Social Development Vol •• No. •• ••–•• •• 2013
doi: 10.1111/sode.12071

Parenting Mediates the Effects of Income and Cumulative Risk on the Development of Effortful Control

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Abstract

This study tested the hypothesis that the effects of income and cumulative risk on the development of effortful control during preschool would be mediated by parenting. The study utilized a community sample of 306 children (36–40 months) representing the full range of family income, with 29 percent at or near poverty and 28 percent lower income. Two dimensions of effortful control (executive control and delay ability) were assessed at four time points, each separated by nine months, and growth trajectories were examined. Maternal warmth, negativity, limit setting, scaffolding, and responsiveness were observed. Above the effects of child cognitive ability, income, and cumulative risk, scaffolding predicted higher initial levels of executive control that remained higher across the study, and limit setting predicted greater gains in executive control. Parenting did not predict changes in delay ability. Significant indirect effects indicated that scaffolding mediated the effects of income and cumulative risk on growth in executive control. The findings suggest that parenting behaviors can promote effortful control in young children and could be targets of prevention programs in low-income families.

Keywords: effortful control; low income; cumulative risk; parenting

Introduction

Low income and poverty have a marked impact on children's well-being, increasing the likelihood of academic, social, emotional, and behavior problems (e.g., Brooks-Gunn & Duncan, 1997; Evans, 2003). Further, early experiences of poverty have effects on adjustment into adulthood (Brooks-Gunn & Duncan, 1997; Duncan, Ziol-Guest & Kalil, 2010). The pervasive impact of early exposure to poverty may reflect its disruptive effects on the development of self-regulatory systems that develop early in childhood, underlie a range of developmental outcomes, and have both immediate and long-term effects on adjustment (Raver, 2004). One of these

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self-regulatory systems is effortful control, which is a robust predictor of children's academic, social, emotional, and behavioral adjustment (Blair & Razza, 2007; Valiente, Lemery-Calfant & Castro, 2007). The development of effortful control might represent a pathway through which low income impacts children's adjustment (Meich, Essex & Goldsmith, 2001). Clarifying the effects of income on effortful control and the potential mechanisms of those effects is critical for understanding children's well-being in the face of low income and for developing preventive interventions for children growing up in poverty (Blair & Raver, 2012). However, few studies examine how adversity or socialization factors affect the early development of effortful control. This study tested the hypothesis that parenting mediates the effects of income and cumulative risk on growth in effortful control in preschool-aged children.

Effortful Control

Effortful control is the executive-based core of self-regulation that includes attention regulation and inhibitory control (Rothbart & Bates, 2006) and refers to the ability to shift attention from irrelevant or distracting stimuli, focus on relevant stimuli, and inhibit an undesired dominant response to produce a preferred non-dominant response, facilitating the regulation of attention, emotions, and behavior (e.g., Rothbart, Ahadi & Evans, 2000). The term effortful control arises from a temperament tradition and is utilized here because it emphasizes core executive functions that represent both inherent individual differences and environmental influences on the expression of these individual differences. There is considerable overlap in the conceptualization and operationalization of effortful control and executive function (Zhou, Chen & Main, 2011). Although executive functioning includes attention regulation, inhibitory control, and delay ability, it also includes higher-order functions such as planning, decision making, and problem solving. Thus, conceptually, effortful control represents the attentional, inhibitory, and delay core of executive functions.

Effortful control is related to a range of indicators of adjustment including academic competence (Blair & Razza, 2007; Buckner, Mezzacappa & Beardslee, 2009; Raver et al., 2011; Valiente et al., 2007; Valiente, Lemery-Chalfant & Reiser, 2007), social-emotional competence (e.g., Eisenberg et al., 2003; Raver et al., 1999), externalizing (Hughes & Ensor, 2009; Kochanska & Knaack, 2003), and internalizing problems (de Boo & Kolk, 2007; Eisenberg et al., 2001; Lengua, 2006; Muris, van der Pennen, Sigmond & Mayer, 2008). Thus, investigation of the factors that shape the development of effortful control is critical for our understanding of children's adjustment and for developing interventions to facilitate well-being. Promoting effortful control in children in high-risk contexts, including those characterized by low income, might pave the way for more adaptive outcomes.

Low Income and Effortful Control

Children from low-income families tend to demonstrate lower effortful control compared with children from higher-income families (e.g., Evans & English, 2002; Hughes, Ensor, Wilson & Graham, 2010; Mezzacappa, 2004; Mistry, Benner, Biesanz, Clark & Howes, 2010), with differences apparent as early as preschool age (Lengua, Honorado & Bush, 2007). However, little research clarifies the factors that might account for the effects of low income on effortful control (Blair & Raver, 2012). This study was designed to explicitly test the relation of family income to effortful control, with equal representation of families across income levels. This design also facilitates the examination of mediators of the effects of income, such as cumulative risk and parenting. Few if any studies have examined both adversity and parenting as mediators of the effects of income on growth in effortful control.

Cumulative Risk and Parenting as Mediators of the Effects of Low Income

Children's experiences of family risk factors and parenting might account for the effects of low income on effortful control. For example, in the context of stress model (Linver, Brooks-Gunn & Kohen, 2002; McLoyd, 1990), the effects of poverty on children are accounted for by experiences of poverty-related stress, including concerns about hunger, violence, illness, and other threats to basic needs. Similarly, the family stress model (Conger & Elder, 1994) suggests that the pervasive adverse effects of finance-related stress are accounted for by the impact of economic strain on parental psychopathology, family conflict, and parenting, which in turn impact children's well-being. A few studies have examined the links among poverty, related stressors, and child effortful control. However, comprehensive, longitudinal tests of the effects of income, cumulative risk, and parenting on the development of effortful control are needed. This study extends prior work by testing parenting as a mediator of the effects of income and cumulative risk on the development of effortful control. We hypothesized that low income and cumulative risk compromise effective parenting, which in turn interferes with developing effortful control.

Cumulative Risk. Low income is associated with greater stress, residential instability, neighborhood problems, family conflict and disorganization, parental mental health problems, and others risk factors that often co-occur and have cumulative effects on children's adjustment (Ackerman, Brown & Izard, 2004; Evans, 2003; Linver et al., 2002; Mistry, Vandewater, Huston & McLoyd, 2002). These poverty-related risk factors have been shown to account for the effects of low income on children's allostatic load (Evans & Kim, 2012), adjustment (e.g., Ackerman, Kogos, Youngstrom, Schoff & Izard, 1999; McLoyd, 1990; Wadsworth, Raviv, Compas & Connor-Smith, 2005), and effortful control (Hughes & Ensor, 2009; Sektnan, McClelland, Acock & Morrison, 2010). A context characterized by single- or adolescent-parent households, frequent negative events, residential instability, family conflict, and maternal depression might create an unpredictable and stressful environment for young children that interferes with the development of effortful control (Li-Grining, 2007). The few studies examining the link among poverty, cumulative risk, and effortful control suggest that cumulative risk is related to lower effortful or executive control (Lengua et al., 2007) and delay (Evans, 2003), and the accumulation of poverty-related risk factors partially accounts for the effects of poverty on children's self-regulation (Buckner, Mezzacappa & Beardslee, 2003; Evans & English, 2002; Mistry et al., 2010). However, no studies have examined the effect of cumulative risk on developmental changes in effortful control or have tested parenting as a mediator of this effect.

Parenting. Parenting consistently predicts effortful control. Control strategies that included clear, consistent limit setting and scaffolding predicted increases in effortful control (e.g., Bernier, Carlson & Whipple, 2010; Hammond, Muller, Carpendale &

Bibok, 2011; Karreman, van Tuijl, van Aken & Dekovic, 2008; Lengua, 2006; Lengua et al., 2007; Olson, Bates & Bayles, 1990) whereas power assertion, coercion, and punitive discipline predicted lower effortful control (Colman, Hardy, Albert, Raffaelli & Crockett, 2006; Karreman et al., 2008; Kochanska & Knaack, 2003; Kochanska, Askan, Prisco & Adams, 2008). In addition, maternal warmth, sensitivity, and responsiveness predicted increases in effortful control (Bernier et al., 2010; Braungart-Rieker, Garwood, Powers & Wang, 2001; Clark, Woodward, Horwood & Moor, 2008; Colman et al., 2006; Eiden, Edwards & Leonard, 2004; Olson et al., 1990). Thus, both control and affective aspects of parenting play a role in the development of effortful control. However, the precise parenting practices that promote effortful control or that mediate the effects of income have not been delineated, as most studies combine across control and affective parenting behaviors or include one or few specific parenting dimensions.

Low income is associated with disruptions in parenting (Conger et al., 2002; McLoyd, 1990; Mistry et al., 2002), which mediate the effects of income on children's adjustment (Conger et al., 2002; McLoyd, 1990; Mistry et al., 2002). For effortful control, warmth and language stimulation mediated the effects of cumulative risk on self-regulation in one study (Mistry et al., 2010). In another study, limit setting and scaffolding, which combined responsiveness and autonomy support, mediated the effects of cumulative risk on effortful control (Lengua et al., 2007). In early childhood, parenting may be a key conduit through which the effects of low income impact children's developing effortful control. However, few studies have examined a comprehensive set of parenting variables to identify which specific parenting behaviors predict changes in effortful control. This study examined parenting practices representing the affective (warmth, negativity, and responsiveness) and control (scaffolding and limit setting) aspects of parenting as predictors of changes in effortful control to identify the specific parenting practices that promote effortful control and account for the effects of income.

Measures of Effortful Control

Measures of effortful control often include attention focusing and shifting, inhibitory control, and reward delay. Although these dimensions may represent a single factor (Allan & Lonigan, 2011), there is also evidence to support separating the delay component from the dimensions that reflect executive control (i.e., attention and inhibitory control; Li-Grining, 2007). Evidence suggests that delay and executive control may differ in their developmental course, predictors, and relations with social-emotional and academic outcomes (Brock, Rimm-Kaufman, Nathanson & Grimm, 2009; Carlson, 2005; King, Lengua & Monahan, 2011; Li-Grining, 2007). Further, executive control may reflect more directly activity in the prefrontal cortex whereas delay in reward contexts may reflect an additional motivational component related to the mesolimbic-dopaminergic pathway (Dixon, 2010), also suggested by the 'hot' vs. 'cold' distinction (e.g., Brock et al., 2009; Hongwanishkul, Happaney, Lee & Zelazo, 2005). In prior analyses with data from this study, we found that a model with separate delay ability and executive control dimensions demonstrated a better fit compared with a single-factor model, and delay ability demonstrated a different growth pattern compared with executive control (Lengua et al., 2013). Therefore, we examined delay ability separately from executive control, which consisted of attention and inhibitory control, to explore possible differential relations with income, cumulative risk, and parenting.

This Study

A critical task for researchers is to understand the role of income in the development of effortful control, with particular attention to the contextual and socialization factors that might account for its effects. Examination of cumulative risk and parenting as mediators of the effects of income facilitates the identification of potentially modifiable mediators that can be targets of interventions aimed at promoting effortful control. This study examined the relation of income to growth in effortful control in preschool-aged children, testing hypotheses that cumulative risk and parenting would mediate the effects of income on the development of effortful control. Based on previous evidence, we expected cumulative risk to account for the relation between income and effortful control. In addition, we expected parenting, in particular warmth, limit setting, and scaffolding, to predict increases in effortful control and to account for the effects of income and cumulative risk on effortful control.

Method

Participants

Participants were 306 mothers and their 36–40-month-old children (T1-M = 37, *SD* = .84) who participated in four assessments, each nine months apart. Participants were recruited from various sources, including a university hospital birth register, daycares, preschools, health clinics, and charitable agencies. Families were recruited such that equal representation across income levels was obtained. The 2009/2010 Federal Department of Health and Human Services Poverty Guidelines, in place at T1, which is an income-to-needs ratio based on the number of people in the home, was used to describe the income levels represented in the sample. The distribution included 29 percent of the sample at or near poverty (N = 90 ≤150 percent of the federal poverty threshold), 28 percent lower income (N = 84 between 150 percent poverty and the local median income of $58 000), 25 percent middle to upper income (N = 77 between the median income and $100 000), and 18 percent affluent (N = 54 >$100 000). To participate, families were required to have reasonable proficiency in English to comprehend the assessment procedures, and children diagnosed with a developmental disability were excluded. Participants included 50 percent girls. The racial and ethnic composition of the sample of children included 64 percent European American, 10 percent Latino or Hispanic, 9 percent African-American, 3 percent Asian American, 2 percent Native or American Indian, and 12 percent multiple racial and ethnic backgrounds or other. Mothers' educational distribution included 3 percent mothers with some high school attainment, 6 percent completed high school, 34 percent with some college, technical, or professional school, 30 percent college graduates, and 27 percent with postgraduate education. Eighty-one percent of mothers were married or had long-time partners, 12 percent were never married, and 7 percent were separated, divorced or widowed, and were single heads of household.

Participants missing data on study variables at any of the four time points (N = 100) were compared with those missing no data (N = 206) to assess the extent of bias introduced by missing data. All participants had complete income data. Complete data were available for 96 percent of participants on cumulative risk and 94 percent on parenting. On effortful control, there were complete data on 85 percent at T1, 95 percent at T2, and 94 percent at T3 and T4. Income, cumulative risk, parenting, and T1 effortful control were compared across participants missing and not missing data.

Participants missing data differed from those not missing data in that they had lower T1 executive control [*M* missing = .25, no missing = .30, $t(304) = 2.76$, $p = .01$]. However, the effect size of the association of missingness to executive control ($r = -.16$) was modest and did not reach suggested thresholds for introducing substantial bias (i.e., $r > .40$, Collins, Schafer & Kam, 2001). Thus, little bias was introduced because of missing data.

Procedures

Families were assessed in offices on a university campus when children were 36–40, 45–49, 54–58, and 63–67 months. Both parental consent and child assent were secured prior to data collection. Assessments included neuropsychological, behavioral, and questionnaire measures administered by trained experimenters. Children completed neuropsychological and behavioral measures of effortful control whereas mothers completed questionnaire measures in a separate room. Mothers then joined children to engage in parent–child interactions. Families received $70 for their first assessment, and compensation increased by $20 for each subsequent assessment.

Measures

Descriptive statistics for study measures are presented in Table 1.

Income

At T1, mothers reported on household income from all sources on a 14-point Likert scale that provided a fine-grained breakdown of income at the lower levels facilitating

Table 1. Descriptive Statistics for Study Variables

	M	*SD*	Range	Skew
Child cognitive ability	.23	.08	.08–.40	−.72
Income	8.75	3.93	1.00–14.00	−.78
Cumulative risk	1.02	.83	.00–4.59	1.78
Warmth	3.75	.44	2.22–4.83	−.34
Negativity	.36	.38	.00–2.42	2.04
Scaffolding	3.47	.55	1.54–4.38	−.75
Limit Setting	4.42	.60	2.17–5.00	−1.23
Responsiveness	4.40	.74	.75–5.00	−2.17
Executive control T1	.29	.15	.00–.77	.66
Executive control T2	.49	.20	.00–.91	−.22
Executive control T3	.68	.17	.18–.95	−.66
Executive control T4	.79	.15	.18–1.00	−1.23
Delay ability T1	.62	.25	.09–1.00	−.01
Delay ability T2	.76	.23	.08–1.00	−.79
Delay ability T3	.78	.19	.17–1.00	−.75
Delay ability T4	.75	.21	.17–1.00	−.55

identification of families at the federal poverty cutoff using an income-to-means ratio (1 = \$14 570 or less, 2 = \$14 571−18 310, 3 = \$18 311−22 050, and so on). However, the continuous 14-point variable representing the full range of income was used for analyses. The sample mean of 8.75 corresponds to \$35 601–48 200.

Cumulative Risk

T1 cumulative risk was the sum of eight risk factors: low education, single parent, adolescent parent, residential instability, divorce, household density, negative events, and depression. Dichotomous risk factors were scored as 0 = not present, 1 = present. Continuous risk factor scores were converted into proportions of the total possible score so that they ranged 0–1 and had similar weighting as the dichotomous variables.

Mothers reported on their educational attainment, and risk was indicated by not graduating from high school (3 percent of the sample). Mothers reported on marital status and were identified as single parents if they indicated being never married, currently widowed, separated or divorced, or having a live-in partner for $<$one year (19 percent). Mothers reported their age at the time of the study child's birth, and 3 percent were considered adolescent parents given they were ≤19 years when the child was born. Residential instability was indicated by the family changing households ≥three times in the previous three years (10 percent). Family structure transitions were indicated by mothers reporting being divorced in the child's lifetime (3 percent). Household density was calculated as the number of individuals living in the home divided by the number of rooms in the home. The score was converted to a proportion of the highest score in the sample. The average ratio was .52, indicating that, on average, there were twice as many rooms as individuals in the home.

Negative life events were assessed with parent report on the general life events schedule for children (Sandler, Ramirez & Reynolds, 1986). The 29 events are moderate to major negative events including changing schools, death of a family member or friend, parental arrest, and loss of friends. Parents reported the occurrence of events within the previous 9 months, and total scores were the number of events (M = 5.3, SD = 4.0). The total score was converted into a proportion of the possible 29 events.

Mothers reported on their depressive symptoms over the previous month using the 20-item Center for Epidemiological Studies–depression scale (Radloff, 1977), designed to measure depressive symptoms in the general population. Participants indicated whether each symptom was present on a 0–3 scale, and the items were summed for a total score. Internal consistency was .88 (M = 10.01, SD = 8.38). The total score was converted into a proportion of the total possible score of 60.

Parent–Child Interaction

At T1, mothers and children engaged in four activities (7 min restricted play, 7 min free play, 7 min instructional activity, and 3 min clean up; Kerig & Lindahl, 2001). In restricted play, mothers were instructed to allow children to play with toys in the room except those in a specified place, an accessible shelf of highly desirable toys. This was followed by free play in which mothers and children were informed that they could now play with the previously restricted toys. Next mothers were instructed to help children build a challenging Lego figure. Finally, mothers were to obtain children's assistance in cleaning up.

Warmth, negativity, limit setting, scaffolding, and responsiveness were coded in 1-min epochs for all segments, and then averaged across epochs and segments.

Parenting was coded from video recordings by research assistants using a system that was adapted from established coding systems (Cowan & Cowan, 1992; Lindahl & Malik, 2000; Rubin & Cheah, 2000) and used previously by this research team (*redacted*). All behaviors were rated on 6-point scales (0 = absent/lowest, 5 = highest). Positive affect captured the frequency and level of behavioral and verbal expressions of happiness, comfort, connection, and warmth toward the child. Interactiveness assessed the quantity of verbal and non-verbal engagement. Positive affect and interactiveness were combined into a measure of warmth. Negativity assessed the negative tone or tension expressed by the mother, including verbal and non-verbal expressions of irritation with the child that were critical, rejecting, or invalidating. Limit setting assessed mothers' clarity, consistency, and follow through of directives when children were non-compliant, oppositional, or disruptive. Scaffolding was a combination of guidance/structuring, autonomy granting, and low intrusive control. In effect, scaffolding reflected the parent's ability to intervene when the child needed it and disengage when the child was functioning independently. Responsiveness to children's expressions of negativity indicated mothers' sensitivity to cues of the child. Interrater reliability was assessed by independent recoding of 20 percent of the interactions. Intraclass correlations (ICCs) for warmth, negativity, scaffolding, limit setting, and responsiveness were .80, .75, .81, .73, and .67, respectively.

Effortful Control

Effortful control was assessed at T1–T4 with identical measures of attention, cognitive and behavioral inhibitory control, and delay ability. Modeled after traditional cognitive tests, measures were selected to be of varying difficulty for children across childhood so that identical measures could be used over time. Although some of the measures were normed for children older than those in this sample, there was still variability in performance even at these early ages. Proportion scores were used so that scores were on a comparable scale. Given evidence that delay ability might operate differently than attention and inhibitory control, two variables were created: executive control and delay ability.

Executive control was assessed using six tasks. The inhibition and auditory attention subscales of the NEPSY developmental neuropsychological assessment battery (Korkman, Kirk & Kemp, 1998) were used. The inhibition subtest assesses the ability to inhibit a dominant response to enact a novel response. Specifically, children are shown an array of circles and squares and asked to label each shape in an opposite manner (e.g. say circle when shown a square). Scores were the proportion correct responses. Auditory attention is a continuous performance test that assesses the ability to be vigilant and to maintain and shift selective set. Children were required to listen to a series of words and respond only when they heard a target word, refraining from responses to other words. Scores were the proportion correct responses.

Behavioral inhibitory control was assessed using bear-dragon (Kochanska, Murray, Jacques, Koenig & Vandegeest, 1996), which requires the child to perform actions when a directive is given by a bear puppet, but not when given by a dragon puppet. Children's actions were scored as performing no movement, wrong movement, partial movement, or complete movement, with scores ranging from 0 to 3. Total scores were the proportion of the sum of item scores across both bear and dragon items to the total possible score.

Cognitive inhibitory control was assessed using day-night (Gerstadt, Hong & Diamond, 1994), which requires the child to say 'day' when shown a picture of moon/stars and 'night' when shown a sun picture. Children's actions were scored 1 = correctly providing the non-dominant response, or 0 = providing the dominant response. Total scores were the proportion of correct responses.

The dimensional change card sort (Zelazo, Muller, Frye & Marcovitch, 2003) assesses cognitive inhibitory control, attention focusing, and set shifting. Children were instructed to sort cards first according to shape (six trials) then according to color (six trials). The experimenter stated sorting rules before each trial and presented a card labeled according to the current dimension (e.g., on a shape trial, 'Here's a truck. Where does it go?'). If children correctly sorted ≥50 percent of cards, they advanced to the next level in which the target cards integrated the sorting properties, and children were again instructed to sort according to shape (six trials) then color (six trials). If they correctly sorted ≥50 percent of the cards, children advanced to the next level in which they were instructed to sort by color if the card had a border on it and by shape if the card lacked the border (12 trials). The score was the proportion of correct trials out of the total 36 possible trials.

Head-toes-knees-shoulders integrates attention and inhibitory control (Ponitz et al., 2008). Children were asked to follow the experimenter's instructions, but to enact the opposite of the direction (e.g., touch toes when asked to touch head). Behaviors were coded as 0 = touched the directed body part, 1 = self-corrected, or 2 = correctly touched the opposite body part. Total scores were the proportion of the score across items to the total possible score.

Children's delay ability was assessed using a gift delay task (Kochanska et al., 1996) in which children were told that they would receive a present, but that it needed to be wrapped. Children were instructed to sit facing the opposite direction and not peek while the experimenter noisily wrapped the gift. Children's peeking (frequency, degree, latency to peek, and latency to turn) and difficulty delaying (fidgeting, tensing, out of seat, and grimacing) were rated. Latencies and behavior scores were converted to proportions of total possible and averaged. Twenty percent of all tasks were independently recoded to assess inter-rater reliability (ICCs = .72–.98).

An executive control score was computed at each time point as the mean of the proportion scores of the individual tasks and was considered missing if ≥50 percent of the component scores were missing (α = .67, ICC = .83). A delay ability score was computed at each time point as the mean of the proportion scores for the individual delay indicators and was considered missing if ≥50 percent of the component scores were missing (α = .77, ICC = .91).

Cognitive Ability

Estimates of verbal and non-verbal abilities were obtained using the NEPSY comprehension and block-construction subtests. Comprehension and block-construction scores (r = .48) were averaged for an overall estimate of cognitive ability.

Results

Analytic Plan

Analyses were conducted to examine the effects of income, cumulative risk, and parenting on initial levels and growth in effortful control, and to test whether cumulative risk and parenting mediated the effects of income. First, correlations were examined to determine the plausibility of the proposed relations. Next, growth models of executive control and delay ability were specified with income, cumulative risk, and parenting as predictors of intercepts and slopes. Models were tested in Mplus 6.0 (Muthen & Muthen, 2010) using full information maximum likelihood estimation, which uses all the data available simultaneously to calculate parameter estimates. Examination of missing data suggested that the pattern of missing data introduced minimal bias. Therefore, families with any data were included in analyses (N = 306). Finally, mediation was tested using the Mplus-provided Sobel test of the indirect effects of income on effortful control through cumulative risk and parenting.

Correlations

Correlations among the variables were examined to evaluate the plausibility of the study hypotheses (Table 2). Child gender was related to T2 executive control and T1, T3, and T4 delay ability, with girls higher in both. Therefore, gender was included as a covariate in all analyses. Income and cumulative risk were moderately correlated, and both were related to executive control and delay ability. Both income and cumulative risk were associated with parenting. Lower income and higher cumulative risk were associated with lower warmth, scaffolding and limit setting, and higher negativity. Cumulative risk was also associated with lower responsiveness. All of the parenting dimensions were related to executive control and delay ability, although warmth, limit setting, and responsiveness were not related to delay ability at the later time points. These associations suggested that parenting was a plausible mediator of the effects of income and cumulative risk on effortful control.

Growth in Effortful Control

Models were specified to test the potential direct and indirect effects of income, cumulative risk, and parenting on growth factors of executive control and delay ability. In previous analyses with this sample, both executive control and delay demonstrated significant linear growth and significant variability in initial levels and slopes, indicating individual differences in levels and growth that can be predicted by other variables (Lengua et al., 2013).

To test the direct and indirect effects of income, cumulative risk, and parenting on effortful control, the intercept and slope factors of executive control and delay ability were conditioned on covariates, child gender, and cognitive ability. Gender was unrelated to the effortful control growth factors. Cognitive ability significantly predicted higher initial levels of executive control and delay ability. Cognitive ability also was related negatively to growth in delay. Children lower in T1 cognitive ability had lower initial delay ability that grew more quickly over time. Children who had higher initial cognitive ability demonstrated higher levels of delay ability across the study, but a slower rate of growth.

Growth factors were also conditioned on income, cumulative risk, and the five parenting dimensions simultaneously. Further, the parenting dimensions were regressed on income and cumulative risk, and cumulative risk was regressed on income (Figure 1). Higher income predicted lower cumulative risk, higher warmth, scaffolding, and limit setting. Cumulative risk predicted higher negativity and lower scaffolding. Neither income nor cumulative risk had direct effects on effortful control growth factors, although there was a trend toward an effect of cumulative risk on the intercept

Table 2. Correlations Among Study Variables

	Risk		Parenting					Effortful control							
	INC	CR	WRM	NEG	SCAF	LS	RSP	EC1	EC2	EC3	EC4	DA1	DA2	DA3	DA4
Covariates															
Child gender	−.06	−.01	−.02	.04	−.12*	−.04	−.12*	−.09	−.13*	−.11	−.10	−.14*	−.11	−.21*	−.20*
Cognitive ability	.23*	−.22*	.25*	−.28*	.36*	.21*	.18*	.52*	.57*	.58*	.51*	.33*	.37*	.25*	.14*
Risk															
Income (INC)	—	−.61*	.23*	−.26*	.40*	.29*	.07	.19*	.24*	.24*	.24*	.24*	.14*	.13*	.08
Cum. risk (CR)		—	−.14*	.34*	−.32*	−.23*	−.12*	−.16*	−.21*	−.26*	−.21*	−.20*	−.26*	−.12*	−.03
Parenting															
Warmth (WRM)			—	−.24*	.50*	.33*	.33*	.24*	.27*	.21*	.27*	.17*	.07	.03	.04
Negativity (NEG)				—	−.51*	−.25*	−.36*	−.24*	−.23*	−.23*	−.26*	−.22*	−.26*	−.13*	−.15*
Scaffolding (SCAF)					—	.42*	.35*	.35*	.35*	.30*	.25*	.27*	.25*	.09	.12*
Limit setting (LS)						—	.17*	.15*	.21*	.32*	.22*	.15*	.14*	.06	.08
Responsive (RSP)							—	.21*	.13*	.18*	.21*	.19*	.07	.06	.07
Effortful control															
Exec control T1								—	.50*	.53*	.42*	.26*	.27*	.12*	.19*
Exec control T2									—	.61*	.48*	.31*	.36*	.25*	.15*
Exec control T3										—	.65*	.29*	.40*	.26*	.17*
Exec control T4											—	.29*	.35*	.24*	.19*
Delay ability T1												—	.49*	.40*	.22*
Delay ability T2													—	.45*	.34*
Delay ability T3														—	.40*

* $p < .05$.

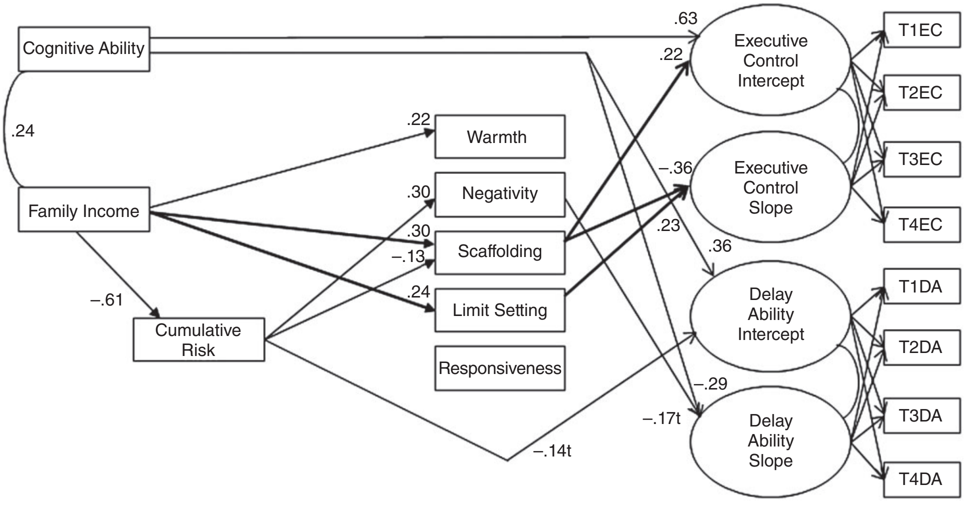

Figure 1. Standardized Coefficients for the Relations of Income, Cumulative Risk, and Parenting to the Intercepts and Slopes of Executive Control and Delay Ability. *Note:* Only significant paths are depicted. Child gender was included as a covariate, and correlations among the growth factors were estimated, but are not depicted for ease of presentation.

of delay ability such that higher cumulative risk was related to lower initial levels. Above the effects of income and cumulative risk, scaffolding predicted higher initial levels of executive control. Limit setting was associated with greater increases in executive control, and scaffolding was negatively related to the slope of executive control. Because the latter association was in the unexpected direction, it was explored by examining the mean level of executive control across low (≤1*SD*), medium (within ±1*SD*), and high (>+1*SD*) levels of T1 scaffolding. Children whose mothers demonstrated higher T1 scaffolding had significantly higher levels of executive control at all four time points that increased at a slower rate (T1−*M* = .43, T2−*M* = .63, T3−*M* = .77, and T4−*M* = .85). Children whose mothers demonstrated lower T1 scaffolding had significantly lower levels of executive control at all four time points, but their effortful control increased at a greater rate (T1−*M* = .23, T2−*M* = .39, T3−*M* = .60, and T4−*M* = .72). None of the parenting dimensions was significantly related to the intercept or slope of delay ability, although there was a trend toward an association of negativity predicting less growth in delay ability.

Indirect Effects

The indirect effects of income and cumulative risk on growth factors of effortful control were tested. There was a significant indirect effect of income on the intercept of executive control ($\beta = .07$, $p < .05$) and on the slope of executive control through scaffolding ($\beta = -11$, $p < .05$). In addition, there was a trend toward an indirect effect of income on the slope of executive control through limit setting ($\beta = .06$, $p = .07$). The indirect effects of income and cumulative risk on delay ability through parenting and the indirect effects of income through cumulative risk were non-significant.

Discussion

This study sought to expand our understanding of the relation between low income and effortful control by testing whether cumulative risk and parenting mediated the effects of low income on growth in effortful control. The study also aimed to identify specific parenting practices that might promote effortful control. Few studies have investigated both adversity and parenting as potential mechanisms of the effects of income on effortful control. Our findings suggest that parents' scaffolding and limit setting mediate the effects of income on executive control and are potentially fruitful targets for prevention programs for young children in low-income families. The findings also suggest different pathways to difficulties with executive control and delay ability, with differential roles for cumulative risk and parenting.

Consistent with previous findings, children living in low-income families demonstrated lower effortful control (e.g., Hughes et al., 2010; Mistry et al., 2010). Both income and cumulative risk were related to both the executive control and delay ability. One difference between these findings and prior findings is the different roles of income and cumulative risk. Previous studies have not examined income and cumulative risk separately, and the findings of this study suggest that doing so might provide more fine-grained understanding of the effects of adversity. However, once the set of parenting variables was accounted for, there was little evidence of direct effects of income or cumulative risk on effortful control, except for a trend toward an effect of cumulative risk on lower delay ability. These findings suggest that, during the preschool period, the effects of income and cumulative risk on effortful control are largely accounted for by their effects on parenting (Blair & Raver, 2012). This is consistent with a bioecological model of development in which the effects of more distal factors operate through the influence of nested, proximal factors (Bronfenbrenner & Morris, 2006), and with the context of risk and family stress models that posit that the effects of low income are accounted for by the stress, disruptions, and parenting problems associated with low income.

Effortful control growth was predicted by parenting, which mediated the effects of income. This parallels previous findings of the role of parenting in the development of effortful control as a mediator of the effects of cumulative risk (e.g., Lengua et al., 2007). Although all of the parenting behaviors were correlated with executive control and delay ability, at least at some time points, a more specific pattern of prediction of changes in executive control and delay ability emerged when their unique effects were tested. Similar to prior findings, limit setting, scaffolding, and negativity (trend) were related to changes in effortful control.

Children whose mothers demonstrated higher scaffolding had higher levels of executive control throughout the study, although their rate of increase was slower relative to children whose mothers were lower in scaffolding. Despite increasing at a faster rate, the children whose mothers were lower in scaffolding started and ended the study with significantly lower executive control. This finding is consistent with previous findings in which autonomy support (Bernier et al., 2010) and scaffolding (Hammond et al., 2011) were related to higher executive functioning, and predicted rank-order increases in effortful control (Lengua et al., 2007). As assessed here, scaffolding represents parents appropriately stepping in to structure and guide a child's play, emotions, and learning while also providing the child autonomy to operate independently when functioning well. This 'stepping in, stepping out' represents parenting that is attuned to children's cues and serves to support children's navigation of experiences. Scaffolding might provide children with the support, practice, and independence needed to buttress their cognitive and behavioral control abilities. It might also build patience, restraint, and tolerance to persist because they have more frequent experiences of support and predictability.

Limit setting was related to greater increases in executive control, again consistent with previous findings (Lengua et al., 2007). Limit setting reflected mothers' clear communication and consistent and appropriate enforcement of expectations and rules for child behavior in the presence of children's oppositional, non-compliant, or unacceptable behaviors. Such clarity and predictability of expectations and their enforcement may allow children to more readily internalize rules and expectations, facilitating self-regulation of behaviors.

There was a trend toward an association of negativity with lower delay ability. Because negativity was related to delay ability and not executive control, it may be that maternal negativity is disruptive to children's reward-response systems, reducing children's tolerance of the discomfort or uncertainty of reward delay. However, this is highly speculative and should be tested in the future. Overall, the findings suggest that the affective parenting behaviors had relatively less importance in the development of effortful control compared with the control aspects of parenting. It is possible that parental warmth and negativity have greater relative importance earlier in development, when control strategies are less often required. It is also possible that the affective dimensions of parenting have an impact on effortful control indirectly through their impact on physiological stress-response systems such as the hypothalamic-pituitary-adrenal axis (Blair et al., 2011; Lengua, Zalewski, Fisher & Moran, in press; Zalewski, Lengua, Kiff & Fisher, 2012). Finally, warmth and responsiveness may relate to children's self-regulation in emotionally challenging contexts, but not necessarily across all contexts (Dennis, 2006), possibilities that should be explored in the future.

Income, cumulative risk, and parenting were differentially related to executive control and delay ability, similar to previous findings examining poverty-related risk factors (Li-Grining, 2007), suggesting the value in examining them separately. Although related, they may stem from different neurobiological systems that are differentially affected by stress and socialization. Although the effects of income were largely accounted for by the set of parenting variables, there continued to be a trend toward a direct effect of cumulative risk on delay ability. Further, the evidence for parenting effects was more robust for executive control than for delay ability. The findings point to the possibility that different contextual and socialization factors might shape the executive and delay components of effortful control. Low income might relate to the development of executive control through disruptions in parenting and through its effects on physiological stress response systems, which in turn impact the prefrontal cortex, the seat of executive activity (Blair & Raver, 2012; Lengua et al., in press). On the other hand, delay abilities appear sensitive to cumulative risk, which represents the physical and social disruptions associated with low income. Such an environment may render the context chaotic and unpredictable, and receipt of rewarding experiences or objects may be uncertain or inconsistent. This might reduce the ability to tolerate discomfort or distress associated with delaying receipt of something desired, or impact decision making about delaying reward, a possibility supported by experimental evidence that children experiencing a condition with unreliable outcomes demonstrated shorter delay times than children experiencing a reliable condition (Kidd, Palmeri & Aslin, 2013). However, the differential effects of income, cumulative risk, and parenting on executive and delay abilities, and the potential reasons for them, are tentative. Future research might focus on the possibility of differential effects of risk on the neurobiological systems thought to underlie executive control and delay abilities.

Strengths of this study include the use of a relatively large sample that overrepresents lower-income families, but that also includes the full range of income allowing robust tests of the effects of income. The longitudinal design and use of growth modeling to examine the development of effortful control across the preschool period are also strengths, along with the use of multi-method assessments, including neuropsychological, observational, and questionnaire measures. One potential limitation involves the measurement of delay ability. Although executive control was assessed using multiple tasks, the delay ability indicators were all drawn from one task, which might have impacted the pattern of findings. However, previous research has shown the longitudinal predictive value of delay of gratification even when assessed with a single task (e.g., Mischel, Shoda & Peake, 1988). In addition, delay ability was assessed with a task that had only a 1-min delay period, which might have been less difficult for older children, resulting in a possible ceiling effect. However, the delay ability score comprised a number of behavioral indicators, including latency to peeking and turning, number of times peeking, and difficulty with delaying, and only 18 percent of children obtained perfect scores on delay ability at T4 compared with 16 percent at T1, suggesting that a ceiling effect does not fully account for the findings. A larger question is whether delay should be examined separately from executive control. Although some evidence suggest that a single factor underlies both executive and delay components (Allan & Lonigan, 2011; Wiebe et al., 2011), other evidence suggests the predictors, outcomes, and trajectory of delay may differ from that of executive control (e.g., Brock et al., 2009; Li-Grining, 2007). Future research should address this question using both conceptual and empirical approaches.

In conclusion, effortful control is an important predictor of children's adjustment across a variety of domains, including children's academic, social, emotional, and behavioral adjustment. Given that self-regulatory systems undergo rapid development in early childhood, examination of early disruptions in the development of effortful control may explain the pervasive effects of low income and adversity on adjustment across childhood. The findings of this study suggest that low income may impact the development of effortful control through parenting. Specifically, maternal scaffolding and limit setting predicted higher initial levels or growth in executive control. Notably, income, cumulative risk, and parenting differentially predicted the executive and delay components of effortful control, highlighting potentially divergent pathways whereby experience and context impact components of effortful control. These findings suggest that prevention interventions for low-income families that target parenting may help parents to buffer children from the experiences of adversity and in turn facilitate children's development of effortful control.

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Acknowledgments

Support for this research was provided by a National Institute of Child Health and Human Development (NICDH) grant R01HD054465 awarded to the first author. The authors thank the families who participated in this study.