 2005; Diamond & Taylor, 1996; Smith-Donald, Raver, Hayes, & Richardson, 2006). Although both delayed gratification and executive control tasks tap inhibition, the two types of tasks place distinct demands on children's behavioral and cognitive skills, with executive control tasks placing a greater burden on children's working memory (Carlson, 2005).

Normative Development of Effortful Control

In studies focused on low-income children's acquisition of effective self-regulatory competence, researchers have begun to use measures of delayed gratification and executive control (Blair et al., 2005; Chang & Burns, 2005; McCabe, Hernandez, Lara, & Brooks-Gunn, 2000; Raver, 2004). Although these investigations show substantial variation in levels of effortful control among low-income children, these researchers have rarely examined individual differences in developmental patterns of children's regulatory behavior and attention over time. The development of effortful control may be viewed in terms of stability and change (Rothbart & Bates, 1998). *Stability* refers to whether children's rank ordering remains the same across time: Children who have difficulty controlling their behavior at younger ages may continue to struggle with managing behavior, even as they age. *Change* addresses whether children's behavior becomes more organized and less impulsive over time.

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In existing studies, researchers suggest that children's rank order in effortful control tends to remain moderately stable during early childhood (Carlson, Mandell, & Williams, 2004; Kochanska & Knaack, 2003). Children's effortful control also has been moderately consistent as children transition from preschool to middle childhood (Eisenberg, Sadovsky, et al., 2005; Eisenberg et al., 2003; Murphy, Eisenberg, Fabes, Shepard, & Guthrie, 1999; Olson, Schilling, & Bates, 1999). Additionally, children have less difficulty controlling their behavior and attention as they grow older (Gerstadt, Hong, & Diamond, 1994; Jacques & Zelazo, 2001; Olson et al., 1999), with large improvements occurring between ages 2 and 3 years (Carlson et al., 2004; Kochanska, Murray, & Harlan, 2000). Growth in behavioral and attentional regulation may slow as children grow older, with less improvement occurring after age 4 years (Jones, Rothbart, & Posner, 2003; Murphy et al., 1999).

These findings have been noted in studies of children from a range of socioeconomic and racial/ethnic backgrounds. Still, we know relatively little about whether these patterns would hold among large groups of ethnic minority children. Studies that are focused on the development of effortful control among those low-income children, who are disproportionately African American and Latino, would add to the generalizability of existing research, would answer calls for tests of normative models among ethnic minority children (Garcia Coll et al., 1996), and would address the pressing need for the study of developmental phenomena among Latino children (Flores, Cicchetti, & Rogosch, 2005; Flores et al., 2002; Mistry, Vandewater, Huston, & McLoyd, 2002), who are among one of the fastest growing immigrant groups in the United States (Flores et al., 2002).

Sources of Individual Differences in Effortful Control

It is important that researchers not only provide a portrait of developmental patterns in effortful control among low-income, ethnic minority children but also find empirical answers to what factors may drive these individual differences in children's trajectories. Bioecological and transactional theories view child development as a product of a reciprocal exchange between children and the multiple ecologies in which children's lives are embedded (Bronfenbrenner, 1986; Sameroff, 2000). As such, child characteristics, environmental stressors, and child-mother interaction may act as sources of individual differences in children's effortful control.

Child Characteristics

Using existing developmental models, researchers have explored how three child characteristics—age, gender, and temperament—explain individual differences in effortful control. Younger children are less successful at managing their behavior and attention than are older children (Gerstadt et al., 1994; Jacques & Zelazo, 2001; Jones et al., 2003). Boys have performed worse than girls on effortful control tasks (Kochanska & Knaack, 2003; Kochanska et al., 2000; Olson, Sameroff, Kerr, Lopez, & Wellman, 2005), but mixed findings regarding gender differences also have been noted (Bjorklund & Kipp, 1996; Carlson & Moses, 2001). Children who are more prone to anger (Buss & Plomin,

1984) may have a more difficult time with effortful control (Kochanska & Knaack, 2003).

Largely missing from existing research on children's self-regulatory skills are studies in which researchers examine the roles of child characteristics that are particularly salient for low-income children. Although previous studies have been racially and ethnically diverse, a fourth child characteristic—race/ethnicity—has not been a central focus of extant research. Use of an exclusively low-income sample allows researchers to test whether children from various racial/ethnic groups perform differently on effortful control measures without the confound of income (Garcia Coll et al., 1996; Raver, 2004). A fifth child characteristic is low birth weight status, which is a major risk factor for low-income children (Reichman, 2005). Normal birth weight children have outscored low birth weight children on neuropsychological tasks that tap school-age children's behavior, attention, and memory skills (Taylor, Klein, & Hack, 2000). Low birth weight newborns may experience medical complications that impair neurological development, leading to difficulties with multiple dimensions of effortful control (Harvey, O'Callaghan, & Mohay, 1999). Although some researchers have addressed preschoolers' executive control (Bohm, Katz-Salamon, Smedler, Lagercrantz, & Forsberg, 2002; Harvey et al., 1999), low birth weight studies, to my knowledge, have not focused on preschoolers' delay of gratification.

Ecological Risk Factors

Building on extant studies in which researchers have focused more on how proximal factors such as child characteristics shape children's ability to control their behavior and attention (Calkins, 1994; Dennis, 2006; Eisenberg et al., 2003; Eisenberg, Zhou, et al., 2005; Kochanska et al., 2000; Kopp, 1982; Olson, Bates, Sandy, & Schilling, 2002), this investigation sought to broaden research on the etiology of children's effortful control by examining the roles of more distal factors such as family and neighborhood risks. Taking a broader perspective is important for understanding the etiology of effortful control because poverty-related stressors play a salient role in the lives of low-income, ethnic minority children (Garcia Coll et al., 1996). *Allostasis theory* suggests that constant exposure to ecological risk may strain the flexibility of children's self-regulatory competence by continually placing high demands on neuroendocrine systems that influence how children respond to stress and regulate their behavior, attention, and emotions (Evans, 2003; McEwen, 1998). Thus, in this investigation I sought to embed child-centered models of effortful control in socioeconomic context by integrating a child-focused approach and a multiple risk approach.

School-age children from lower socioeconomic backgrounds tend to lag behind their more affluent peers on indices of effortful control, including measures of delayed gratification and executive control (Eisenberg et al., 2001; Evans & English, 2002; Howse, Lange, Farran, & Boyles, 2003; Hughes & Ensor, 2005; Mezzacappa, 2004; Noble, Norman, & Farah, 2005). Yet we know little about what specific aspects of low-income children's lives may drive these differences. A multiple risk approach may help disentangle linkages between low socioeconomic status and low effortful control.

Exposure to a higher number of environmental stressors has repeatedly been associated with children's elevated behavior prob-

lems (Ackerman, Schoff, Levinson, Youngstrom, & Izard, 1999; Campbell, Shaw, & Gilliom, 2000; Deater-Deckard, Dodge, Bates, & Pettit, 1998; Gerard & Buehler, 2004; Raver, Jones, Silver, & Metzger, 2006; Shaw, Winslow, Owens, & Hood, 1998). More proximal environmental risk factors include *psychosocial stressors* (Ackerman et al., 1999; Campbell et al., 2000; Deater-Deckard et al., 1998; Shaw, Winslow, Owens, & Hood, 1998), which encompass indicators of mothers' psychological well-being, such as depressive symptoms, substance abuse, and criminal behavior, as well as mothers' lack of social support and experience with domestic violence.

More distal stressors include families' *sociodemographic risks* (Ackerman et al., 1999; Campbell et al., 2000; Deater-Deckard et al., 1998; Shaw, Winslow, Owens, & Hood, 1998). Mothers may lack socioeconomic resources, which are indexed by low levels of education, unemployment, welfare receipt, and poverty status. Family risk factors include single parenthood, teenage parenthood, large family size, and family separation. Distal ecological stressors also consist of *residential risks*, such as living in homes with electrical problems, in neighborhoods with gang violence, and in communities in which neighbors do not trust one another (Evans & English, 2002; Sheidow, Gorman-Smith, Tolan, & Henry, 2001).

Facing multiple poverty-related risks may jeopardize children's behavior problems by compromising children's self-regulatory skills. However, relatively few studies have incorporated multiple risk models into studies of individual differences in children's behavior and attention regulation. Higher levels of cumulative stressors, including maternal mental illness and low maternal education, have been predictive of preschoolers' lower levels of executive control (Barocas et al., 1991; Bendersky, Gambini, Lastella, Bennett, & Lewis, 2003). Greater exposure to cumulative risks, including exposure to violence, single parenthood, and housing problems, has been linked to school-age, rural children having more difficulty delaying gratification (Evans, 2003; Evans & English, 2002).

However, in past studies examining the covariation between multiple stressors and children's effortful control, researchers have not foregrounded multiple risk models with a child-centered approach, leaving the co-occurring roles of child characteristics and child-mother interaction largely unexamined. Further, prior research has left unanswered questions regarding the specific ways in which multiple risk influences children's delayed gratification and executive control, although such research would inform intervention efforts. Extant research has focused on children's total exposure to risk rather than on how the aggregates of risk, within domains such as psychosocial, sociodemographic, and residential stressors, may be uniquely predictive of children's self-regulatory competence. Moreover, in previous studies researchers have not considered whether a more comprehensive spectrum of stressors, from child to neighborhood risks, may be related to preschoolers' effortful control, although the child psychopathology literature suggests that child risks and ecological risks should be considered as contributors to children's socioemotional adjustment (Campbell et al., 2000; Deater-Deckard et al., 1998; Olson et al., 2005).

Child-Mother Interaction

Within the broader socioeconomic context, proximal parenting may serve as an important buffer for children at risk. Optimal

parenting has been predictive of children's lower behavior problems and greater social competence in the context of adversity (Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000; Landry, Smith, Miller-Loncar, & Swank, 1997; Linver, Brooks-Gunn, & Kohen, 2002). One important aspect of competent parenting is *dyadic connectedness*, which reflects mutual engagement, shared pleasure, and reciprocity between children and their caregivers. Children with a history of affective and behavioral synchrony may find it less challenging to manage behavior and attention on their own (Feldman, Greenbaum, & Yirmiya, 1999; Moore & Calkins, 2004), especially in the context of high risk (Garner & Spears, 2000; Raver, 1996). In sum, this study first considered whether child-mother connectedness, multiple risk, and child characteristics predict children's effortful control, on average. Next, this investigation examined whether this model holds across subgroups of children.

The Moderating Roles of Race/Ethnicity and Gender

Scholars have underscored the importance of testing the universality of developmental models rather than assuming that one model fits all (Garcia Coll et al., 1996; Mistry et al., 2002; Hill, Bush, & Roosa, 2003), especially in the context of prevention, intervention, and policy-relevant research (Raver, Gershoff, & Aber, in press). To my knowledge, in existing studies on the etiology of children's effortful control researchers rarely have considered how developmental models of effortful control may fit similarly or differently across racial/ethnic groups. Linkages between parenting and children's socioemotional adjustment may vary across racial/ethnic groups because parenting practices often are influenced by sociocultural context (Hill et al., 2003). Latino parents may hold higher expectations for compliance than African American and European American parents (Dearing, 2004).

Further, the relation between ecological risk and children's socioemotional well-being may depend on children's category membership to racial/ethnic groups (Deater-Deckard et al., 1998). Ecological risk may take a greater toll on Latino children because of challenges associated with acculturation, immigration, and language barriers (Flores et al., 2002). However, there is not a clear consensus on which racial/ethnic groups may be more disadvantaged (Flores et al., 2002, 2005). Thus, this study does not put forth hypotheses regarding racial/ethnic differences a priori.

Group differences also may exist across gender. Boys tend to be more susceptible to neurological impairments and psychological disorders (Shaw, Winslow, Owens, Vondra, et al., 1998). Thus, boys may be more sensitive to the adverse effects of multiple stressors.

Research Goals

The overarching aim of this investigation was disentangling linkages between low socioeconomic status and low effortful control by taking a within-group approach. First, I aimed to depict normative developmental patterns of stability and change in effortful control among low-income, predominantly African American and Latino preschoolers in Boston, Chicago, and San Antonio, Texas. Second, I sought to identify sources of individual differences in these developmental patterns by foregrounding child-centered models of effortful control against ecological risk models.

Specifically, I integrated poverty-related stressors—low birth weight and psychosocial, sociodemographic, and residential risks—into child-centered models of effortful control. Further, I explored whether these models fit similarly or differently for African American and Latino children and for boys and girls.

Method

Participants

This investigation drew data from the first two waves of Welfare, Children, and Families: A Three-City Study, a multidisciplinary, longitudinal study of the influence of welfare reform on low-income children and families in Boston, Chicago, and San Antonio. In 1999, a household-based, stratified random-sample survey was administered among 2,402 children (ages 0–4 years and 10–14 years) and their caregivers in low-income neighborhoods in Boston, Chicago, and San Antonio. Families were randomly selected from more than 40,000 screened households (response rate of 90%). On the basis of a set of socioeconomic factors, such as race, income, and children's age, families were deemed eligible for the study and then asked to participate (response rate of 82%), resulting in an overall response rate of 74%. Wave 2 interviews were conducted 16 months later with a response rate of 88%.

In addition to taking part in the survey component of the study, all families with children ages 2–4 years were asked to participate in the Embedded Developmental Study (EDS; Wave 1 response rate of 85% and Wave 2 response rate of 88%). The EDS involved more extensive interviews with 626 primary caregivers in Wave 1 and with 589 primary caregivers in Wave 2. Also included in the EDS were videotaped observations of mother–child interaction and of children's effortful control. Because a focus of the present investigation was understanding the development of effortful control over time, analyses were conducted on a sample of 439 cases that had data on effortful control at both waves. No significant differences were present in background characteristics between children who were included in the final analytic sample versus those children who were excluded as a result of the previously mentioned criterion. Median imputation was used for 13.5% of cases that had missing data on at least one child or family characteristic. I included a dummy indicator for missing values in all analyses to control for the influence of missing cases, and the dummy indicator was never significant. Additionally, analyses were run separately through the use of nonimputed and imputed data, and results were nearly identical across models.

Procedure

Trained, professional interviewers collected data during four home visits. One child from each eligible household was selected randomly to participate. During the first visit, mothers completed a 2-hour survey on topics including child and family functioning and demographic characteristics. Using a Computer-Assisted Personal Interview, the interviewers directly entered participants' responses into a laptop computer. For approximately 12% of the families, interviews were administered in Spanish. During the second visit, interviewers administered an additional 1-hour EDS survey to mothers who answered more detailed questions on child and family functioning. Mothers and children participated in the Puzzle Task, which lasted about 10 min, and children completed effortful control tasks, which lasted about 15 min at Wave 1 and about 25 min at Wave 2. About 16 months later, interviewers returned to families for a third visit to collect another round of main survey data and for a fourth visit to collect an additional wave of EDS survey and observational data.

Measures

Effortful Control

Originally developed for laboratory research, the effortful control tasks of Kochanska, Murray, Jacques, Koenig, and Vandegeest (1996) and Kochanska, Murray, and Coy (1997) were piloted to ensure that the tasks could adequately tap effortful control in larger scale, survey-based research. Preschoolers in the Three-City Study then participated in videotaped administrations of the effortful control tasks in their homes with trained, professional interviewers following the general guidelines of Kochanska and colleagues (Kochanska et al., 1996, 1997). Racially and ethnically diverse research assistants coded the tapes in the laboratory. Interrater reliability was based on approximately 25% of the cases. Kappas (κ s) were calculated for categorical scores, and intraclass correlations (ICCs) were calculated for continuous variables.

Delay of gratification at Wave 1. Children participated in two delay-of-gratification tasks, Snack Delay and Gift Wrap, at Time 1 (Kochanska et al., 1996). In the Snack Delay task, children were asked to place their hands flat on a table and then asked to withhold from eating an M&M candy placed in front of them. During four trials (20 s, 30 s, 40 s, and 60 s in length), children were instructed to delay eating until the interviewer rang a bell. Coders judged the extent to which children attempted to eat the M&M candy on a scale of 0 (*eats the candy within the first half of the trial*) to 10 (*child waits successfully*; $\kappa = .69$). Coders also recorded how long children waited to eat the M&M (ICC = .98). Scores were averaged across all trials.

In the Gift Wrap task, interviewers told children that they would be receiving presents but that they could not peek at the presents while the presents were being wrapped. The interviewers then instructed the children to turn their backs to the interviewers as the interviewers noisily wrapped the presents for 60 s. Coders rated how well children waited on a metric of 0 (*child gets out of chair and goes to interviewer*) to 7 (*child does not try to peek*; $\kappa = .62$) and noted how long children waited to peek at the present (ICC = .94) and to turn around toward the present (ICC = .80).

Delay of gratification at Wave 2. To ensure that the Time 2 tasks captured adequate variation in children's delay scores, the Three-City Study slightly modified the measures. The Snack Delay task included six trials with a wider range in length (10 s, 10 s, 20 s, 30 s, 40 s, and 90 s). Average behavior ($\kappa = .72$) and latency to eat (ICC = .98) scores were calculated. In the Gift task, the child was told not to touch a can of Play-Doh® while the interviewer looked for another can to give the child. Coders assessed how well a child withheld from touching the can on a scale of 1 (*child takes Play-Doh® out of can*) to 10 (*child does not touch the can*; $\kappa = .67$) as well as how long a child waited to touch the can (ICC = .95) and to open the can (ICC = .98).

Executive control at Wave 2. The Three-City Study administered the Shapes task (Kochanska et al., 1997) and Turtle–Rabbit task (Kochanska et al., 1996) at Time 2 to capture executive control. In the Shapes task, children were shown a series of line drawings of familiar objects (e.g., hand, car) over 16 trials. Children were first shown a *primer*, which was a colored line drawing of a big object (e.g., car), and were instructed to remain silent when a primer was shown. The interviewers then showed children a line drawing of the same big object filled with smaller drawings of a different object (e.g., hand). Children were asked to name the little pictures. Coders captured how well the children were able to focus attention on the little pictures by using a metric of 0 (*wrong response to a picture and responds to primer*) to 5 (*correct response to picture in picture and does not respond to primer*). Scores were averaged across trials ($\kappa = .84$).

During the Turtle–Rabbit task, the field interviewer gave each child a picture of a path leading to a house and asked him or her to draw lines representing a turtle slowly going “home” and a rabbit quickly going “home.” Coders assessed how well a child stayed within the lines while drawing paths (0 = *does not follow the general curve of the path*; 1 = *followed the general curve of the path*; 2 = *stayed within the lines*) for two

turtle trials and two rabbit trials. Average turtle behavior ($\kappa = .95$) and average rabbit behavior ($\kappa = .94$) scores were calculated across trials. A third measure captured the mean difference between how slow a child drew a path for a turtle ($ICC = .99$) and how fast a child drew a path for a rabbit ($ICC = .98$).

Composites. Rather than creating a global effortful control composite, I calculated separate composites for delayed gratification and executive control. This decision was based on both theoretical and empirical grounds. As noted previously, delayed gratification and executive control are related but distinct constructs. Although both constructs reflect children's ability to inhibit behavior, the two types of tasks place different demands on children's behavioral and cognitive skills, with executive control taking a greater toll on children's working memory (Carlson, 2005). Consistent with prior research on effortful control, in the current study I found that delayed gratification and executive control were significantly related to one another, $r(433) = .45, p < .01$. However, factor analysis of the effortful control variables yielded two distinct factors, one representing delayed gratification and another representing executive control (Li-Grining, 2005). This factor solution is consistent with results of other studies of effortful control and reinforced the theoretical decision to analyze these two dimensions of effortful control separately (Fisher, Tininenko, & Pears, 2007; Smith-Donald et al., 2006).

Furthermore, the effortful control scores were correlated with one another within wave and domain, with an average correlation of .57 among the snack delay and gift wrap variables at Wave 1, .42 among the snack delay and gift variables at Wave 2, and .49 among the shapes and turtle-rabbit variables at Wave 2 (see Appendix for details). Thus, following other studies of children's effortful control (Carlson et al., 2004; Kochanska et al., 2000), the delay and executive control scores were then standardized and averaged into three composites ($\alpha_{\text{Delay, w1}} = .87$; $\alpha_{\text{Delay, w2}} = .78$; $\alpha_{\text{Executive Control, w2}} = .79$). Additionally, I calculated a delay behavior score averaged across the 20 s, 30 s, and 40 s Snack Delay trials to examine developmental change.

Child Characteristics

Five child characteristics were examined. Age was represented in years. Gender was coded as 1 for *boys* and 0 for *girls*. A three-item scale was used as a rough proxy for children's proneness to anger, frustration, and distress (Buss & Plomin, 1984). Mothers rated the items (i.e., "child gets upset easily," "child tends to cry easily," and "child has a quick temper") on a 1 to 5 metric (1 = *never like this child*, 5 = *always like this child*; $\alpha_1 = .70$, $\alpha_2 = .64$). Race comprised four categories: African American, Latino, European American, and other, the last of which consisted of Asian and biracial children. Based on maternal reports of children's birth weight in pounds and ounces, children were coded as having low birth weight if they were born at less than 5.5 lbs (Reichman, 2005).

Ecological Risk

Because statistical interactions do not have adequate power to capture the interplay of proximal and distal stressors, researchers have used cumulative risk models to reflect the constellation of poverty-related stressors that low-income children tend to face (Evans, 2003; Rutter, 1983, 1993). Risk is captured in a dichotomous fashion, with the *presence of risk* coded as 1 and the *absence of risk* coded as 0. Researchers then add the dichotomous risk indicators to reflect the total number of stressors that children experience. Here, stressors are examined in clusters, in which similar risks are grouped together, so that researchers can pinpoint the different types of stressors that account for individual differences (Ackerman et al., 1999; Deater-Deckard et al., 1998). In this investigation, I examined risk in three domains: psychosocial, sociodemographic, and residential stressors.

Psychosocial risk. Mothers' psychological well-being and lack of social support were captured through use of five self-report measures. On the

basis of the six-item Depression subscale on the Brief Symptom Inventory 18 (BSI 18; Derogatis, 2000), mothers were coded as being at risk for depression if *t* scores were at or above the clinical cutoff of 63 ($\alpha_1 = .83$; $\alpha_2 = .86$). Risk factors for delinquency and substance abuse were based on 12 items (e.g., "getting in trouble with the police") and 4 items (e.g., "using marijuana"; Borus, Carpenter, Crowley, & Daymont, 1982; Gold, 1970; Steinberg, Mounts, Lamborn, & Dornbusch, 1991). Mothers' experience of domestic violence was measured through use of 13 items (Straus, 1979; Tolman & Rosen, 2001; $\alpha_1 = .91$; $\alpha_2 = .92$). Any indication of delinquency, substance abuse, or domestic violence was coded as a risk for each category (Raver et al., 2006). Social support was captured through use of four items (e.g., "has others for emotional support"; $\alpha_1 = .80$; $\alpha_2 = .83$), with higher scores indicating more social support. Following Gerard and Buehler (2004), a 25th percentile cutoff was used for determination of whether families experienced a lack of social support.

Sociodemographic risk. Eight self-reported risks reflected socioeconomic resources and family structure. A risk factor for education indicated whether mothers held less than a high school degree (Ackerman et al., 1999). Other risk factors included whether mothers received welfare, whether they were not employed (i.e., working fewer than 10 hours per week), and whether families lived in poverty (Ackerman et al., 1999; Raver et al., 2006). Poverty status was based on an *income-to-needs ratio*, which is defined as total household income adjusted for family size with a ratio of less than 1.0, meaning that a family lives below the poverty line. For family structure, single parenthood (i.e., mothers were not married or cohabiting; Deater-Deckard et al., 1998) and living with four or more minors (Ackerman et al., 1999) were coded as risk factors. For purposes of capturing the challenges of early motherhood (Deater-Deckard et al., 1998), young maternal age (i.e., less than age 21 years) was considered a stressor. For purposes of modeling family separation (Ackerman et al., 1999), an additional risk factor reflected whether the child's primary caregiver was not the biological mother.

Residential risk. Residential risk comprised three self-reported stressors. Housing problems were captured using an eight-item scale that included questions about experiencing plumbing problems. A composite of neighborhood problems was based on 11 items (e.g., "unsafe streets"). Being in the 75th percentile on housing problems and being in the 75th percentile on neighborhood problems were categorized as stressors (Gerard & Buehler, 2004; Raver et al., 2006). Neighborhood quality also was measured in terms of *collective efficacy*, which is defined as mutual trust among neighbors and their willingness to take action for the common good (Sampson, Raudenbush, & Earls, 1997). Collective efficacy was captured through use of nine items (e.g., "people in this neighborhood can be trusted"), with higher scores indicating more collective efficacy and families being at risk if scores fell into the 25th percentile.

Child-Mother Interaction

A global rating of child-mother connectedness was used as a rough proxy for optimal parenting. Children and mothers participated in the Puzzle Task, which was administered and videotaped in children's homes by trained interviewers at Waves 1 and 2. The Puzzle Task was revised for use with low-income, minority families by Chase-Lansdale, Brooks-Gunn, and Zamsky (1989) and adapted from Owen and Henderson (1988), Easterbrooks and Goldberg (1984), and Sroufe, Matas, and Rosenberg (1980). Interviewers asked children to complete a set of four puzzles of increasing difficulty and told mothers that they could assist children when necessary. Connectedness was rated on a 4-point scale (1 = *none*; 2 = *mild*; 3 = *moderate*; 4 = *high*). Approximately 25% of the tapes were double coded for interrater reliability. Coders demonstrated adequate interrater reliability when comparing none/mild ratings with moderate/extreme ratings ($\kappa_1 = .67$, $\kappa_2 = .64$).

Tables 1 and 2 provide descriptive data, with the first table showing information on measures of preschoolers' delayed gratification, executive

Table 1
Descriptive Statistics for Effortful Control and Child Characteristics

Variable	Wave 1			Wave 2	
	<i>M</i>	<i>SD</i>	%	<i>M</i>	<i>SD</i>
Effortful control					
Delay of gratification					
Snack delay task					
Behavior	4.84	3.41		6.47	2.54
Latency to eat	0.79	0.32		0.94	0.16
Gift wrap task					
Behavior	3.40	2.24			
Latency to peek (s)	21.08	20.16			
Latency to turn (s)	30.89	20.31			
Gift task					
Behavior				7.35	2.50
Latency to touch (s)				33.28	21.47
Latency to open (s)				46.75	10.91
Delay composite	0.00	0.79		-0.01	0.72
Executive control					
Shapes task behavior				3.66	1.47
Turtle rabbit task					
Behavior during turtle trials				9.54	3.20
Behavior during rabbit trials				8.65	3.13
Mean difference between turtle and rabbit trials				11.19	16.30
Executive control composite				-0.03	0.77
Child characteristic					
Age (years)	3.18	0.88		4.50	0.93
Boy			55		
Negative emotionality	9.61	3.16		8.94	2.90
Race/ethnicity					
African American			41		
Latino			51		
European American			5		
Other			4		

Note. Values in this table are weighted. s = seconds.

control, and individual characteristics and the second table presenting statistics on exposure to risk and child–mother connectedness.

Analytic Approach

The first goal of this study was providing a descriptive portrait of developmental patterns of effortful control among low-income, predominantly Latino and African American children. To assess stability in effortful control, I estimated the correlation between the delay composites at Waves 1 and 2. To assess developmental change in effortful control, I examined mean differences in delay behavior across waves using a *t* test. I also estimated the *t* test separately for children who entered the study at ages 2 years, 3 years, and 4 years to determine whether there was greater change in delayed gratification for younger children.

The second goal of this investigation was exploring sources of individual differences in these developmental patterns using OLS regression. The hierarchical regression model included two sets of predictors: child characteristics and contextual factors. Entering the variables in this manner allowed for the embedding of child-centered models of effortful control in context by the addition of poverty-related stressors and child–mother connectedness as predictors of delayed gratification and executive control. I performed an incremental *F* test to test the statistical significance of the additional set of independent variables (Cohen, Cohen, West, & Aiken, 2003). Variables in these sets included child characteristics that remained

constant over time (i.e., low birth weight, race, and gender) and factors that changed across waves (e.g., ecological risk). Following recent developmental research (Carmody et al., in press; National Institute of Child Health and Human Development Early Child Care Research Network & Duncan, 2003; Votruba-Drzal, in press), I averaged time-varying characteristics across waves to reflect children's accumulation of experiences across early childhood. These models assume that a child's development at any given time is a product of experiences that occurred until that time. Furthermore, averaging across time provides robust predictors. Also, the gap between waves was relatively short, and descriptive analyses revealed little change in risk factors over time in this study and in other research using the same data (Raver et al., 2006).

Specifically, the regression model included the following predictor and outcome variables. Child predictors that did not change over time were captured at Wave 1 only, which included low birth weight, race, and gender. Child and contextual variables that did vary across time were averaged across Waves 1 and 2, and these means were entered as predictors, which included average age, negative emotionality, psychosocial risk, sociodemographic risk, residential risk, and connectedness. The outcomes considered in this study were children's delayed gratification and executive control at Wave 2. Thus, the regression model tested here predicts levels of delayed gratification and executive control. The model does not predict growth in these dimensions of effortful control, given the absence of a key outcome (i.e., executive control) at Wave 1.

Table 2
Descriptive Statistics for Risk Factors and Child–Mother Interaction

Variable	Wave 1			Wave 2		
	<i>M</i>	<i>SD</i>	Presence of risk factor (%)	<i>M</i>	<i>SD</i>	Presence of risk factor (%)
Risk factor						
Child risk—low birth weight			7			
Psychosocial risk						
Depression	48.85	9.21	9	48.00	9.16	8
Delinquency	0.69	1.15	38	0.52	1.08	27
Substance abuse	0.65	1.07	39	0.64	1.20	35
Social support receipt	2.30	0.50	18	2.32	0.54	20
Domestic violence	0.39	0.32	67	0.36	0.35	60
Cumulative psychosocial risk	1.70	1.22		1.49	1.20	
Sociodemographic risk						
Less than high school degree			43			48
Welfare receipt			36			27
Employment hours per week	12.04	18.10	66	16.40	18.88	53
Income-to-needs ratio	0.85	0.49	68	0.99	0.63	62
Single parent			65			55
Number of minors	2.96	1.41	31	3.06	1.44	36
Maternal age (years)	29.59	8.90	10	31.04	8.85	4
Not biological mother			10			10
Cumulative sociodemographic risk	3.26	1.66		2.94	1.70	
Residential risk						
Housing problems	1.33	1.64	19	1.25	1.57	17
Neighborhood problems	2.85	2.93	27	2.51	2.80	25
Collective efficacy	25.84	8.94	27	26.63	9.05	24
Cumulative residential risk	0.73	0.89		0.65	0.87	
Child–mother interaction						
Dyadic connectedness	3.31	0.79		3.32	0.82	

Note. Values in table are weighted.

Additionally, this study explored whether the regression model fit similarly or differently across African American and Latino children and across boys and girls. For examination of race/ethnicity group differences, interaction terms between the dummy variable for Latino and each of the other predictors were added to the regression model. I conducted a post hoc test to assess whether any of the interaction terms were significantly different from zero. If a post hoc test was significant, I estimated separate models for the two racial/ethnic groups to determine how results varied across the two groups. Comparisons between boys and girls were made in the same manner.

All analyses used probability weights. Thus, the descriptive statistics in Tables 1 and 2 and the results presented throughout this investigation are weighted. This means that the statistics presented here are representative of the current study's population of inference, which is preschoolers in low-income families living in low-income neighborhoods in Boston, Chicago, and San Antonio.

Results

Patterns of Normative Development in Delayed Gratification

The first goal of this study was understanding patterns of normative development in effortful control among low-income, predominantly African American and Latino children by examination

of stability and change in delayed gratification. There was a positive correlation between the delay composite scores at Waves 1 and 2, $r(437) = .40, p < .01$. Similar results were found for African American children, $r(190) = .48, p < .01$, and Latino children, $r(201) = .42, p < .01$, and for boys, $r(233) = .42, p < .01$, and girls, $r(201) = .39, p < .01$. Together, these findings suggest that children's delayed gratification was moderately stable over time.

Next, I sought to determine the extent to which delayed gratification improved over time and whether the size of improvement varied across age groups. These analyses focused on behavior scores averaged across trials that were administered in both waves. Results suggested that the mean behavior score significantly increased by 1.43 points across waves ($p < .001$), which is equivalent to about half of a standard deviation increment. There were no main effects for race/ethnicity or gender, and there were no interaction effects between wave and race/ethnicity or between wave and gender. Behavior increased by 2.48 points ($p < .001$), 1.44 points ($p < .01$), and .79 points ($p < .01$) across waves for children who were ages 2, 3, and 4 years, respectively, at Wave 1. These changes are equal to .88, .51, and .28 of a standard deviation improvement, respectively, suggesting that greater growth occurred at younger ages.

Predictors of Delayed Gratification and Executive Control

The second goal of this study was explaining individual differences in developmental patterns of effortful control by situating child-centered models of effortful control in socioeconomic context. Table 3 shows results from estimating the hierarchical regression model, with delayed gratification and executive control at Wave 2 as outcomes. The first panel displays results from regressing delayed gratification and executive control onto the set of child characteristics. The second panel of Table 3 presents findings after adding poverty-related stressors and child–mother connectedness as predictors of children’s effortful control. Table 3 presents OLS coefficients, standard errors, and standardized beta coefficients when each set of variables was added to the model. Additionally, the variance explained by the set of child characteristics is listed, along with the change in variance explained when the set of contextual factors was added.

Child Characteristics

The first panel of Table 3 displays findings for four types of child characteristics: age, gender, negative emotionality, and race/ethnicity. The top row of the first panel shows that child characteristics explained 19% of variance in preschoolers’ delayed gratification and 42% of variance in their executive control. The next rows present results for age and gender, which emerged as significant predictors of preschoolers’ effortful control. Younger children scored lower than older children on both delayed gratification and executive control. In contrast, gender differences were detected for delayed gratification but not for executive control. Gender was linked to lower delayed gratification scores, where boys scored .38 of a standard deviation lower than girls, net of other child characteristics.

The last rows of the first panel display the findings for temperament and race/ethnicity. Surprisingly, there were no significant

relations between children’s proneness to negative emotionality and individual differences in delayed gratification and executive control. Latino preschoolers performed better on executive control tasks than did European American children, at a trend level. Post hoc analyses found no significant differences in task performance between African American and Latino preschoolers and between each of these groups and children from other racial/ethnic minority backgrounds.

The second panel of Table 3 shows results for contextual factors. The top row of the second panel shows that the set of contextual characteristics explained 4% of additional variance in delayed gratification, $F(5, 423) = 3.76, p < .01$, beyond child factors. Furthermore, the set of contextual factors accounted for 7% of additional variance in executive control, above the contribution of child characteristics, $F(5, 421) = 6.21, p < .001$.

Poverty-Related Risk

The next rows of the second panel of Table 3 show results for four types of poverty-related stressors: child, psychosocial, socio-demographic, and residential risks. Low birth weight posed a significant risk to children’s delayed gratification, with low birth weight children scoring .38 of a standard deviation worse than normal birth weight children, net of child and environmental factors. There was a stronger linkage between low birth weight status and children’s executive control. Low birth weight children performed significantly worse than did normal birth weight children, scoring .62 of a standard deviation lower, above and beyond ecological risk factors, dyadic connectedness, and other child characteristics.

Cumulative ecological risks were not related to preschoolers’ delayed gratification but were associated with children’s executive control. Unexpectedly, exposure to psychosocial risks did not appear to jeopardize children’s delayed gratification or executive control. Similarly, preschoolers facing a higher number of socio-

Table 3
Regressions: Child Characteristics, Risk Factors, and Child–Mother Interaction Predicting Delayed Gratification and Executive Control at Wave 2

Variable	Delayed gratification					Executive control				
	R^2	ΔR^2	B	$SE B$	β	R^2	ΔR^2	B	$SE B$	β
Child characteristics	.19					.42				
Age			.35***	.05	.42			.55***	.05	.62
Gender			-.27**	.08	-.19			-.04	.08	-.03
Negative emotionality			.00	.01	.00			-.01	.01	-.03
Race										
European American (omitted)										
African American			.08	.19	.06			.34	.25	.22
Latino			.00	.18	.00			.43 [†]	.25	.28
Other			.27	.24	.07			.35	.29	.09
Risk factors and child–mother interaction		0.04**					0.07***			
Low birth weight			-.27*	0.13	-.09			-.48**	.17	-.16
Psychosocial risk			.02	0.04	.03			.04	.04	.05
Sociodemographic risk			-.01	0.03	-.01			-.08**	.03	-.15
Residential risk			-.01	0.05	-.01			-.16*	.07	-.16
Dyadic connectedness			.21***	0.06	.19			.07	.06	.06

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

demographic risks did not display lower levels of delayed gratification. Yet preschoolers' experience with more sociodemographic stressors was significantly linked to lower executive control. An additional sociodemographic risk was related to .10 of a standard deviation drop in executive control scores, net of other types of risks, connectedness, and child characteristics. Although exposure to a greater number of residential risks was not associated with worse delayed gratification performance, it was significantly linked to inferior executive control performance. For each additional residential risk, preschoolers scored .21 of a standard deviation lower on executive control, controlling for other types of stressors, connectedness, and child factors.

In sum, poverty-related risk compromised children's executive control, which was negatively linked to three of the four types of stressors examined in this study. There was less evidence of a linkage between poverty-related stressors and preschoolers' delayed gratification, which was significantly associated with low birth weight but not related to ecological risk.

Child–Mother Interaction

Individual differences in preschoolers' delayed gratification were significantly predicted by dyadic connectedness between children and their mothers. As shown at the bottom of Table 3, a standard deviation improvement in child–mother connectedness was related to about one fifth of a standard deviation increment in preschoolers' delayed gratification scores, controlling for child characteristics and poverty-related stressors. However, no linkage between dyadic connectedness and children's executive control was found, suggesting that child–mother connectedness was protective for preschoolers' delayed gratification but not for preschoolers' executive control.

Exploring the Moderating Role of Race/Ethnicity and Gender

Additional exploratory analyses compared the regression model across African American and Latino children and across boys and girls. No significant slope differences were observed between African American and Latino preschoolers. Significant slope differences between boys and girls did emerge for delayed gratification and executive control. Low birth weight appeared to pose a greater risk to boys' delayed gratification, where low birth weight boys scored .91 of a standard deviation lower in delayed gratification, child characteristics, and dyadic connectedness, controlling for other risk factors. For girls, low birth weight was not a significant predictor of delayed gratification. Similarly, low birth weight boys performed 1.30 standard deviations worse on executive control than did normal birth weight boys, net of child and environmental factors ($p < .01$). However, low birth weight girls scored .45 of a standard deviation less than normal birth weight girls ($p < .05$).

There was no significant relation between residential risk and boys' executive control, but there was a negative linkage between residential risk and executive control among girls. Exposure to an additional environmental risk was associated with girls performing .44 of a standard deviation worse ($p < .001$), over and above other risk factors, dyadic connectedness, and child characteristics. This finding could be due to chance, given the number of interaction

tests conducted. Still, results from preliminary analyses suggest that girls' executive control was more sensitive to residential risk and that boys' delayed gratification and executive control were more vulnerable to low birth weight status.

Discussion

A Longitudinal View of Low-Income, Ethnic Minority Children's Delayed Gratification

In this study, I posed two questions regarding developmental patterns. Is there substantial evidence for stability in children's profiles of delayed gratification among a sample facing high levels of risk, including exposure to chaotic home and neighborhood environments? We may see less stability among preschoolers in the face of such stressors. Yet, similar to past research (Carlson et al., 2004; Kochanska & Knaack, 2003), preschoolers' delayed gratification was moderately stable for this large group of low-income children. These findings add to the generalizability of existing studies with relatively smaller numbers of ethnic minority children.

To what extent does children's delayed gratification improve in the context of high risk? In this study, I found large improvements in the delay behavior for 2-year-olds, which corroborates evidence from Kochanska et al. (2000), whose Snack Delay data suggest a large increment in delay behavior from 22 months to 33 months. Also, older children experienced less growth in delayed gratification, with a moderate increment for 3-year-olds and a modest increase for 4-year-olds, which is congruent with prior research on children's compliance (Kochanska, Coy, & Murray, 2001). In sum, these findings provide a much needed developmental portrait of stability and change in effortful control among a large group of African American and Latino children.

Developmental Pathways to Low-Income, Ethnic Minority Children's Delayed Gratification and Executive Control

With a basic understanding of developmental patterns in children's effortful control, in this study I then sought to explain individual differences in these patterns by situating child-centered models of effortful control in socioeconomic context. Before consideration of the role of ecological risk, child characteristics were examined. What are the linkages among child characteristics and preschoolers' delayed gratification and executive control? Child age was a consistent predictor of children's effortful control, although the findings were mixed or null for other child characteristics. There was a positive association between child age and both delayed gratification and executive control, net of other child characteristics. In contrast, gender was not consistently associated with children's effortful control. Delayed gratification scores were moderately higher for girls than for boys, whereas executive control scores did not differ across gender. These findings conflict with prior research that has noted gender differences on most types of effortful control tasks (Blair et al., 2005; Kochanska et al., 2000). However, they are in keeping with past research that has detected moderate differences on behavioral tasks but small and inconsistent differences on cognitive tasks (Bjorklund & Kipp, 1996).

Surprisingly, this study found no significant relation between children's tendencies to display anger, frustration, and distress and their delayed gratification and executive control. In existing studies, researchers have noted that children with a temperamental proneness to negative reactivity display lower levels of self-regulatory competence (Kochanska & Knaack, 2003). The discrepancy between past findings and those from the current investigation may be attributed to differences in measurement, with prior studies using more in-depth measures of negative emotionality, including extensive parental reports and detailed observations.

Similarly, this study found no significant differences in delayed gratification and executive control scores across children of different racial/ethnic groups. Conducting a thorough investigation of measurement equivalence is beyond the scope of this investigation. However, these findings provide preliminary evidence that the effortful control tasks used here did not yield substantial measurement differences between African American, Latino, and European American preschoolers in an exclusively low-income sample.

What are the relations among poverty-related risk and preschoolers' delayed gratification and executive control? Controlling for other child characteristics and environmental factors, low birth weight emerged as a significant predictor of preschoolers' delayed gratification and executive control. Low birth weight was significantly associated with moderately lower delay-of-gratification scores and with substantially lower executive control scores, net of other child characteristics, ecological risk, and child-mother interaction. Because neural systems may be linked to individual differences in effortful control (Davis, Bruce, & Gunnar, 2002), neurological impairments associated with low birth weight may decrease children's ability to control their behavior and attention (Harvey et al., 1999), especially when cognitive demands are high. These findings add to the generalizability of research conducted among preschoolers in Australia (Harvey et al., 1999) and Stockholm, Sweden (Bohm et al., 2002), which showed that low birth weight preschoolers scored lower on executive control tasks than did their normal birth weight counterparts. In the future, researchers might explore whether the negative effects of low birth weight on multiple dimensions of preschoolers' effortful control continues as children enter elementary school.

Ecological risk factors were predictive of children's executive control, above and beyond child characteristics and connectedness. Exposure to an additional sociodemographic risk, such as single parenthood or living in poverty, was associated with modestly lower executive control scores, net of other types of stressors, connectedness, and child factors. Similarly, each additional residential stressor, such as living in an unsafe neighborhood or in a home with plumbing problems, posed a modest risk to children's executive control, controlling for other kinds of risk, connectedness, and child characteristics. Consistent with studies examining the bivariate association between children's total exposure to ecological stressors and their executive control (Barocas et al., 1991; Bendersky et al., 2003), the current study suggests that sociodemographic and residential stressors explain unique variance in children's effortful control, controlling for psychosocial stressors, child-mother interaction, and child factors. This study cannot characterize the full feedback loop linking low birth weight status, sociodemographic risk, residential stressors, and children's effortful control. Nevertheless, it may be that prenatal and postnatal caregiving environments characterized by numerous sociodemo-

graphic and residential stressors have long-lasting effects on children's executive control, which is more cognitively demanding than delayed gratification. Indeed, early cumulative environmental risk recently has been linked to brain activation in adolescents who were born preterm (Carmody et al., in press).

Unexpectedly, psychosocial stressors did not jeopardize preschoolers' effortful control. It may be that sociodemographic and residential risk factors drive the effect of overall exposure to risk on children's self-regulatory skills. Alternatively, it may be that the combination of psychosocial and child stressors is particularly risky for children's behavior problems (Campbell et al., 2000) and self-regulatory competence or that the measurement used in this study captured sociodemographic and residential risks more adequately than it did mothers' psychosocial risks.

What are the relations among child-mother connectedness and preschoolers' delayed gratification and executive control? More proximal connectedness modestly enhanced children's delayed gratification, net of child characteristics and ecological stressors. This finding corroborates prior research on contributors to effortful control, which found that responsiveness (Kochanska et al., 2000), cognitive stimulation (Olson et al., 2002), restrictiveness (Olson et al., 2002), and emotional expression (Eisenberg et al., 2003) foster children's self-regulatory skills. Children who readily engage in dyadic coordination with their mothers may find it less difficult to regulate their behavior and attention independently (Feldman et al., 1999; Garner & Spears, 2000; Moore & Calkins, 2004; Raver, 1996). Additionally, the pleasure of experiencing connectedness may serve as a motivator for children to comply with mothers' expectations that their children manage their own behavior and attention (Maccoby & Martin, 1983), and connectedness may serve as a source of support in the face of challenging situations that demand delayed gratification, especially in the context of high risk.

Interestingly, different predictors emerged for children's delayed gratification and executive control; this finding supports the call to recognize the multifaceted nature of effortful control (Carlson, 2005; Davis et al., 2002). It is unclear why connectedness did not foster children's executive control and why ecological risk did not compromise children's delayed gratification. These results suggest that more basic effortful control processes are more sensitive to proximal parenting practices and that more complex effortful control processes are more susceptible to distal ecological stressors that jeopardize prenatal and postnatal environments. However, the connectedness measure used here is a rough proxy for optimal parenting, which underscores the need for hybrid research that develops carefully measured ecological risk factors and parenting constructs for survey use. Furthermore, this study is simply a first step in understanding how both proximal and distal factors shape children's delayed gratification and executive control, leaving many unanswered questions about the ways in which environmental factors promote or inhibit the development of children's effortful control (Carlson, 2005). Future research is needed for determination of how multiple dimensions of both parenting and ecological risk may be related to specific dimensions of children's effortful control during the preschool years and beyond. For example, there may be a lagged effect of ecological risk on children's delayed gratification that does not appear until middle childhood (Evans, 2003; Evans & English, 2002).

Do developmental pathways to preschoolers' effortful control differ across children's race/ethnicity or gender? The models tested in the current study fit similarly for African American and Latino children. Although this study examined only one aspect of cultural variation, this finding suggests that the pathway from child characteristics, poverty-related stressors, and connectedness to children's effortful control is similar for these two groups. In contrast, the model fit differently for boys and girls. Congruent with extant research (Evans, 2003; Barocas et al., 1991), the current study did not find that the association between multiple environmental stressors and children's effortful control differed across gender. However, low birth weight, which has not been considered in prior research on cumulative environmental stressors and children's effortful control, posed a substantial risk to boys', but not girls', delayed gratification. Similarly, there was a large gap for boys but a moderate gap for girls when comparing the executive control scores of low birth weight and normal birth weight children. Because boys are more likely to experience neurocognitive deficits than are girls (Shaw, Winslow, Owens, Vondra, et al., 1998), they may be more susceptible to medical complications associated with low birth weight.

It is important to reflect on caveats of the current investigation. First, the present study was based on only two time points; thus pinpointing causal direction is difficult. Second, connectedness could be more easily established with children who have high levels of delayed gratification. Third, results are generalizable to low-income children in Boston, Chicago, and San Antonio. Thus, replication is needed for determination of the generalizability of these findings to low-income children in other urban and rural areas of the United States. Fourth, preschoolers' effortful control may be associated with other child and family characteristics, including children's cortisol reactivity (Blair et al., 2005). Fifth, although these findings illuminate predictors of levels of delayed gratification and executive control, an important direction for future research is the examination of predictors of growth in these dimensions of effortful control.

In sum, this study extended prior research on the etiology of children's effortful control by combining a child-centered approach and a multiple risk approach. This integrated framework has the potential to shed light on the complex and specific ways in which proximal and distal factors work in concert to shape multiple dimensions of children's self-regulatory competence. Furthermore, by embedding developmental models of effortful control in socioeconomic and sociocultural contexts, researchers may further understand the self-regulatory processes that may underlie the pathway from poverty to children's socioemotional functioning.

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Appendix

Table A1
Zero-Order Correlations Among Effortful Control Variables at Wave 1 and at Wave 2

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Wave 1														
1. Snack delay behavior	—													
2. Snack delay latency to eat	.75	—												
3. Gift wrap behavior	.51	.42	—											
4. Gift wrap latency to peek	.47	.38	.84	—										
5. Gift wrap latency to turn	.42	.36	.79	.71	—									
Wave 2														
6. Snack delay behavior						—								
7. Snack delay latency to eat						.65	—							
8. Gift behavior						.41	.18	—						
9. Gift latency to touch						.40	.18	.83	—					
10. Gift latency to open						.27	.19	.58	.48	—				
11. Shapes behavior						.47	.36	.25	.28	.17	—			
12. Turtle behavior						.41	.36	.23	.25	.22	.54	—		
13. Rabbit behavior						.35	.28	.20	.21	.14	.43	.88	—	
14. Turtle-rabbit slowdown score						.30	.24	.21	.18	.18	.40	.39	.27	—

Note. Variables 1–5 were observed at Wave 1, and variables 6–14 were observed at Wave 2. All correlation coefficients are significant at $p < .01$.

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