SOCIAL DETERMINANTS OF EARLY SELF-REGULATION DEVELOPMENT IN LOW-INCOME AFRICAN AMERICAN AND LATINO FAMILIES

by

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(Under the Direction of Margaret Caughy)

ABSTRACT

This dissertation aimed to investigate whether family-level poverty shapes growth in self-regulation through parenting practices, and whether there is a bidirectional relation between self-regulation and parenting. This dissertation is a secondary data analysis of the data from the Dallas School Readiness Project. A sample of 359 low-income African American and Latino families were included in this dissertation. Data were collected when the child was aged 2½ (Wave 1), 3½ (Wave 2), 6 (Wave 3), and 7 (Wave 4) years. Child self-regulation was measured using the Head-Toes-Knees-Shoulders task from Wave 2 to 4. Parenting practices were observed during semi-structured parent-child interactions. Family level poverty was indicated by the frequency of exposure to severe poverty and family income-to-needs ratio.

Structural equation modeling was used to analyze the data. In Study 1, a growth curve model and a mediation path model were tested to examine whether exposure to severe poverty shaped growth in children's self-regulation through parenting practices. More frequent exposure to severe poverty across 4 waves was associated with slower growth in behavioral self-regulation between Wave 2 and Wave 4, and the effect was partially mediated through decreased sensitive and supportive parenting practices at Wave 1. In Study 2, a cross-lagged model was tested to

examine whether parenting practices contributed to differences in child self-regulation and whether child self-regulation was associated with subsequent maternal behaviors. Maternal sensitive support at Wave 2 predicted higher levels of self-regulation at Wave 3, and maternal intrusive insensitivity at Wave 3 predicted worse self-regulation at Wave 4. Self-regulation at Wave 2 was prospectively associated with mothering practices.

Taken together, findings suggest that different levels of family poverty contribute to compromised development of self-regulation through decreased positive parenting practices. Although I did not find the impact of child self-regulation on parenting practices, parenting practices influenced self-regulation across time, and the role of positive and negative parenting practices may change with child age. Theoretical and applied implications of this dissertation were discussed.

INDEX WORDS: Self-regulation, Poverty, Parenting, African American, Latino, Early childhood

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CHAPTER 1

INTRODUCTION

Self-regulation is a multi-component construct that represents a child's ability to volitionally modulate behaviors according to the cognitive, emotional, and social demands to achieve a goal (Blair & Raver, 2012a, 2012b; Blair & Ursache, 2011; Calkins & Fox, 2002; McClelland & Cameron, 2012). In early childhood, self-regulation can be observed at a behavioral level, so observed self-regulation is often termed behavioral self-regulation (McClelland et al., 2007b; McClelland et al., 2014; Montroy, Bowles, Skibbe, McClelland, & Morrison, 2016). The development of adequate self-regulation is of significant importance for early adjustment as well as later life success (Blair, 2002; Bronson, 2000; Calkins & Hill, 2007; Diamond, 2006; Kopp, 1982). Generally, self-regulation develops rapidly in the first few years of life, but individual variability self-regulation development patterns exists and has been repeatedly observed in research (Diamond, 2006; Kochanska, Coy, & Murray, 2001; Kopp, 1982; Montroy et al., 2016; Vaughn, Kopp, & Krakow, 1984; Zelazo & Carlson, 2012).

Disparities of self-regulation exist between children from low-income families and their more affluent counterparts. Children from low-income families are more likely to enter kindergarten with lower self-regulation compared to children from middle-class families (Clearfield & Niman, 2012; Obradović, Portilla, & Boyce, 2012; Wanless, McClelland,

Tominey, & Acock, 2011). Studies have linked poverty and related risks to slower development of self-regulation (Evans & Kim, 2013). Lower family income is directly related to low levels of self-regulation and longer exposure to poverty is linked to more dysregulation (Evans & Kim, 2013; Lengua et al., 2015; Mistry, Benner, Biesanz, Clark, & Howes, 2010; Moilanen et al., 2009; Raver, Blair, & Willoughby, 2013; Wanless et al., 2011; Weiland & Yoshikawa, 2014).

Poverty, as a social determinant, shapes self-regulation development through proximal processes such as parenting. Differences in parenting qualities contribute to differences in self-regulation development (Carlson, 2003; Fay-Stammbach, Hawes, & Meredith, 2014). Poverty can undermine parenting quality through diminished parental mental health and, in turn, influence self-regulation development (Bocknek, Brophy-Herb, & Banerjee, 2009; Ellis, Alisic, Reiss, Dishion, & Fisher, 2014; Harvey et al., 2016; Lengua, Honorado, & Bush, 2007; Lengua et al., 2014). However, most studies of the mechanisms by which family poverty shape self-regulation development have not examined the trajectory of self-regulation over time but rather focused on self-regulation at a single point in time. Finally, most of the existing research has not acknowledged the possible bidirectional relation between parenting and self-regulation development.

Another limitation of the current literature is that it mostly compares children living in poverty to their more affluent counterparts but fails to capture variability in poverty levels within the low-income population (Caughy, Mills, Owen, & Hurst, 2013; Caughy, Owen, & DeLuna, 2016; Clearfield & Niman, 2012; McClelland, Tominey, & Acock, 2011; Lengua et al.,

2014Obradović, Portilla, & Boyce, 2012; Wanless et al., 2011). When examining the mechanisms by which poverty shapes self-regulation, there is significant heterogeneity in poverty levels within low-income families, and such variations in poverty levels can contribute to differences in child developmental outcome (Blair et al., 2008; Chang, Shelleby, Cheong, & Shaw, 2012; Mistry et al., 2010; Moilanen, Shaw, Dishion, Gardner, & Wilson, 2009; Raver et al., 2013). Capturing within-group variability of economic status among low-income families can expand our understanding of self-regulation development in the face of poverty.

There is also a lack of research focusing on low-income African American and Latino children in early childhood regarding poverty, parenting, and self-regulation. African American and Latino children demonstrate a lower level of self-regulation compared to their White counterparts (Barnes et al., 2016; Lengua et al., 2007; Moilanen et al., 2009; Sektnan, McClelland, Acock, & Morrison, 2010). One explanation for these ethnic disparities in self-regulation is that ethnic minority children are more likely to be challenged by poverty because of structural racism (Li-Grining, 2012; Raver, 2004). In 2017, 33.7% of African American children and 26.2% of Latino children under age 5 lived in families below the federal poverty line compared to 11.7% of White children (Child Defense Fund, 2017). Despite the heightened challenges of poverty, there is a lack of developmental data on self-regulation for African American and Latino children (Garon et al., 2008). Thus, more developmental studies on self-regulation development among low-income African American and Latino samples are needed.

In sum, a critical task for researchers is to treat self-regulation development as a dynamic and longitudinal process within the family context and to capture the influence of different levels of family poverty, especially within low-income African American and Latino families. There are two goals of this dissertation. First, this dissertation proposes to study the mechanisms by which family poverty level shapes the trajectory of self-regulation development within the family context. Second, this dissertation proposes to examine the potential bidirectional relation between parenting and self-regulation development.

CHAPTER 2

LITERATURE REVIEW

The Construct of Self-Regulation

Definition of Self-Regulation

Self-regulation is a multi-component construct that represents a child's ability to volitionally modulate behaviors according to the cognitive, emotional, and social demands of a particular situation (Blair & Raver, 2012a, 2012b; Blair & Ursache, 2011; Calkins & Fox, 2002; McClelland & Cameron, 2012). Self-regulation operates at different levels, including cognitive, emotional, and behavioral (Bell & Deater-Deckard, 2007). One approach for capturing the multi-component nature of self-regulation is by using a bidirectional model consisting of interrelated top-down and bottom-up systems (Blair & Raver, 2012b; Blair & Ursache, 2011). The top-down system is referred to as executive functions and includes working memory, inhibition, and cognitive flexibility (Garon, Bryson, & Smith, 2008). Working memory is the ability to hold and manipulate information in mind (Garon et al., 2008). Inhibition involves withholding or restraining a motor response (Garon et al., 2008). Cognitive flexibility is the ability to shift focus of attention flexibly according to different demands (Garon et al., 2008; Miyake & Friedman, 2012; Miyake et al., 2000). Executive functions enable reasoning, problem-solving, and goal-directed thinking, which assist regulating attention, emotions, and behaviors according to

external needs (Blair & Raver, 2012b; Blair & Ursache, 2011; Garon et al., 2008; Miyake & Friedman, 2012; Miyake et al., 2000; Obradović, 2016). The bottom-up system includes automatic and non-voluntary processes, such as emotional arousal, stress physiology, and attention focusing (Blair & Raver, 2012b; Blair & Ursache, 2011; Obradović, 2016). The top-down and bottom-up systems coordinate with each other and help regulate a child's cognition, emotions, and behaviors (Blair & Raver, 2012b; Blair & Ursache, 2011; Obradović, 2016). The relationship between executive functions and bottom-up processes can be described as an inverted U-shaped curve. Executive functions are reduced at both very high and very low levels of emotional and physiological arousal but optimized at moderate levels of arousal (Blair & Ursache, 2011; Obradović, 2016). Effective self-regulation requires coordination of top-down and bottom-up processes to produce overt behaviors. Thus, observed self-regulation can be termed as behavioral self-regulation (McClelland et al., 2007; McClelland et al., 2014; Montroy et al., 2016).

Self-Regulation and Adjustment

The development of adequate self-regulation is of significant importance for early adjustment as well as later life success (Blair, 2002; Bronson, 2000; Calkins & Hill, 2007; Diamond, 2006; Kopp, 1982). Self-regulation is especially important when the children enter school, as they need adequate self-regulatory abilities to engage in classroom activities including the ability to remain in their seats, control their behaviors, and follow teachers' directions (Bierman, Nix, Greenberg, Blair, & Domitrovich, 2008; Raver et al., 2011). Empirical evidence

supports that better self-regulation predicts better school readiness as well as early school success including better math and literal performance, better social competence and peer relationships, and less behavioral problems (Blair, 2002; Blair, Ursache, Greenberg, & Vernon-Feagans, 2015; Bull, Espy, & Wiebe, 2008; Caughy, Mills, Brinkley, & Owen, 2018; Denham, Warren-Khot, Bassett, Wyatt, & Perna, 2012; Dilworth-Bart, 2012; Lan, Legare, Ponitz, Li, & Morrison, 2011; McClelland & Cameron, 2011, 2012; McClelland et al., 2007a; McClelland et al., 2014; Mills et al., 2018; Ng, Tamis-LeMonda, Yoshikawa, & Sze, 2015; Ponitz, McClelland, Matthews, & Morrison, 2009; Schmitt, Finders, & McClelland, 2015; Schmitt, Geldof, Purpura, Duncan, & McClelland, 2017; Ursache, Blair, & Raver, 2012; Willoughby, Kupersmidt, & Voegler-Lee, 2012). In contrast, inadequate self-regulation is related to more early adjustment problems (Eisenberg et al., 2005; Jacobson, Schneider, & Mahone, 2017; Sawyer, Miller-Lewis, Searle, Sawyer, & Lynch, 2015; van Dijk et al., 2017). Moreover, higher levels of self-regulation in early childhood are associated with better physical health, less recurrent depression, less substance use, more wealth, and fewer criminal convictions in adulthood (Terrie et al., 2011).

Normative Development of Self-Regulation from Birth Through Early School Age

Self-regulation develops rapidly in the first few years of life (Diamond, 2006; Kochanska et al., 2001; Kopp, 1982; Vaughn et al., 1984; Zelazo & Carlson, 2012). Although infants can soothe themselves by sucking on their fingers, they depend heavily on primary caregivers to regulate their arousals and behaviors (Kopp, 1982). Caregivers help infants to regulate their arousals and behaviors by feeding them, helping them to sleep, and comforting them when

distressed, so regulation during infancy is termed co-regulation rather than self-regulation (Kopp, 1982, 1989). In the second year of life, self-regulation emerges as children begin to internalize social demands and exhibit goal-directed behaviors (Kopp, 1982). By the age of three, children can flexibly regulate their behaviors according to changing situational demands (Kopp, 1982). It is the significant growth of executive functions in early life that provides the foundation for the advancement of behavioral self-regulation (Kopp, 1989; Montroy et al., 2016; Vaughn et al., 1984).

Working memory is the component that develops first in executive functions (Garon et al., 2008). The ability to hold representation in mind over a delay is the essential ability required for working memory, and the ability can be tested in a delayed response task (Garon et al., 2008; Pelphrey & Reznick, 2004; Pelphrey et al., 2004). In a delayed response task, the infant watches a toy being hidden in one of two possible locations and attempts to locate the toy after a short delay (Garon et al., 2008). Evidence from this delayed response task demonstrates that working memory ability emerges before 6 months of age as the infants are able to locate the object in this task (Garon et al., 2008; Pelphrey & Reznick, 2004; Pelphrey et al., 2004). Between 8 and 12 months, infants are able to hold information in mind for progressively longer periods (Diamond, 2006; Slaughter & Boh, 2001). Working memory capacity also improves by 12 months, as infants are able to find objects from four possible locations in a delayed response task (Pelphrey et al., 2004).

In the second year of life, more complicated working memory abilities such as updating or manipulating representations in mind gradually advance (Garon et al., 2008; Pelphrey & Reznick, 2004). Around age 2, working memory can be assessed with more complicated tasks, such as a backward digit span task (Garon et al., 2008). A backward digit span task requires a child to repeat a list of digits backward (Garon et al., 2008). The number of items that can be successfully recalled increases between 3 and 5 years of age and continues to improve from preschool years to adolescence (Best & Miller, 2010; Bull, Espy, & Senn, 2004; Conklin, Luciana, Hooper, & Yarger, 2007; Espy & Bull, 2005; Luciana, Conklin, Hooper, & Yarger, 2005; Rasmussen & Bisanz, 2005). Between preschool years and adolescence, children are able to master simple working memory tasks like digit span and advance to more complex tasks like word span, in which a list of words needs to be successfully recalled (Conklin et al., 2007; Luciana et al., 2005).

Inhibition can be differentiated as simple response inhibition and complex response inhibition. Simple response inhibition involves minimal working memory, but it involves more automatic and less effortful processes associated with stress physiology, emotional arousal, and attention focusing (Blair & Ursache, 2011; Garon et al., 2008; Hongwanishkul, Happaney, Lee, & Zelazo, 2005; Zelazo & Carlson, 2012). Complex response inhibition requires working memory abilities, as it requires a child to hold an arbitrary rule in mind and to inhibit a dominant response according to this rule (Garon et al., 2008). These two kinds of inhibition processes develop at different developmental stages.

Simple response inhibition develops in the first year of life. The earliest form of simple response inhibition is when a young child stops an enjoyable activity to comply with a caregiver's request (Garon et al., 2008). A "don't" paradigm (e.g., do not touch an attractive toy) is often used to test simple response inhibition in the early years. Simple inhibition improves rapidly in early childhood, as 8-month-olds are able to inhibit only less than half of the time (Grazyna, Terri, & David, 1998), but toddlers successfully inhibit their behaviors the majority of the time (Kochanska, 2002). With the improvement in simple response inhibition, a delay of gratification paradigm is often used for preschoolers (Garon et al., 2008). In the delay of gratification paradigm, children can wait for the full period for more treats, or they can have fewer treats after a shorter period of waiting (Mischel, 1974). Between age 3 and 5, older children are more likely to wait for the full period for more treats (Mischel, Shoda, & Rodriguez, 1989).

Complex response inhibition requires the development of working memory and verbal control of behavior, so it is not developed in very young children (Garon et al., 2008). One task to examine complex response inhibition is the Bear and Dragon game, in which children are asked to comply with one puppet's suggestion but inhibit the actions requested by another puppet (Reed & Rothbart, 1984). Complex response inhibition develops rapidly, starting at 3 years of age (Carlson, 2005; Murray & Kochanska, 2002) and keeps improving into the school years (Diamond, 2006). However, the evidence for whether complex inhibition response keeps improving after the early school years is inconsistent and unclear (Best & Miller, 2010).

Cognitive flexibility is the third component of executive functions. Cognitive flexibility can be tested with tasks that involve two phases (Diamond, 2006; Garon et al., 2008). The first phase requires children to form a mental set in which an association is made between a particular stimulus and a response, and the second phase involves shifting to a new mental set that in some way conflicts with the first phase (Garon et al., 2008). For instance, in an A-not-B task, a reward is hidden at location A within sight of a child. After the child retrieves rewards after a delay for a few trials, the object is hidden at location B (Diamond, 2006). By 12 months, infants show the early signs of cognitive flexibility and are able to shift from location A to location B in the second phase (Diamond, 2006). However, cognitive flexibility improves the most significantly during the latter part of the preschool period (Garon et al., 2008). The Dimensional Change Card Sort (DCCS) is a more complicated cognitive flexibility task, in which a child is asked to sort the cards according to one dimension (e.g., shape) in the first phase and then to sort the cards according to another dimension (e.g., color) in the second phase (Frye, Zelazo, & Palfai, 1995). There is a significant improvement in DCCS performance between ages 3 and 4 (Garon et al., 2008). Most 3-year-olds are able to sort cards according to the first rule but cannot shift to the second rule, but most children after age 4 are able to shift to the new rule (Carlson, 2005; Diamond, 2006; Frye et al., 1995). However, a child's ability to shift attention keeps improving through adolescence (Best & Miller, 2010). There is usually an increase in reaction time during the attention shift phase, but there is less of an increase in reaction time as the child grows older

between preschool years and adolescence (Huizinga, Dolan, & van der Molen, 2006; Huizinga & van der Molen, 2011).

Overall, executive functions develop in a hierarchical fashion as the result of compounding simpler skills (Garon et al., 2008). In Garon et al.'s (2008) review, working memory emerges first among the three components, followed by inhibition. Simple inhibition reflects a child's ability to impose cognitive control over behaviors, and complex inhibition reflects coordination of both working memory and response inhibition. Cognitive flexibility is the most complex executive function component and develops last, as it requires both working memory and complex inhibition abilities.

The development of the attention system is essential for all executive function tasks, as it allows a child to selectively pay attention to a target and ignore irrelevant information (Garon et al., 2008). There are two attention subsystems: the orienting attention system and the anterior attention system (Garon et al., 2008). The orienting attention system allows a child to shift attention to stimuli in the external environment, and the anterior attention system allows a child to selectively enhance processing according to internal representations (Ruff & Rothbart, 1996). The development and coordination of the orienting attention system and anterior attention system contributes to a child's executive function development (Garon et al., 2008). The development of attention systems and executive functions is related to the growth of the pre-frontal cortex (Blair & Ursache, 2011; Garon et al., 2008), which is indicated by age-related changes in the volumes of gray and white matter (Hongwanishkul et al., 2005). Moreover, both focalization of brain

activities (i.e., fewer brain areas are activated) and connectivity of different brain areas increase with age (Rothbart, Posner, Sheese, & Rueda, 2011). These age-related changes are reflected in more efficient brain networks during executive function tasks and improved executive function performance (Rothbart et al., 2011).

Gender Difference in Self-Regulation Development

Gender differences in self-regulation are documented in both cross-sectional studies that compare two genders at a given age and in longitudinal studies that capture the trajectory of self-regulation. Many cross-sectional studies indicate that girls outperform boys in self-regulation abilities during early childhood. During toddlerhood and preschool years, girls surpassed boys in committed compliance, executive functions, emotional self-regulation, and behavioral self-regulation (Bocknek et al., 2009; Kochanska, 2002; Matthews, Ponitz, & Morrison, 2009; Moilanen et al., 2009; Ponitz et al., 2008; Raffaelli, Crockett, & Yuh-Ling, 2005; Wanless et al., 2013). In addition, boys have more difficulty regulating themselves between age 2 and 8 years (Piotrowski, Lapierre, & Linebarger, 2013). Longitudinal studies also demonstrate earlier development and faster growth of self-regulation in girls than in boys. Between ages 3 and 7 years, girls are more likely to develop self-regulation at an earlier age than boys (Montroy et al., 2016). Moreover, girls display faster self-regulation growth between age 14 and 36 months than boys (Raikes, 2007). Vallotton and Ayoub (2011) found that even though boys and girls showed the same level of self-regulation at 14 months, girls' self-regulation rose steadily in their second

year, while boys' self-regulation declined until their second birthday, after which it rose again and approached girls' level near their third birthday.

Although not thoroughly understood, recent work suggests that gender differences in self-regulation development may be attributed to differences in gender socialization (von Suchodoletz et al., 2013; Wanless et al., 2016; Wanless et al., 2013). For example, sociodramatic play is sometimes seen as more appropriate for girls than boys, so girls are more likely to engage in sociodramatic play (Edwards, 2000). During sociodramatic play, acting in pretend roles requires the children to keep the rules in mind and act accordingly, which are key components in self-regulation (Wanless et al., 2013). Because of the nature of the game, girls are more likely to practice self-regulation skills during play, which in turn is related to better behavioral self-regulation development (Bodrova & Leong, 2006; Elias & Berk, 2002).

Poverty as a Social Determinant of Self-Regulation in Early Childhood

Despite the general trend of rapid self-regulation development in the first a few years of life, individual variation exists and has been observed repeatedly in research (Montroy et al., 2016; Raikes, 2007; Vaughn et al., 1984). Researchers find both differences in self-regulation at a given age as well as variability in the trajectory of self-regulation development (Montroy et al., 2016; Ponitz et al., 2008; Ponitz et al., 2009). Beyond individual differences, systematic disparities exist among children from different socioeconomic status background.

Disparities in self-regulation development between children from low-income families and their middle-class counterparts emerge as early as preschool. Children from low-income

families are more likely to enter kindergarten with lower self-regulation (Caughy et al., 2013; Caughy et al., 2016; Clearfield & Niman, 2012; Obradović et al., 2012; Wanless et al., 2011). Studies have linked low-income and related risks to less well-developed self-regulation and slower growth in self-regulation during early childhood (Blair et al., 2008; H. Chang, Shelleby, Cheong, & Shaw, 2012; Ellis et al., 2014; Evans & English, 2002; Evans & Kim, 2013; Evans & Rosenbaum, 2008; Lengua et al., 2015; Mistry, Benner, Biesanz, Clark, & Howes, 2010; Moilanen et al., 2009; Raver, Blair, & Willoughby, 2013; Wanless et al., 2011; Weiland & Yoshikawa, 2014).

Most of the time, intervention programs that aim to promote self-regulation development cannot target poverty directly and change families' economic environment. It is crucial to identify and understand the mechanisms by which poverty undermines self-regulation development in young children to target mediating factors for more efficient and effective interventions. In the following section, I will review the pathways linking poverty to self-regulation development.

Linking Early Childhood Adversities to Child Outcomes: Experiential Canalization

Blair and Raver (2012a, 2012b) used the concept of experiential canalization to explain how early childhood adversity, including early childhood poverty, can impact the development of self-regulation. Experiential canalization describes a general developmental process through which an individual's innate traits (e.g., biological mechanisms) and typically occurring experiences jointly influence behavior (Blair & Raver, 2012a, 2012b). In other words,

individuals develop a certain pattern of behaviors to adapt to the environment. For example, children from low-income families are more likely to be impulsive because they need to use resources as fast as they can in case they do not have access to adequate resources regularly (Sturge-Apple et al., 2016). This adaptation can be beneficial in an impoverished environment in the short term but may not be optimal for self-regulation development in the long term (Sturge-Apple et al., 2016).

A series of physiological processes can serve as the canalizers of self-regulation in the face of adversity. Blair and Raver (2012a, 2012b) describe how stress hormones may serve as a primary canalizer through which early adversities and stressors influence the development of self-regulation. Early exposure to poverty can elevate the baseline cortisol level in young children, which in turn can undermine the neural connectivity and growth of the prefrontal cortex and self-regulation development (Blair & Raver, 2012a, 2012b; Blair & Ursache, 2011). Moreover, early adverse experience is linked to dysregulated parasympathetic and sympathetic nervous systems (Obradović, 2016; Winzeler et al., 2017). Such dysregulated physiological processes, characterized by hyper- or hypo-responsivity, undermine self-regulation development (Obradović, 2016). These dysregulations occur because physiological responses to environmental stress are designed to handle relatively infrequent, acute environmental demands and can promote short-term adaptation but can be overwhelmed by chronic exposure to adversities and lead to wear-and-tear of the physiological system and dysregulation in the long term (Evans & Kim, 2013; McEwen & Gianaros, 2010).

According to experiential canalization, a child's experience in different contexts (e.g., family & neighborhood) can canalize the physiological responses underlying self-regulation development (Blair & Raver 2012a; Blair & Raver 2012b; Obradovic, 2016). Poverty is linked to a set of environmental conditions that can shape self-regulation development (Blair & Raver, 2012a, 2012b). Early childrearing environments, especially parenting practices, together with household environment and neighborhood environment, can all be impacted by poverty and in turn, change a child's physiological response and alter the development of self-regulation (Blair & Raver 2012a; Blair & Raver 2012b; McEwen & Gianaros, 2010; Obradovic, 2016). Therefore, in the following sections, I will review the mechanisms by which poverty shapes self-regulation development through different contexts, namely, parenting, household environment, and neighborhood environment.

Poverty Shapes Self-Regulation Development Through Parenting

Parenting has been theorized to be the social origin of individual differences in the early development of self-regulation, and empirical evidence substantiates this theorization (Calkins & Fox, 2002; Thompson, 1994). Parenting practices that are responsive, flexible, supportive, and warm foster self-regulation development across developmental stages in early childhood (Calkins & Fox, 2002; Calkins, Smith, Gill, & Johnson, 1998; Fay-Stammbach, Hawes, & Meredith, 2014; Garner & Spears, 2000; Hughes & Devine, 2017; Sroufe, 2000; Thompson, 2015; Valcan, Davis, & Pino-Pasternak, 2018). As early as infancy, supportive parenting predicts improved infant behavioral regulation (Martinez-Torteya et al., 2014). Responsive, flexible,

supportive and warm parenting is also linked to toddlers' more advanced self-regulation (Brophy-Herb, Stansbury, Bocknek, & Horodynski, 2012; Eiden, Colder, Edwards, & Leonard, 2009). Moreover, high levels of parental support that express encouragement are related to better self-regulation and faster self-regulation growth during the preschool years (Lunkenheimer et al., 2008; Moilanen et al., 2009). In contrast, over-controlling and harsh parenting practices can undermine self-regulation development. Maternal over-controlling behaviors, including physical control and verbal control, predict lower self-regulation and less compliance in toddlerhood and preschool (Calkins & Johnson, 1998; Calkins et al., 1998; Mathis & Bierman, 2015). Likewise, harsh parenting, characterized by negative affect, criticism/blame, and use of physical discipline predicts preschooler's less advanced self-regulation (Fabes, Leonard, Kupanoff, & Martin, 2001; Lucassen et al., 2015; Moilanen et al., 2009).

Despite the abundance of findings of parenting on self-regulation, there appeared to be inconsistency with the impacts of parenting among African American and Latino families. For example, the racial/ethnic differences in the role of intrusiveness in child development have been unclear. Parenting characterized by both intrusiveness and warmth is linked to better child school readiness for African American but not for Latino preschoolers (Dyer, Owen, & Caughy, 2014). However, intrusive parenting predicts poorer reading achievement for African American but not for Latino children (Caughy et al., 2017). Intrusiveness has also been found not related to mother-child mutuality both in African American and Mexican American families (Ispa et al., 2004).

Role of child gender and sensitivity to parenting. Some studies have demonstrated different parenting impacts on boys' and girls' self-regulation development suggesting boys may be more sensitive to parenting than girls. For example, positive parenting has a more significant benefit for boys' self-regulation than girls' in preschool (Amicarelli, Kotelnikova, Smith, Kryski, & Hayden, 2018). However, evidence of differentiated parenting impact on boys' and girls' self-regulation development is not consistent in the literature. One study found that even though preschool-aged boys are more sensitive to parental sensitivity regarding their attention flexibility, parental sensitivity did not affect inhibitory control of boys and girls differently (Mileva-Seitz et al., 2015). Similarly, paternal harsh parenting affects boys more than girls, whereas there is no gender differential effect with harsh maternal parenting (Chang, Schwartz, Dodge, & McBride-Chang, 2003). Moreover, parental supportiveness over time does not differentially predict toddler self-regulation over time for boys as compared to girls (Bocknek et al., 2009). These inconsistent findings suggest that the moderating role of child gender is not universal for different child outcomes, and differential parenting effects for boys and girls may vary according to developmental stage.

Poverty and parenting. Poverty is related to low parenting quality, which in turn can undermine self-regulation development. Poverty and accumulated risks associated with low income such as financial constraints, low parental education, household density, and single parenthood are related to less parental support, sensitivity, warmth and elevated control and harshness, which in turn are linked to less advanced self-regulation and slower self-regulation

growth during toddlerhood and the preschool years (Bocknek et al., 2009; Ellis et al., 2014; Harvey et al., 2016; Lengua et al., 2007; Lengua et al., 2014). It is difficult for parents to provide effective parenting when they are under economic stress. Studies have found that poverty is associated with diminished parental mental health, including elevated depressive symptoms and substance abuse, which in turn is associated with lower parenting quality (Bøe et al., 2014; Fitzsimons, Goodman, Kelly, & Smith, 2017; Hoffman, Crnic, & Baker, 2006; Kelley, Lawrence, Milletich, Hollis, & Henson, 2015; Maughan, Cicchetti, Toth, & Rogosch, 2007).

Variation among low-income families. Based on the section above, poverty puts families at greater risk for low parenting quality and less advanced self-regulation in children compared to their middle-class counterparts. However, there is a significant variation in poverty levels and parenting quality *within* the low-income population. Higher levels of poverty within low-income populations are linked to less advanced self-regulation in young children (Blair et al., 2008; Chang, Shelleby, Cheong, & Shaw, 2012; Mistry, Benner, Biesanz, Clark, & Howes, 2010; Moilanen et al., 2009; Raver, Blair, & Willoughby, 2013; Raver, McCoy, Lowenstein, & Pess, 2013). Moreover, studies of children living in economically stressed families indicate that variations in parenting quality in the face of challenges are associated with differences in self-regulation development. Higher levels of parental supportiveness, warmth, and responsivity are associated with better self-regulation in children living in low-income families (Kim, Brody, & Murry, 2003; Owen, Caughy, Hurst, Amos, & Hasanizadeh, 2013; Towe-Goodman et al., 2014). It is of great importance to examine the within-group variation in family poverty levels that

contributes to individual differences in self-regulation development among children from low-income families.

Poverty Shapes Self-Regulation Development Through Other Factors in Low-Income Families

Household environment and neighborhood environment are two factors often related to family socioeconomic status that can also shape self-regulation development. Household chaos and family conflict are more frequently observed in households below the federal poverty level and may represent another mechanism by which low income impacts self-regulation development (Garrett-Peters, Mokrova, Vernon-Feagans, Willoughby, & Pan, 2016; Raver, Blair, & Garrett-Peters, 2015). Household chaos has been found to be detrimental to self-regulation development (Doom et al., 2018; Evans, Eckenrode, & Marcynyszyn, 2010; Evans & Wachs, 2010; Raver et al., 2015). For example, higher household chaos at age 3 years is negatively linked to children's self-regulation at age 4 among racially diverse low-income preschoolers (Hardaway, Wilson, Shaw, & Dishion, 2012). Studies have found that household chaos is associated with less effective parental discipline and limited child attention focusing (Dumas et al., 2005). Moreover, the relation between household chaos and self-regulation development is mediated by decreased parenting quality (Vernon-Feagans, Willoughby, & Garrett-Peters, 2016). Likewise, family conflict can undermine self-regulation development through decreased parenting quality (Gartstein & Fagot, 2003). Higher levels of inter-partner

conflict and aggression are related to more harsh parenting and less parental sensitivity (Graham, Kim, & Fisher, 2012; Sturge-Apple, Davies, Cicchetti, & Fittoria, 2014).

Characteristics of neighborhoods are also associated with child developmental outcomes. During preschool and the early school years, higher neighborhood socioeconomic status is associated with better child socioemotional competence, more advanced language development, higher school readiness, and fewer socioemotional or behavioral problems (Barbarin et al., 2006; Flouri, Mavroveli, & Midouhas, 2013; Iruka, De Marco, Garrett-Peters, & Family Life Project Key, 2018; Kingston, Huang, Calzada, Dawson-McClure, & Brotman, 2013; Kohen, Brooks-Gunn, Leventhal, & Hertzman, 2002; Palamar et al., 2015). Moreover, higher neighborhood poverty predicts higher risk for conduct problems and socio-emotional difficulties, and its impact was independent of family socioeconomic status (Flouri, Mavroveli, & Tzavidis, 2012; Goodnight et al., 2012; Palamar et al., 2015).

Studies that link neighborhood poverty and violence to self-regulation development echo findings from studies regarding other child outcomes. Moving out of higher poverty and into lower poverty neighborhoods is found beneficial for low-income African American and Latino children's self-regulation development, whereas moving out of lower poverty and into higher poverty neighborhoods is found detrimental to self-regulation development (Roy, McCoy, & Raver, 2014). Moreover, children from low-income families are more likely to be exposed to neighborhood violence, which is linked to poorer self-regulation development (McCoy, 2013; McCoy, Raver, & Sharkey, 2015; Raver, 2004). Neighborhood violence can have significant

negative implications for children's self-regulation development through victimization or witnessing of a violent act (McCoy et al., 2015). This observed relation between violence exposure and self-regulation dysfunction relies on a multifaceted set of interactions between changes in individual physiological response and attention functioning (McCoy et al., 2015). A study of children from primarily African American low-income households finds that children pay greater selective attention toward negatively valenced emotional stimuli and less biased appraisal of fear on a facial identification task when exposed to neighborhood violence (McCoy, Roy, & Raver, 2016). It suggests that children who are exposed to a high level of neighborhood violence may develop unique regulatory processes that are adaptive in the face of an environmental threat but can lead to dysregulation in the long term.

Child Susceptibility

Based on the review above, poverty can shape self-regulation development through many pathways, but not all children respond to adversities and stressors the same way. Studies have found that heightened physiological reactivity is an indicator of susceptibility to environmental impacts, which puts children at greater risk for undermined self-regulation in the context of high adversity (Obradovic, 2016; Raver et al., 2013). Certain child temperament characteristics are also indicators of susceptibility. Temperament refers to constitutionally based individual differences in reactivity (Kochanska, Murray, & Coy, 1997). Prior research has found that high negative emotionality places children at greater risk for poor self-regulation in the context of adversity relative to children with easier temperaments (Chang et al., 2012). Raver and her

colleagues (2013) also found that family risk is only detrimental for self-regulation when the children are high in negative emotional reactivity.

Self-Regulation Development in African American and Latino Families

There are racial/ethnic disparities in self-regulation development, with African American and Latino children demonstrating a lower level of self-regulation compared to their White counterparts (Barnes et al., 2016; Lengua et al., 2007; Moilanen et al., 2009; Sektnan et al., 2010). Such ethnic disparities in self-regulation can be partially explained by the fact that both African American and Latino youth are disproportionally challenged by poverty (Li-Grining, 2012; Raver, 2004). In 2017, 33.7% of African American children and 26.2% of Latino children under age 5 lived in families below the federal poverty level compared to 11.7% of their White counterparts (Child Defense Fund, 2017). Researchers have found detrimental effects of poverty and poverty-related risks on self-regulation development in African American, Latino, and racially diverse samples (Evans & Kim, 2013; Li-Grining, 2007; Mistry et al., 2010; Raver, Blair, et al., 2013).

African American and Latino families are likely to experience systemic challenges besides poverty in the United States. Social stratification systems, such as racism and segregation, can shape child developmental contexts (Garc á-Coll et al., 1996). Through social stratification systems, an individual's social position can directly influence his/her promoting/inhibiting environments, such as the school, neighborhood, and other institutions, as well as the family's adaptive culture. A family's adaptive culture evolves from a combination of

both historical events and current societal demands. For African Americans, their shared history of enslavement and racial segregation shape their current cultural values and traditions, which, in turn, affect child developmental outcomes. For Latino families, the cultural values and traditions are shaped by a different set of societal processes related to immigration, as well as their traditional values from their countries of origin (Halgunseth, Ispa, & Rudy, 2006; Li-Grining, 2012). Because of different historical and current ecologies for these populations in the US, self-regulation development in African American and Latino families are impacted by different and unique contextual factors and processes.

Racial discrimination is a unique and significant challenge for African American families that may undermine self-regulation development. African Americans face racial discrimination in a variety of contexts including employment, interpersonal and educational (Darity, 2003; Pachter, Bernstein, Szalacha, & Garc á-Coll, 2010; Skiba et al., 2011). Racial discrimination may negatively impact self-regulation development through diminished parenting quality. Parental racial discrimination encounters are linked to decreased parenting quality, indicated by more harsh and abusive parenting behaviors (Pakizegi, 1985). One plausible explanation for this association is that racial discrimination experiences are associated with compromised mental health for parents (Clark, Anderson, Clark, & Williams, 1999; Gee, Ryan, Laflamme, & Holt, 2006; Paradies, 2006; Williams & Williams-Morris, 2000). Racial discrimination can also impact children directly (Sanders-Phillips, Settles-Reaves, Walker, & Brownlow, 2009). African American children as young as 3 to 4 years old are likely to identify with negative African

American stereotypes (Averhart & Bigler, 1998; Branch & Newcombe, 1986), and as early as age 6, African American children show an understanding of how racial discrimination can impact African Americans' occupations (Bigler, Averhart, & Liben, 2003). Perception of racial discrimination may promote children's psychological distress, which may be linked to self-regulation development (Sanders-Phillips et al., 2009).

African American parents may utilize racial-ethnic socialization to help their children cope with structural challenges like racial discrimination in the future. With young children, parents are likely to socialize their young children to be familiar with their cultural background and proud of their cultural heritage, and such cultural socialization practices may contribute positively to child cognitive development because of increased parental cognitive stimulation during racial socialization (Caughy et al., 2002). Studies have found that cultural socialization is linked to better academic skills, language development, as well as problem-solving skills(Brown, Tanner-Smith, & Lesane-Brown, 2009; Caughy, O'Campo, Randolph, & Nickerson, 2002; Caughy & Owen, 2015). Therefore, it is possible that racial socialization practices can also foster self-regulation development.

For Latino families, especially immigrant Latino families, stressors related to the acculturation process can influence the development of self-regulation. Immigrant Latino families can navigate between the two different cultures fluently, and they may face a "mismatch" of expectations between family and institutions when their young children enter preschool (Barbarin, Downer, Odom, & Head, 2010; Doucet & Tudge, 2007; Halgunseth et al.,

2006; Keels & Raver, 2009). This cultural mismatch can cause acculturation stress for families because the mismatch may lead to feelings of anxiety (Berry, 2007; Crosnoe, 2006). Acculturation stress can undermine Latino parents' mental health and contribute to lower parenting quality (Cervantes & Bui, 2017; Lorenzo-Blanco et al., 2016). English competency pressure can also contribute to elevated depressive symptoms among immigrant Latino adults (Torres, 2010). Latino parents' mental health can be negatively impacted when they face English competency pressure, which in turn can undermine parenting quality. As reviewed in the previous section, decreased parenting quality can then negatively impact self-regulation development. Latino children's English proficiency may also affect self-regulation. Latino children's limited English ability is associated with worse self-control and social competence (Kang, Haddad, Chen, & Greenberger, 2014). English-speaking Latino children from low-income families exhibit faster growth of behavioral self-regulation than low-income Latino children who are English learners (Wanless, McClelland, Tominey, & Acock, 2011). However, Latino children who are native English-Spanish bilinguals display advantages in self-regulation development over their monolingual peers (Carlson & Meltzoff, 2008).

Despite the challenges, traditional cultural values can impact self-regulation development in Latino families. Familism is a commonly held value in Latino families that refers to family solidarity, support, and commitment to the family beyond oneself (Galindo & Fuller, 2010; Gamble & Modry-Mandell, 2008). Familism can serve as an important protective factor for child development in Latino families. Poverty may be less likely to jeopardize parenting quality in the

context of greater familism because family bonds may serve as a buffer against poverty-related risks (Roosa et al., 2011). Familism can also enhance the positive relation between parental warmth and child social adjustment (Gamble & Modry-Mandell, 2008). Warmth is more beneficial for children's social adjustment in the context of greater familism because warmth may be more meaningful in a household that adheres more to family ties and broader emotional support (Li-Grining, 2012). This interaction between familism and parental warmth is significant in low-income Latino families but not in higher-income Latino families (Rose & Rudolph, 2006). This three-way interaction suggests that familism is an especially crucial protective factor in low-income Latino families.

In sum, African American and Latino children are challenged by both poverty and other systematic challenges. Racial discrimination and acculturation stress, as well as family adaptive cultures, can all shape the development of self-regulation in African American and Latino children. It is of great importance to pay attention to African American and Latino families and study the mechanisms, by which social determinants shape self-regulation development, in order to understand how self-regulation development unfolds in the face of challenges and develop effective intervention programs targeting on intermediating processes.

Summary

Adequate self-regulation development is essential for early adjustment as well as later life success (Blair, 2002; Bronson, 2000; Calkins & Hill, 2007; Davidson, Amso, Anderson, & Diamond, 2006; Kopp, 1982). Self-regulation develops rapidly during early childhood, and

external factors can contribute to individual differences in self-regulation development. Poverty is a critical social determinant on self-regulation development in early childhood. Poverty has been found to be related to less advanced self-regulation development through compromising the quality of a series of proximal processes, including parenting, household environment, and neighborhood environment. In this dissertation, I will focus on one of the mechanisms by which poverty shape self-regulation development, which is through parenting practices. As reviewed above, studies have linked poverty to less positive and more negative parenting practices, which, in turn, contribute to self-regulation development negatively. However, there are a few limitations to the current literature.

First of all, studies examining the impact of poverty on self-regulation through parenting fail to capture the wide range of poverty levels within the low-income population. Previous studies mostly compare children living in poverty to their more affluent counterparts (e.g., Lengua et al., 2014). There is significant variability in economic status within low-income families, with some families being exposed to severe poverty chronically and some families never experiencing extreme economic hardship. Capturing within-group variability of economic status among low-income families can expand our understanding of self-regulation development in the face of poverty. In studies limited to low-income participants, differences in poverty level and parenting quality are linked to differences in self-regulation outcomes (Blair et al., 2008; Chang, Shelleby, Cheong, & Shaw, 2012; Mistry et al., 2010; Moilanen et al., 2009; Raver, Blair, et al., 2013; Raver, McCoy, et al., 2013; Towe-Goodman et al., 2014). Although

variability within the low-income population was captured, none of these studies examined the mediating path of parenting between poverty and self-regulation. Thus, future studies need to capture the within-group variability in poverty when linking poverty to self-regulation development via parenting.

Another limitation of the existing research on self-regulation development is that it fails to capture the trajectory of self-regulation. Much of the existing research linking poverty to self-regulation development through parenting has measured self-regulation at a single point in time (e.g., Kim, Brody, & Murry, 2003; Lengua et al., 2007). Garon et al.'s (2008) review of early executive function development highlighted the lack of longitudinal research. Treating behavioral self-regulation as a time-invariant variable may not capture the nature of early self-regulation development, as self-regulation develops rapidly in the first a few years of life (Diamond, 2006; Kochanska, Coy, & Murray, 2001; Kopp, 1982; Vaughn et al., 1984). Moreover, factors that impact self-regulation at a single point in time may not be the same as the factors that can shape self-regulation development over time. Identifying the factors affecting a child's self-regulation growth would allow us to target novel variables for intervention to accelerate self-regulation growth in children from low-income families.

Although most studies have not focused on the trajectory of self-regulation development in early childhood, there are a few exceptions. A study of low-income African American families found that parental supportiveness predicted faster growth in self-regulation in the first three years of life, but it did not examine the mediation effect of parenting between poverty and self-

regulation growth (Bocknek et al., 2009). In addition, a study of 36-40-month-old children reported that parental scaffolding mediated the relation between family income and executive function growth (Lengua et al., 2014). However, this study did not include families below the federal poverty line despite the fact that there is a large variation in poverty levels within the low-income population. Therefore, studies are still needed to explore the pathways by which variations in poverty level impacts self-regulation growth through parenting in low-income minority families and potential racial/ethnic differences in these paths.

Another limitation to the literature on self-regulation and parenting practices is that most studies focus on the unidirectional parenting impact on self-regulation development, ignoring the possible bidirectional association between parenting and self-regulation. Researchers have identified some influences of child characteristics on parenting practices (Kiff, Lengua, & Zalewski, 2011). For example, difficult child temperament, such as negative emotionality, can motivate negative parenting practices (Bridgett et al., 1990; Feldman, Greenbaum, Mayes, & Erlich, 1997). Likewise, child fearfulness and positive emotionality evoke positive parenting practices such as encouragement and acceptance (Belsky, Rha, & Park, 2000; Lengua & Kovacs, 2005). Also, child externalizing behavior problems, such as disruptive behaviors, predict lower levels of parental sensitivity and responsiveness and more harshness and negative affect (Besnard et al., 2013; Combs-Ronto, Olson, Lunkenheimer & Sameroff, 2009; Serbin, Kingdon, Ruttle, & Stack, 2015). A few longitudinal studies have examined the bidirectional association between parenting and child functioning in domains similar to behavioral self-regulation. For

example, child effortful control ability, as evidenced by an ability to delay gratification, prospectively related to mothers' use of more positive and less harsh and directive parenting practices (Eisenberg et al., 2010; Tiberio et al., 2016). Children's inability to regulate emotion is associated with increased coercive and hostile parenting (Bridgett et al., 1990; Morrell & Murray, 2003).

Some studies did examine the bidirectional relation between self-regulation and parenting directly. Blair et al. (2014) reported that child executive function skills at 36 months positively predicted changes in responsive parenting behavior from 36 to 60 months in a sample of low-income families, but the samples were predominantly White. Moreover, bidirectional relations between parenting and different aspects of child self-regulation may not be universal. Merz et al. (2017) find that higher parental responsiveness predicted better delay of gratification and cognitive flexibility, but only better child delay of gratification but not cognitive flexibility predicted more parental responsiveness. To date, only Merz (2017) included mostly Latino and African American children from low-income families. However, this study included only two time points of assessment. Thus, more studies are needed to investigate the bidirectional relation between both positive and negative parenting and behavioral self-regulation in low-income African American and Latino families across a longer period of time.

In sum, more studies should treat self-regulation development as a dynamic and longitudinal construct when investigating the mechanisms linking social determinants to child self-regulation. As reviewed above, poverty can impact self-regulation development through the

family context. Differences in family-level poverty can shape self-regulation development through differences in more proximal parent-child interaction contexts. Distal contexts such as the neighborhood, racial discrimination, and acculturation, and family context shape self-regulation development. This dissertation will emphasize the processes within the family context. A conceptual framework is proposed to illustrate how family-level poverty shapes self-regulation development through family processes.

The conceptual framework shown in Figure 2-1 draws upon the integrative model of minority child development (Garc á-Coll et al., 1996) as well as the transactional model (Sameroff, 2009, 2010). The integrative model posits that social determinants affect child developmental outcomes and the child's immediate developmental contexts through social stratification systems. Social stratification systems such as racism and segregation that determine an individual's social position directly influence his/her proximal promoting/inhibiting environments such as the school, neighborhood, and other institutions as well as the family's adaptive culture. A family's adaptive culture evolves from a combination of both historical events and current societal demands. African American and Latino families have unique cultural values and traditions that may be different from the mainstream culture as a response to the discrimination and acculturation pressure they face. Both promoting/inhibiting environments and adaptive culture can shape family socioeconomic status as well as family processes such as parenting behaviors, which directly affects child development.

According to the transactional model, a child is an active agent in his/her development, and there is a reciprocal relationship between the child and the child's developmental context (Sameroff, 2009, 2010). Both the child, as an active agent, and the developmental context are continuous and susceptible to the influence of other components in the developmental system. In other words, child characteristics and developmental context stay relatively consistent over time but still impact each other and shape developmental outcomes jointly. As reviewed above, parenting practices contribute to the development of self-regulation. According to the transactional model, the picture may be more complicated. First of all, children's self-regulation is continuous over time, as self-regulation development is likely to be associated with previous achievements in self-regulation. Moreover, children are also active agents in their development, as their self-regulatory ability may impact parenting practices, which, in turn, affect self-regulation development. In sum, there is a reciprocal exchange between self-regulation and parenting practices, which shape the trajectory of self-regulation as development unfolds.

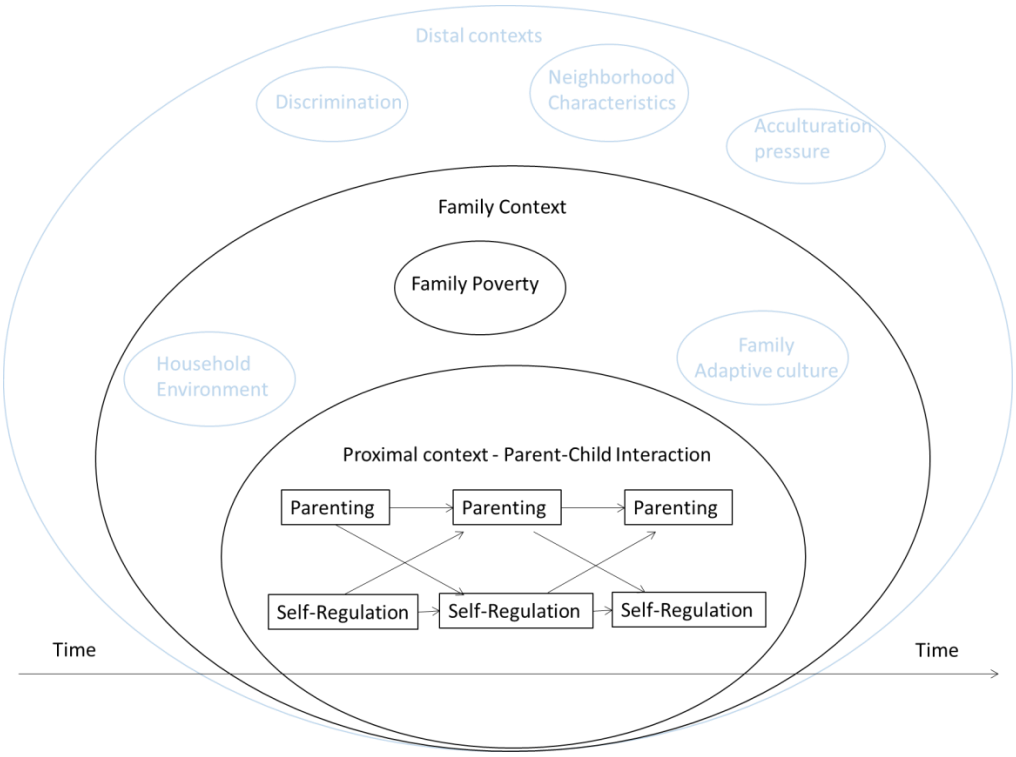

Figure 2-1. Conceptual model

This conceptual model describes a broad picture of how family-level social determinants shape child self-regulation through processes in family contexts. Social class and race/ethnicity are linked to distal contexts such as discrimination, acculturation pressure, and neighborhood environment. These distal contexts directly affect the family context, including family-level poverty, family adaptive culture, and household environment. Within the family context, family poverty, household environment, and adaptive culture impact child self-regulation trajectory through the more proximal parent-child interaction context. High levels of family poverty are linked to decreased parenting behavior quality. How parents and children interact with each other may change over time. Parenting can shape a child's self-regulation developmental trajectory, and self-regulation also has an impact on parenting behaviors. At the same time, the interactive

process between parenting and self-regulation may differ by ethnicity because of their different adaptive cultures.

Constructs that are the focus of this dissertation are shown in bold. In this dissertation, I focused specifically on family-level poverty and the parent-child interaction context. I investigated how family level-poverty interfere with the parent-child interaction context and shape self-regulation development over time. Then I examined how parenting and self-regulation development unfold and impact each other across early childhood.

Research Questions

The first study of this dissertation examined the association between poverty and trajectory of self-regulation as mediated by parenting. It addressed the following research questions:

1. Are individual differences in family poverty level associated with growth in self-regulation during early childhood among low-income African American and Latino children?
    - Hypothesis 1.1.1. Higher levels of family poverty are associated with slower growth in self-regulation.
2. Does the quality of parenting mediate the link between family poverty level and growth of self-regulation during early childhood among low income African American and Latino children?

- Hypothesis 1.2.1. Higher levels of family poverty will be associated with lower levels of positive parenting practices, which in turn will be associated with slower growth in child self-regulation.
- Hypothesis 1.2.2. Higher levels of family poverty will be associated with higher levels of negative parenting practices, which in turn will be associated with slower growth in child self-regulation.

The second study of the dissertation will test the bidirectional relation between the quality of parenting and child self-regulation. It will address the following research questions:

1. Does the quality of parenting predict child self-regulation among low-income African American and Latino children?
    - Hypothesis 2.1.1 Higher levels of positive parenting practices will predict higher levels of child self-regulation.
    - Hypothesis 2.1.2 Higher levels of negative parenting practices will predict lower levels of child self-regulation.
2. Does child self-regulation predict the quality of parenting among low-income African American and Latino children?
    - Hypothesis 2.2.1 Higher levels of child self-regulation will predict higher levels of positive parenting practices.
    - Hypothesis 2.2.2 Higher levels of child self-regulation will predict lower levels of negative parenting practices.

CHAPTER 3

METHOD

The Dallas Preschool Readiness Project

This dissertation is a secondary analysis of data from the Dallas Preschool Readiness Project (DPReP). DPReP is a longitudinal study with the following aims: 1) to examine the emergence of self-regulation development and its relation to school readiness and academic performance among African American and Latino young children from low-income families; 2) to identify how family-level risk and protective factors contribute to the emergence of self-regulation and academic performance; and 3) to examine how school context contributes to self-regulation development. Participants were a convenience sample recruited through a wide range of community-based strategies including distribution of study information to organizations and agencies serving low-income communities (e.g., Head Start program & WIC clinics) and direct recruitment at community fairs in low-income communities. The eligibility criteria for DPReP included: 1) the target child was between 29 and 31 months of age at the time of enrollment; 2) at least one parent of the target child was African American or Latino; 3) child was not in foster care; 4) family income was below 200% of the federal poverty level; 5) the target child was not hospitalized for more than 7 days after birth; 6) the family intended to stay in the area for at least 1 year. Data collection was completed during home visits at four time-points when the child was

2½ years old (Wave 1), 3½ years old (Wave 2), in kindergarten (Wave 3), and in first grade (Wave 4). A total of 407 families were enrolled in this study.

Study Participants and Procedure

Participants

This dissertation focused on the development of self-regulation as indexed by scores on a measure of behavioral self-regulation, the Head-Toes-Knees-Shoulder (HTKS) test, that was administered started at Wave 2. Children who did not have any HTKS scores from Waves 2, 3, or 4 (N = 46) were excluded. Among the 46 cases, 31 families did not follow up after Wave 1; 11 families had at least one follow-up after Wave 1, but the children did not complete the HTKS assessment because the follow-ups were completed over the phone or the child refused to complete the assessment; 3 families had one follow-up, but the child did not complete the HTKS assessment without a given reason; and 1 family was excluded because the child was too young to complete the HTKS assessment. Among the 361 families, 37 completed only one HTKS assessment, 59 completed two HTKS assessment, and 263 completed all three assessments. Families who were excluded from this study did not differ from other families enrolled in the study in terms of child gender, family income-to-needs ratio at Wave 1 or maternal education. However, African American children were more likely to be excluded (15.8%) compared with Latino children (7.6%), χ^2 (1) = 6.85, $p < .01$. Of the remaining 361 families, two children were excluded because the child was subsequently diagnosed with a significant developmental disability.

The remaining 359 families were included in this dissertation. The demographic characteristics of this sample are shown in Table 3-1. Among these participants, 154 (43.3%) are African American, and 202 (56.7%) are Latino. All of the primary caregivers are mothers or mother-figure female relatives. More than half of African American children (56.5%) and Latino children (52.0%) are boys, and the child gender ratio does not differ by race/ethnicity. African American family incomes fell below 100% federal poverty line between Wave 1 and Wave 4 marginally more often than Latino families, χ^2 (4) = 9.07, p = .06, even though more African American mothers than Latino mothers attained a high school degree/GED or higher, χ^2 (2) = 32.26, p < .01. Among Latino mothers, the majority of them were born outside of the US (73.7%), and the majority of them spoke Spanish (61.8%) as their primary language.

Table 3-1

Demographic Characteristics of Participants

	Child Race/Ethnicity		
	African American (N = 154)	Latino (N = 205)	$\chi^2(df)$
Child gender			.71 (1)
Boy	88 (57.1%)	108 (52.7%)	
Girl	66 (42.9%)	97 (47.3%)	
Times below 100% poverty Wave1-Wave 4			9.07† (4)
0	21 (13.6%)	35 (17.1%)	
1	15 (9.7%)	34 (16.6%)	
2	38 (24.7%)	42 (20.5%)	
3	28 (18.2%)	47 (22.9%)	
4	52 (33.8%)	47 (22.9%)	
Maternal education			32.26**(2)
Less than high school	23 (14.9%)	86 (42.0%)	
High school / GED	68 (44.2%)	72 (35.1%)	
More than high school	63 (40.9%)	47 (22.9%)	
Latino mothers only			
Nativity			
U.S.-born		54 (26.3%)	
Foreign-born		151 (73.7%)	
Country of origin if foreign-born			
Mexico		144 (95.3%)	
Central/South America		7 (4.7%)	
Primary language			
English-dominant		11 (5.8%)	
Spanish-dominant		118 (61.8%)	
Bilingual		62 (32.5%)	

$^{\dagger}p < .10$, $^{*}p < .05$, $^{**}p < .01$.

Procedure

A team of two home visitors visited participants' homes, and the visit lasted between 1.5 and 2 hours. The visit consisted of an interview with the primary caregiver, assessments of the child, and a semi-structured video-recorded parent-child interaction. One visitor would interview the primary caregiver, while the other would carry out the child assessment. All measures were

administered to parents and children in their preferred language. For Spanish-speaking families, both home visitors were bilingual. When measures were not available in Spanish, they were forward-translated and then back-translated by a team of bilingual members, and differences were resolved by consensus.

Measures

The dependent variable of this dissertation is behavioral self-regulation from Wave 2 to Wave 4. The independent variables in this dissertation include parenting practices between Wave 1 and Wave 3 and family-level poverty between Wave 1 and Wave 4.

Dependent Variable: Behavioral Self-Regulation

In order to evaluate individual differences in self-regulation across several years, a behavioral self-regulation measure called the Heads-Toes-Knees-Shoulder (HTKS) task was used. The HTKS is referred to as a measure of "behavioral" self-regulation because in this task, a child is asked to following the rules and regulate his/her overt behaviors using components of executive functions including working memory, inhibitory control, and cognitive flexibility (McClelland et al., 2014; Montroy et al., 2016). The HTKS task has been found effective in capturing variation in behavioral self-regulation throughout early childhood, which makes it suitable to measure developmental self-regulation change across time (McClelland et al., 2007b; Ponitz et al., 2008; Skibbe, Grimm, Bowles, & Morrison, 2012). In addition, studies show that the HTKS task is a valid and reliable measure. The HTKS shows good construct validity as it is correlated with other self-regulation measures, including classroom self-regulation performance

and parental-reported self-regulation (McClelland et al., 2007b; Ponitz et al., 2009). The HTKS task also shows good predictive validity, as HTKS performance predicts academic achievement and other child outcomes such as externalizing problems across racially and ethnically diverse populations (Lipsey et al., 2014; McClelland et al., 2007b; McClelland et al., 2014; Montroy, Bowles, Skibbe, & Foster, 2014; von Suchodoletz et al., 2013; Wanless et al., 2011). Past studies further indicate that HTKS has strong reliability, including interrater reliability and internal consistency (Matthews et al., 2009; Ponitz et al., 2008; Wanless et al., 2011). Moreover, growth in the HTKS score is not a result of practice (Ponitz et al., 2008).

In this study, children completed the HTKS task when they were 3½ years old (Wave 2), around 6 years old when they were in kindergarten (Wave 3), and around 7 years old when they were in first grade (Wave 4). The task consisted of 3 phases. The first phase consisted of 6 practice trials and 10 test trials, and the second and the third phases each consisted of 5 practice trials and 10 test trials. During each phase, children could only move on to the test trials when they responded correctly on at least 3 practice trials. The task starts with a set of paired rules. At the beginning of the game, the researcher tells the child to copy what the researcher does, either touching the head or toes. In the following phase, the researcher changes the rules, and tells the child to do the opposite of what the researcher does (e.g., touch toes when researcher touched her/his head and vice versa). Only the trials in the conflicted-rule phase are scored. After 10 trials of "heads and toes", the next 10 trials used a different set of paired rules: a child was expected to touch his/her shoulders when the researcher touches his/her knees and vice versa. Finally, the last

10 trials re-combined the paired rules in the first two phases (i.e., “touch your head” with “touch your knees” & “touch your shoulders” with “touch your toes”).

The HTKS task was video recorded and scored based on the video recordings. Each test trial was coded as incorrect (0), self-correct (1), and correct (2). As there were a total of 30 trials, the possible score ranged from 0 to 60. Intra-class correlation coefficient was used as the interrater reliability. Interrater reliability was .89 for Wave 2 based on double coding 16% of the cases, .90 for Wave 3 based on 21%, and .87 for Wave 4 based on 23%.

Independent Variables

Parenting. At Wave 1, Wave 2 and Wave 3, maternal parenting practices were measured during a semi-structured mother-child interaction task called the Three-Bag Task. This procedure was used in the NICHD Study of Early Child Care and Youth Development (NICHD Early Child Care Research Network, 1999, 2004, 2008). At Wave 1, when the child was 2½ years old, three numbered bags with toys and a book in them were used for a 15-minute interaction. The first bag included a wordless picture book – *Good Dog, Carl* (Day, 1996), the second bag contained a small kitchen that came with frying pan and salt/pepper shakers, and third bag contained a small toy house that included toy figures and a vehicle. The toys and book were chosen because they were gender neutral, interactive, imaginative, and mirrored the ones used in the NICHD study. The home visitors asked the mothers to introduce the toys to the children in bag order and told them to do anything they wanted with the toys as long as they spent some time with each toy.

Interactions were video recorded and rated. At Wave 1, several dimensions of parenting qualities were rated, including sensitivity, intrusiveness, detachment, cognitive stimulation, positive regard, and negative regard. Each item was rated globally based on a 5-point Likert scale from 1 (*not at all characteristic*) to 5 (*highly characteristic*) (Owen et al., 2010). Interrater reliability (IRR) was determined by a second coding of 29% of the interactions. Interrater reliability was calculated using an intra-class correlation coefficient and ranged from .81 to .87.

At Wave 2, when the children were 3½ years old, mother-child interactions were observed in two tasks. The first task was to load plastic toppings atop a pizza crust balanced on a plastic chef's finger. The second task was to build a bug from a set of 11 Duplo blocks based on the model provided. The toys were chosen because they required more advanced skills than most 3.5-year-olds possessed and provided opportunities for the mothers to assist the child in completing the tasks. The mothers were asked to assist the children in finishing the two tasks in the order stated above. The mother-child interactions lasted about 12 minutes and were video recorded for coding. Similar to Wave 1, dimensions of parental sensitivity, intrusiveness, detachment, cognitive stimulation, positive regard, and negative regard were coded using 5-point Likert global rating scales ranging from 1 (*not at all characteristic*) to 5 (*highly characteristic*) (Owen et al., 2010). Interrater reliability was determined by a second coding of 20% of the interactions and ranged from .81 to .87.

At Wave 3, mothers and children were asked to work together to build a series of identical towers from blocks of varying shapes and sizes. Dimensions of parenting qualities that

were rated included supportive presence, intrusiveness, detachment, cognitive stimulation, positive regard, and hostility using 5-point Likert global rating scales ranging from 1 (*not at all characteristic*) to 5 (*highly characteristic*) (Owen et al., 2010). Interrater reliability was determined by a second coding of 29% of the interactions and ranged from .73 to .86.

Family-level poverty. Family-level poverty was indicated by the frequency of exposure to severe poverty as well as family income-to-needs ratios. Income-to-needs ratio at each wave was computed as the total household income divided by the published federal poverty level for the family household size. Family level frequency of exposure to severe poverty was measured by how many times family income fell below 50% of the federal poverty level across 4 waves at the time of home visits. Thus, the number of exposures to severe poverty ranged from 0 to 4.

Analytic Plan

Study variables were selected from the DPReP dataset, and SPSS was used to create a dataset and conduct descriptive analysis. The means, standard deviations, and bivariate correlations were computed for study variables as the first step to describe the change in HTKS score across waves and whether HTKS score, parenting, and poverty indicators were related to each other. Structure equation modeling (SEM) was used to answer the questions in Study 1 and Study 2. SEM models were tested in M*Plus* 8 (Muthén & Muthén, 1998-2017) using full information maximum likelihood estimation, which handles missing data by using all the data available to estimate the model (Little & Rubin, 1987). The detailed analytical plan is presented with descriptions of Study One and Study Two respectively.

Study One

Study variables. In Study 1, the frequency of exposure to severe poverty was used as the indicator for family poverty level. Parental sensitivity, intrusiveness, detachment, cognitive stimulation, positive regard, and negative regard at Wave 1 were used as the parenting practice indicators. HTKS scores from Wave 2 to Wave 4 was used to capture the growth in behavioral self-regulation.

Statistical analyses. Analyses were conducted to examine the effects of exposure to severe poverty and parenting on the growth in behavioral self-regulation and to test whether parenting mediated the effects of poverty. Growth curve modeling was used to determine the intercept and slope of behavioral self-regulation and whether there was significant growth in behavioral self-regulation over time. Consistent with previous analyses of the parenting data from this study (Caughy, Mills, Owen, Dyer, & Oshri, 2017), quality of parenting at Wave 1 was modeled using a bi-factor model. One latent variable is a general factor called *Sensitive Support* (i.e., sensitivity, cognitive stimulation, and positive regard loading positively; negative regard, detachment, and intrusiveness loading negatively. The second factor is a specific factor labeled *Intrusive-Insensitivity* (negative regard and intrusiveness loading positively and sensitivity and detachment loading negatively). The complete mediation model tested the direct and indirect effect of the frequency of exposure to extreme poverty and two parenting latent factors on HTKS intercept and trajectory. A bootstrapping method was used to test the significance of indirect effects. The statistical model is shown in Figure 3-1.

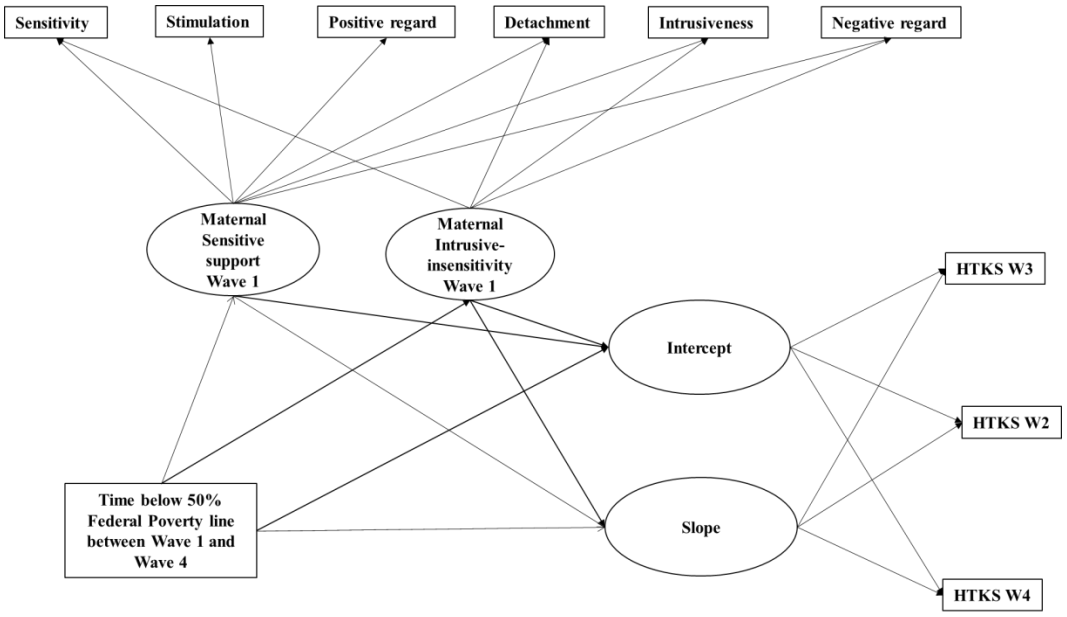

Figure 3-1. SEM model linking poverty and parenting to self-regulation trajectory

Study Two

Study variables. In Study 2, parenting at Wave 1, Wave 2, and Wave 3 and the HTKS score at Wave 2, Wave 3, and Wave 4 were included in computing a cross-lagged SEM. Income-to-needs ratio and child age from Wave 2 to Wave 4 were included as covariates.

Statistical analyses. Parenting at Wave 1 and Wave 2 both fit the bi-factor model that was used in Study 1 (Caughy et al., 2017). However, as the measurement of parenting changed at Wave 3, and the dimensions only included supportive presence, intrusiveness, detachment, cognitive stimulation, positive regard, and hostility at Wave 3, I first examined whether parenting at Wave 3 best fit a single-factor model, a two factor model, or the same bi-factor model as previous waves.

The cross-lagged model (see Figure 3-2) included autoregressive paths of variables across time and cross-lagged regression paths from Wave 1 parenting to Wave 2 HTKS score,

Wave 2 parenting to Wave 3 HTKS score, Wave 3 parenting to Wave 4 HTKS score, and Wave 2 HTKS score to Wave 3 parenting. Family income-to-needs ratio and child age were included at each wave as covariates. Model fit was evaluated based on the chi-square goodness-of-fit test, comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). Adequate model fit is traditionally indicated by a non-significant chi-square, but it is possible to get significant chi-squares even for models that fit the data well. Thus, an RMSEA < .08, a CFI > .90, TLI > .90 and an SRMR < .08, even with a significant chi-square, can still indicate good model fit (Brown, 2006).

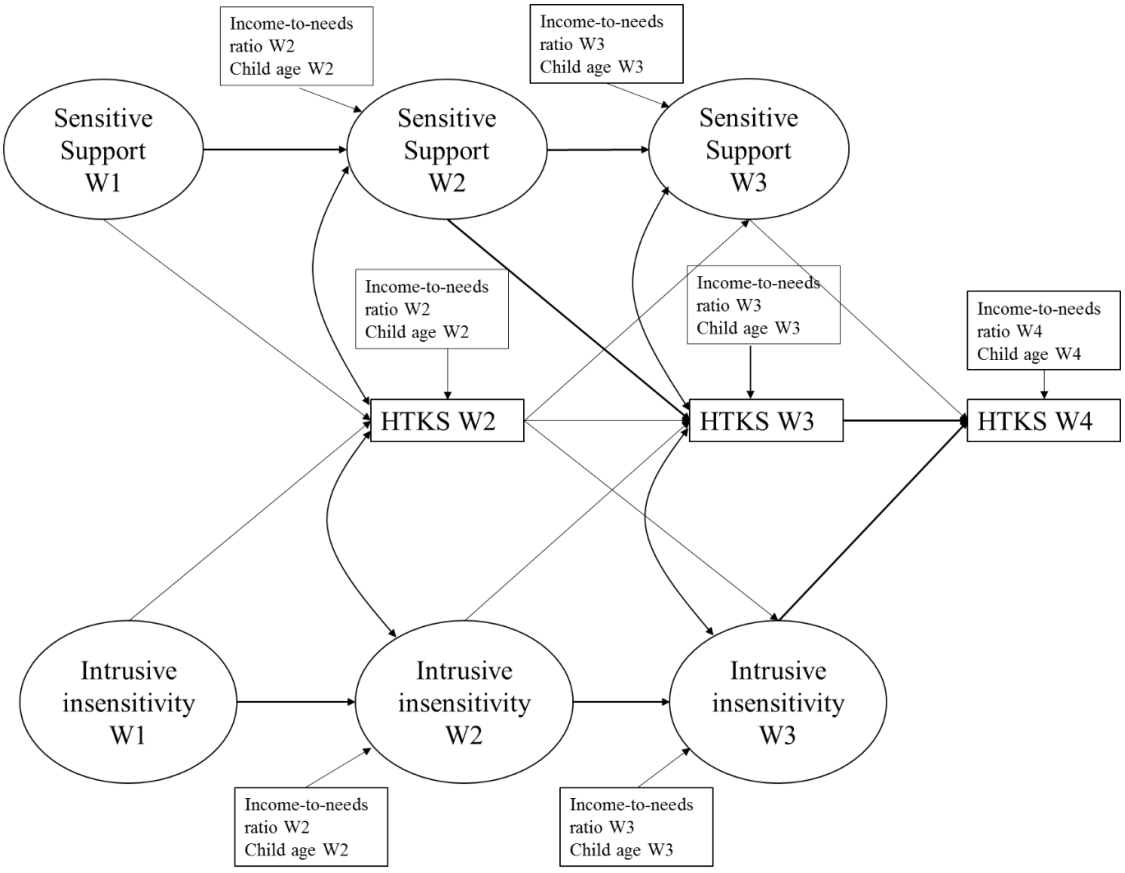

Figure 3-2. Cross-lagged SEM model for parenting and self-regulation

CHAPTER 4

EXPOSURE TO SEVERE POVERTY AND GROWTH IN BEHAVIORAL SELF-REGULATION: THE MEDIATING ROLE OF PARENTING[1]

[1] Dian Yu. To be submitted to *Journal of Applied Developmental Psychology*.

Abstract

This study examined how exposure to severe poverty related to differences in growth of behavioral self-regulation during early childhood as mediated by parenting practices. A total of 359 low-income African American and Latino families participated, and data were collected across 4 waves between ages 2½ and 7 years. The frequency of exposure to severe poverty was indicated by how many times the family income fell below 50% of the federal poverty line across 4 waves. Behavioral self-regulation was assessed at Waves 2 through 4, and parenting practices were observed at Wave 1. More frequent exposure to severe poverty was associated with slower growth in behavioral self-regulation, and the effect was partially mediated through decreased sensitive and supportive parenting practices. Targeting the promotion of sensitive and supportive parenting practices may be an effective strategy for accelerating self-regulation growth among African American and Latino children living in poverty.

Keywords: self-regulation, executive functions, poverty, parenting, minority

Introduction

African American and Latino children are more likely to experience deficits in academic achievement due to racism, discrimination, historical, structural, and moral inequalities (Berends, Lucas, & Penaloza, 2008; Gregory, Skiba, & Noguera, 2010; Ladson-Billings, 2006; Potter & Morris, 2017). As early as elementary school entry, African American and Latino children are more likely to show inadequate school readiness compared to their White counterparts (Currie, 2005; Magnuson & Waldfogel, 2005). In standardized tests in elementary school, African American and Latino children show lower levels of math and reading proficiency across grades compared to their White peers (The Nation's Report card, 2017). Moreover, though increasing over the past decade and currently surpassing 75% African American and Latino children still demonstrate lower high-school graduation rates than Asian or White children (McFarland et al., 2017; Snyder, de Brey, & Dillow; 2019).

One explanation for these ethnic disparities is that ethnic minority children are more likely to be challenged by poverty (Li-Grining, 2012; Raver, 2004). In 2017, 33.7% of African American children and 26.2% of Latino children under age 5 lived in families below the federal poverty line compared to 11.7% of White children (Child Defense Fund, 2017). Studies have linked poverty to worse academic achievement, including both math and reading performance (Baker, Kainz, & Reynolds, 2018; Miller, Votruba-Drzal, & Coley, 2019; Paschall, Gershoff, & Kuhfeld, 2018; Roy & Raver, 2014).

One of the mechanisms by which poverty is associated with poor academic performance is through the negative effects of poverty on self-regulation development. Children from low-income families are more likely to enter kindergarten with lower self-regulation compared to their middle-class counterparts (Caughy, Mills, Owen, & Hurst, 2013; Obradović et al., 2012).

Studies have linked poverty and related risks to less well-developed self-regulation and slower growth in self-regulation during early childhood (Evans & Rosenbaum, 2008; Mistry et al., 2010; Moilanen, Shaw, Dishion, Gardner, & Wilson, 2009; Raver, Blair, & Willoughby, 2013). Disproportionately challenged by poverty, African American and Latino children are more likely to display inadequate self-regulatory abilities, which, in turn, put them at risk for academic failure (Evans & English, 2002; Evans & Rosenbaum, 2008; Mistry, Benner, Biesanz, Clark, & Howes, 2010).

Self-Regulation and Early Academic Adjustment

Self-regulation is a multi-component construct that represents a child's ability to volitionally modulate behaviors according to the cognitive, emotional, and social demands to achieve a goal (Blair & Raver, 2012; Blair & Ursache, 2011; Calkins & Fox, 2002; McClelland & Cameron, 2012). Self-Regulation is supported by executive functions, which are interrelated cognitive skills including working memory (the ability to hold and manipulate information in mind), inhibition (the ability to withhold a dominant response to engage in a subdominant response), and cognitive flexibility (the ability to shift the focus of attention flexibly according to different demands) (Blair & Raver, 2012; Blair & Ursache, 2011). Effective self-regulation requires coordination of working memory, inhibition, and cognitive flexibility to produce overt behaviors. Thus, observed self-regulation is often termed behavioral self-regulation (McClelland et al., 2007; McClelland et al., 2014; Montroy, Bowles, Skibbe, McClelland, & Morrison, 2016).

This study focuses on behavioral self-regulation, which is defined as the ability to utilize different cognitive processes of working memory, inhibition, and cognitive flexibility to regulate overt behaviors (McClelland et al., 2014; McClelland & Cameron, 2012). Behavioral self-regulation is of great significance for early academic achievement because children need to

monitor their behaviors to effectively engage in classroom activities (McClelland & Cameron, 2012). A large body of empirical studies find that better behavioral self-regulation predicts better school readiness and early school success in a wide range of domains, including mathematics and literary achievement, and social competence (Blair, 2002; Blair, Ursache, Greenberg, & Vernon-Feagans, 2015; McClelland & Cameron, 2011; McClelland et al., 2007; McClelland et al., 2014; Mills et al., 2018).

Poverty and Self-Regulation Development

According to the experiential canalization framework, impoverished environment can shape children's behavior patterns by disrupting their neurological system, which forms the foundation of self-regulation development in the long-term (Blair & Raver, 2012). The chronicity of early poverty exposure appears to be particularly deleterious. For example, Evan and Kim (2007) reported that the greater the number of years spent living in poverty during early childhood, the more dysregulated the neurological system becomes, which may contribute to self-regulation on a behavioral level. Longer exposure to poverty also predicts worse executive functions at age 4 (Raver et al., 2013). Besides the duration of exposure to poverty, different levels of poverty may also contribute to individual differences in self-regulation development. In a longitudinal study of low-income children from 2 and 4 years old, extreme family poverty is associated with slower growth of executive functions (Moilanen et al., 2009).

Parenting as a Mediator of the Effects of Poverty on Self-Regulation Development

According to experiential canalization, one significant pathway through which poverty shapes self-regulation development is via diminished parenting quality (Blair & Raver 2012; Bocknek, Brophy-Herbm & Banerjee, 2009; Lengua et al., 2014). Parenting practices that are responsive, flexible, supportive, and warm foster self-regulation development across

developmental stages in childhood (Calkins & Fox, 2002; Calkins, Smith, Gill, & Johnson, 1998; Fay-Stammbach, Hawes, & Meredith, 2014; Hughes & Devine, 2017; Valcan, Davis, & Pino-Pasternak, 2018). In contrast, over-controlling and harsh parenting, characterized by negative affect, criticism/blame, and use of physical discipline, can undermine self-regulation development (Calkins & Johnson, 1998; Calkins et al., 1998; Lucassen et al., 2015; Mathis & Bierman, 2015). However, the findings of parenting practices are inconsistent with African American and Latino families. Parenting characterized by both intrusiveness and warmth is linked to better child school readiness for African American but not for Latino preschoolers (Dyer, Owen, & Caughy, 2014). Moreover, intrusive parenting predicts poorer reading achievement for African American but not for Latino children (Caughy et al., 2017).

Poverty and poverty-related risks, such as low parental education, household density, and single parenthood are related to lower levels of parental sensitivity and warmth, and elevated control and harshness, which in turn are linked to less advanced self-regulation and slower self-regulation growth during toddlerhood and preschool years (Bocknek et al., 2009; Harvey et al., 2016; Lengua, Honorado, & Bush, 2007; Lengua et al., 2014). It is difficult for parents to provide effective parenting when they are under economic stress. Studies have found that poverty can harm parental mental health, resulting in elevated depressive symptoms and substance abuse, which, in turn, is associated with lower parenting quality (Bøe et al., 2014; Fitzsimons, Goodman, Kelly, & Smith, 2017; Hoffman, Crnic, & Baker, 2006; Kelley, Lawrence, Milletich, Hollis, & Henson, 2015; Maughan, Cicchetti, Toth, & Rogosch, 2007). In sum, empirical evidence supports that poverty can undermine self-regulation development through diminished parenting quality.

Current Study

Despite the abundance of research supporting the impact of poverty on self-regulation, the current literature is limited in important ways. Specifically, much of the existing research linking poverty to self-regulation development through parenting has measured self-regulation at a single point in time (e.g., Kim, Brody, & Murry, 2003; Lengua et al., 2007). Treating behavioral self-regulation as a time-invariant variable may not capture the nature of early self-regulation development, as self-regulation develops rapidly in the first a few years of life (Diamond, 2006; Kochanska, Coy, & Murray, 2001; Kopp, 1982; Vaughn et al., 1984). The current study utilizes repeated measures to examine how poverty exposure affects the *growth* of behavioral self-regulation over early childhood and how parenting may mediate this relation. Factors that impact self-regulation at a single time-point may not be the same as the factors that shape the self-regulation trajectory during a period of rapid change in early childhood. Identifying factors that impact self-regulation trajectory during early childhood can enable intervention programs to accelerate self-regulation growth in African American and Latino children living in poverty. Therefore, studies testing the link between poverty to self-regulation through parenting may benefit from treating self-regulation development as a dynamic and longitudinal construct by measuring self-regulation trajectory during early childhood.

Although most studies have not focused on self-regulation growth in early childhood, there are a few exceptions. A study of low-income African American families found that parental supportiveness predicted faster growth in self-regulation in the first three years of life (Bocknek et al., 2009). However, poverty only served as a control variable in the study, and the mediating role of parenting was not examined. Likewise, Moilanen et al., (2009) found that positive parental behaviors were associated with faster self-regulation growth and extreme poverty was

associated with slower self-regulation growth, but this study also did not examine the potential mediating role of parenting.

Another limitation of the extant literature is that it mostly compares children living in poverty to their more affluent counterparts but fails to capture the wide range of poverty levels within the low-income population when examining the mechanisms by which poverty shapes self-regulation (e.g., Lengua et al., 2014). There is significant variability in economic status within low-income families, with some families being exposed to severe poverty chronically and some families never experiencing extreme economic hardship. Capturing within-group variability of economic status among low-income families can expand our understanding of self-regulation development in the face of poverty. In studies limited to low-income participants, differences in poverty level and parenting quality are linked to differences in self-regulation outcomes (Blair et al., 2008; Chang, Shelleby, Cheong, & Shaw, 2012; Mistry et al., 2010; Moilanen et al., 2009; Raver et al., 2013). Although variability within the low-income population was captured, none of these studies examined the mediating path of parenting between poverty and growth in self-regulation.

In sum, a crucial task for researchers is to link variations in poverty level to self-regulation trajectory and to examine the mediating role of parenting among low-income African American and Latino families. To address the limitations of existing research, this study examined the association between the frequency of exposure to severe poverty and trajectory of behavioral self-regulation in a low-income African American and Latino sample. It was hypothesized that a greater frequency of exposure to extreme poverty would be associated with slower growth in behavioral self-regulation across early childhood. Furthermore, it was

hypothesized that this association would be mediated by the association between the frequency of exposure to extreme poverty with less positive and more negative parenting practices.

Method

Participants

Participants were a convenience sample recruited through community-based strategies including distribution of study information to organizations and agencies serving low-income communities (e.g., Head Start program and WIC clinics) as well as direct recruitment at community fairs in low-income communities. All the families had household incomes below 200% of the federal poverty line. Other eligibility criteria included (1) child 2½ years old at time of enrollment; (2) child had at least one parent who self-identified as either African American or Latino; (3) child hospitalized for less than 7 days at birth; and (4) family intended to remain in the area for the next year. A total of 407 families were enrolled in this study, and families were followed up at three subsequent time points: one year later (age 3½), after children entered school when most study children were in kindergarten (age 6), and one year later when most study children were in first grade (age 7).

The current study focused on behavioral self-regulation as the outcome, data for which were collected at Wave 2 through Wave 4. Thus, children who did not have any behavioral self-regulation score from Wave 2 to Wave 4 (N = 46) were excluded. Excluded families did not differ from other families enrolled in the study in terms of child gender, family income-to-needs ratio at Wave 1, or maternal education. African American children were more likely to be excluded (15.8%) compared with Latino children (7.6%), χ^2 (1) = 6.85, $p < .01$. Two children were later excluded because they were diagnosed with a significant developmental disability.

The remaining 359 families comprise the sample for the current analysis, and the demographic characteristics of this sample are shown in Table 4-1. Among these participants, 43.3% were African American, and 56.7% were Latino. All of the primary caregivers were mothers or mother-figure female relatives. More than half of African American children and Latino children were boys, and the child gender ratio did not differ by ethnicity. African American family incomes fell below 50% federal poverty line between Wave 1 and Wave 4 more often than Latino families, even though more African American mothers than Latino mothers attained a high school degree/GED or higher. Among Latino mothers, the majority of them were born outside of the US, and the majority of them spoke Spanish as their primary language.

Procedure

Data collection was completed during home visits at four time points when the child was 2½ years old (Wave 1), 3½ years old (Wave 2), in kindergarten (Wave 3), and first grade (Wave 4). A team of two home visitors visited participants' homes, and the visits lasted between 1.5 and 2 hours. The visit consisted of an interview with the primary caregiver, assessments of the child, and a semi-structured video-recorded parent-child interaction. One visitor would interview the primary caregiver, while the other would carry out the child assessment. All measures were administered to parents and children in their preferred language. For Spanish-speaking families, both home visitors were bilingual. When measures were not available in Spanish, they were forward-translated and then back-translated by a team of bilingual members, and differences were resolved by consensus.

Measures

Behavioral self-regulation. At Waves 2 through 4, behavioral self-regulation was measured using the Heads-Toes-Knees-Shoulder (HTKS) task (McClelland et al., 2007; Ponitz et al., 2008; Skibbe, Grimm, Bowles, & Morrison, 2012). The task consisted of 3 phases. During each phase, children could only move on to the test trials when they responded correctly on at least 3 practice trials. The first phase consisted of 6 practice trials and 10 test trials, and the second and the third phases each consisted of 5 practice trials and 10 test trials. Each trial consisted of a set of paired rules. In the first phase, the researcher told the child to touch his/her toes when the researcher touched his/her head and vice versa. After 10 trials of "heads and toes", the next 10 trials added in a new set of paired rules: a child was expected to touch his/her shoulders when the researcher touched his/her knees and vice versa. Finally, the last 10 trials re-combined the paired rules used in the first two phases (i.e., "touch your head" was paired with "touch your knees," and "touch your shoulders" was paired with "touch your toes").

The HTKS task was video recorded and scored from the video recordings. Each test trial was coded as incorrect (0), self-correct (1), or correct (2). A total score was computed as the total of all test trials, so the possible score ranged from 0 to 60. Based on an intra-class correlation coefficient, interrater reliability based on double coding the cases was .89 for Wave 2 and Wave 3, and .90 for Wave 4.

Parenting. Maternal parenting practices were assessed at Wave 1 using a semi-structured mother-child interaction task adapted from the "three bags" task used for the NICHD Study of Early Child Care and Youth Development (SECCYD) (NICHD Early Child Care Research Network, 1999). Three numbered bags with toys and a book in them were used for a 15-minute interaction. The first bag included a wordless picture book – *Good Dog, Carl* (Day, 1996), the

second bag contained a small kitchen that came with frying pan and salt/pepper shakers, and the third bag contained a small toy house that included toy figures and a vehicle. The mothers were asked to introduce the toys to the child in bag order and were told to do anything they wanted with the toys as long as they spent some time with each toy.

The interactions were video recorded and rated using 5-point Likert global rating scales ranging from 1 (*not at all characteristic*) to 5 (*highly characteristic*) on six dimensions of parenting including sensitivity, intrusiveness, detachment, cognitive stimulation, positive regard, and negative regard (Owen et al., 2010). Video-recordings in Spanish were rated by bilingual raters. Interrater reliability (IRR) was determined by a second coding of 29% of the interactions and calculated using an intra-class correlation coefficient. Interrater reliability ranged from.81 to .87 for the six rating items.

Frequency of exposure to severe poverty. Frequency of exposure to severe poverty was measured by how many times the family income fell below 50% of the federal poverty level at the time of home visits across 4 waves. Thus, the number of exposures to severe poverty ranged from 0 to 4.

Analysis Plans

Mean, standard deviations, and bivariate correlations were computed as the first step to see whether the mean of HTKS scores increased from Wave 2 to 4 and whether dimensions of parenting practices and exposure to severe poverty were correlated with HTKS scores. After descriptive analysis, structural equation modeling (SEM) analyses were conducted in MPlus 8.2 to examine growth of HTKS score over time and to examine the mediating path from poverty to self-regulation growth through parenting factors (Muthén & Muthén, 1998–2017). Full information maximal likelihood was used to deal with missing data and to utilize all the data

available (Little & Rubin, 1987). A linear growth curve model was conducted to capture the growth of HTKS over three waves, and confirmatory factor analysis was conducted to create latent factors of parenting practices before fitting the final mediation model.

Results

Descriptive statistics and bivariate correlations for all study variables are displayed in Table 4-2. HTKS at Wave 2 was not correlated with any parenting practice or frequency of exposure to severe poverty. HTKS at both Wave 3 and Wave 4 were positively correlated with sensitivity, cognitive stimulation, and positive regard, and negatively correlated with detachment and frequency of exposure to severe poverty. HTKS at Wave 4 was also negatively correlated with maternal negative regard, but HTKS at Wave 3 was not correlated with negative regard. Higher frequency of exposure to severe poverty was correlated with less maternal sensitivity, cognitive stimulation, and positive regard and more maternal detachment, intrusiveness, and negative regard.

Trajectory of Behavioral Self-Regulation

A linear growth curve model was tested to define the trajectory of self-regulation from Wave 2 to Wave 4. The factor loadings on the intercept factor were constrained to 1. The average ages for Wave 2, Wave 3, and Wave 4 were 41.58 months, 75.58 months, and 87.32 months, respectively. The factor loadings on the slope factor were constrained to increase at 0, 2.9, and 3.9 based on the average age intervals between waves. The model had excellent model fit, χ^2 (1) = .01, p = .92; comparative fit index (CFI) = 1.00; Tucker-Lewis index (TLI) = 1.05; root mean squared error of approximation (RMSEA) = .00; standardized root-mean-square residual (SRMR) = .00. However, because the residual variance for intercept was negative, the residual variance was constrained to 0. Model fit was not significantly impacted and still

excellent, χ^2 = 1.83, *df* = 3, *p* = .61; CFI = 1.00; TLI = 1.02; RMSEA = .00; SRMR = .04. This sample had a significant but small intercept, b = 1.42, *SE*(b) = .20, *t*(355) = 7.12, *p* < .01, 95% CI [1.03, 1.75] and showed significant increase of HTKS scores over time, b = 11.83, *SE*(b) = .19, *t*(355) = 62.93, *p* < .01, 95% CI [11.46, 12.14].

Bi-Factor Parenting Measurement Model

Before assessing the role of parenting in mediating the impact of poverty experience on children's growth in behavioral self-regulation, confirmatory factor analysis was used to fit a bi-factor model to the six rating items of mother behavior. A bi-factor model is an example of a complex factor structure in which all items load on a general factor and a subset of items also load on one or more specific factors (Reise, 2012). Previous research with this sample indicated that a bi-factor model fits the mother behavior rating items significantly better than simple factor structures such as a single factor model (i.e., all items loading on one latent factor) or a two-factor model (i.e., sensitivity, cognitive stimulation, and positive regard loading on one latent factor; intrusiveness, detachment, and negative regard loading on another latent factor) (Caughy, Mills, Owen, Dyer, & Oshri, 2017). In this study, all of the parenting dimensions loaded on the general factor, and sensitivity, intrusiveness, detachment and negative regard also loaded on a second factor - the specific factor.

The bi-factor model is shown in Figure 4-1. All the factor loadings were significant, and the model fit was excellent,χ^2 = 5.87, *df* = 6, *p* = .44; CFI = 1.00; TLI = 1.00; RMSEA = .00; SRMR = .01. The general latent factor was labeled as Sensitive Support because it was indicated by high levels of sensitivity, cognitive stimulation, and positive regard coupled with low levels of detachment, intrusiveness, and negative regard. The second latent factor was labeled as

Intrusive Insensitivity because it was indicated by high levels of intrusiveness and negative regard coupled with low levels of sensitivity and detachment.

Mediation Model

The complete mediation model tested the direct and indirect effect of the frequency of exposure to extreme poverty and two parenting latent factors on HTKS intercept and trajectory. In order to test the significance of the indirect effect, a bootstrapping procedure was used (Shrout & Bolger, 2002). The model fit was excellent, χ^2 (28) = 32.75, p =.25; CFI = 1.00; TLI = .99; RMSEA = .02; SRMR = .04. The significant standardized coefficients are shown in Figure 4-2. Higher frequency of falling below 50% federal poverty line between Wave 1 and Wave 4 was associated with slower HTKS score growth between Wave 2 and Wave 4. At the same time, the standardized indirect effect on HTKS trajectory through Sensitive Support parenting practice was (-.30) × (.25) = -.08. Unstandardized indirect effects were computed for each of 1000 bootstrapped samples, and the 95% confidence interval was computed by determining the indirect effects at the 2.5th and 97.5th percentiles. The bootstrapped unstandardized indirect effect was -.17, and the 95% confidence interval ranged from -.28 to -.05. Thus, the indirect effect was statistically significant. Maternal sensitive support partially mediated the association between exposure to severe poverty and growth in HTKS score. Exposure to severe poverty was linked to slower growth in HTKS score through decreased maternal sensitive support.

Unlike maternal Sensitive Support, maternal Intrusive Insensitivity was not associated with frequency of exposure to severe poverty. Maternal Intrusive Insensitivity was also not predictive of growth in HTKS. The mediation path from the frequency of exposure to severe poverty to the growth of HTKS through maternal Intrusive Insensitivity was not significant. In addition, higher exposure to extreme poverty was not predictive of the intercept of HTKS.

Neither maternal Sensitive Support nor maternal Intrusive Insensitivity was linked to the intercept of HTKS.

Discussion

Previous studies on poverty and self-regulation failed to capture the variation of poverty within low-income populations and their impact on the growth of behavioral self-regulation. This study sought to expand our understanding of the relation between poverty and self-regulation development by examining the association between frequency of exposure to severe poverty and trajectory of behavioral self-regulation in a low-income African American and Latino sample with parenting as the mediator. Few studies on self-regulation development have considered the influence of different levels of poverty on self-regulation trajectory while also examining the mediating role of parenting among low-income families. It was hypothesized that more frequent exposure to severe poverty would be associated with less positive and more negative parenting practices, which, in turn, would be linked to slower behavioral self-regulation growth. The study findings partially supported this hypothesis. Specifically, lower levels of maternal sensitive support partially mediated the negative effect of the frequency of exposure to severe poverty on behavioral self-regulation growth in early childhood. However, results did not indicate that intrusive and insensitive parenting practices played a significant role in mediating the impact of poverty experiences on growth in behavioral self-regulation.

In this longitudinal study, more frequent exposure to severe poverty was linked to less sensitive and supportive parenting practices, which in turn was associated with slower growth of behavioral self-regulation. The findings support the experiential canalization framework that chronic exposure to poverty is particularly devastating to self-regulation, and poverty can shape self-regulation development through impacting parenting practices (Blair & Raver 2012). These

findings are consistent with previous empirical findings of the mediation path of parenting between family income level and self-regulation growth in a more affluent sample (Lengua et al., 2014).

Inconsistent with previous empirical findings regarding intrusive and insensitive parenting practices, however, more frequent exposure to severe poverty was not associated with more maternal insensitive-intrusiveness, and more maternal insensitive-intrusiveness was not associated with slower behavioral self-regulation growth during early childhood in this low-income African American and Latino sample. One plausible explanation is that the role of intrusive and insensitive parenting practices are complex in low-income ethnic minority families, especially with the presence of positive parenting practices. A previous study found that parenting practices characterized by both intrusiveness and warmth are positively linked to better child school readiness for African American preschoolers (Dyer, Owen, & Caughy, 2014). Intrusive and insensitive parenting may have different meanings in ethnic minority families, especially when combined with positive parenting practices (Dotterer, & Pungello, 2012). The findings of positive and negative parenting practices in this study together also imply that the absence of negative parenting practices is not enough. It is essential to promote positive parenting practices to foster self-regulation growth during early childhood in low-income ethnic minority families.

Even after accounting for differences in parenting, there remained a significant direct effect of severe poverty on self-regulation growth, indicating that all possible mediating processes were not accounted for. Consistent with the experiential canalization framework, poverty may shape self-regulation development through other proximal contexts other than parenting (Blair & Raver 2012). Poverty is often linked to household chaos, family conflict, and

unsafe neighborhoods, all of which have been found to be detrimental to child socio-emotional development (Doom et al., 2018; Evans, Eckenrode, & Marcynyszyn, 2010; Palamar et al., 2015). Future studies should explore the mediating paths of other developmental contexts, such as neighborhood and household environment, on self-regulation trajectories during early childhood.

There are numerous strengths of the present study, including the direct and repeated assessment of child behavioral self-regulation using a reliable assessment method. Despite these strengths, there are a few limitations that should be kept in mind. Specifically, there appeared to be a floor effect of the HTKS at Wave 2, when the children were around 3½ years old, which may have complicated the ability to examine determinants of self-regulation due to low variability in the measure at this time point. Previous studies suggest that self-regulation emerges around age 3 (Diamond, 2006), but the HTKS task requires children to use different components of executive functions and can be difficult for children younger than 4 years old (McClelland & Cameron, 2012). Self-regulation develops rapidly during early childhood, and measurement tools that can capture the variation in self-regulation across different developmental stages in early childhood are needed.

Another limitation of this study was that only three time points of behavioral self-regulation were included. With only three time points, only a linear growth model of self-regulation could be estimated (Muthén & Muthén, 1998–2017). However, self-regulation development during early childhood may not be linear. Indeed, in a secondary analysis of over 1300 children drawn from three different samples, Montroy et al. (2016) modeled growth in HTKS performance between age 36 and 72 months, breaking timepoints into twelve 3-month intervals, and substantiated an exponential growth pattern across this age span. Future studies

should utilize more time points to increase the ability to capture non-linear growth of self-regulation. Last but not least, this study only considered maternal parenting, although other important caregivers' practices may also shape self-regulation development. The support of other family members is critical in shaping child self-regulation outcomes (Li-Grining, 2012). Future studies could include father figures or even important extended family members (e.g., grandparents).

In conclusion, this study found that more frequent exposure to severe poverty was associated with slower behavioral self-regulation growth in low-income African American and Latino families, and this association was mediated by sensitive and supportive parenting practices. This finding acknowledges the within-group variation in poverty levels among low-income populations, and such variation has implications for individual differences in behavioral self-regulation development among children living in poverty. For African American and Latino families, who are disproportionately challenged by poverty, targeting the promotion of sensitive and supportive parenting practices may be more effective than reducing intrusive and insensitive parenting practices.

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Table 4-1
Demographic Characteristics of Participants

	Child Race/Ethnicity		
	African American (N = 154)	Latino (N = 205)	$\chi^2(df)$
Child gender			.71 (1)
Boy	88 (57.1%)	108 (52.7%)	
Girl	66 (42.9%)	97 (47.3%)	
Times below 50% poverty Wave 1-Wave 4			74.60** (4)
0	41 (26.6%)	134 (65.4%)	
1	31 (20.1%)	42 (20.5%)	
2	34 (22.1%)	19 (9.3%)	
3	30 (19.5%)	7 (3.4%)	
4	18 (11.7%)	3 (1.5%)	
Maternal education			32.26** (2)
Less than high school	23 (14.9%)	86 (42.0%)	
High school / GED	68 (44.2%)	72 (35.1%)	
More than high school	63 (40.9%)	47 (22.9%)	
Latino mothers only			
Nativity			
U.S.-born		54 (26.3%)	
Foreign-born		151 (73.7%)	
Country of origin if foreign-born			
Mexico		144 (95.3%)	
Central/South America		7 (4.7%)	
Primary language			
English-dominant		11 (5.8%)	
Spanish-dominant		118 (61.8%)	
Bilingual		62 (32.5%)	

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

Table 4-2

Descriptive Results and Bivariate Correlations of Study Variables

		N	*M (SD)*	1	2	3	7	8	9	10	11	12
1	HTKS W2	280	1.42 (3.36)									
2	HTKS W3	287	35.99 (17.3)	.00								
3	HTKS W4	306	47.52 (12.5)	.07	.44**							
4	Sensitivity	356	3.14 (.97)	-.02	.21**	.21**						
5	Cognitive stimulation	356	3.29 (.92)	.02	.23**	.24**	.61**					
6	Positive regard	356	3.37 (1.02)	-.01	.15*	.20**	.64**	.61**				
7	Detachment	356	1.55 (.86)	.07	-.16**	-.18**	-.53**	-.56**	-.53**			
8	Intrusiveness	356	2.60 (1.08)	-.05	-.03	-.09	-.54**	-.15**	-.17**	.01		
9	Negative regard	356	1.42 (.81)	.07	-.12	-.13*	-.48**	-.26**	-.32**	.23**	.43**	
10	Times below 50% FPL	359	1.04 (1.26)	.08	-.28**	-.22**	-.28**	-.21**	-.25**	.18**	.11*	.12*

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

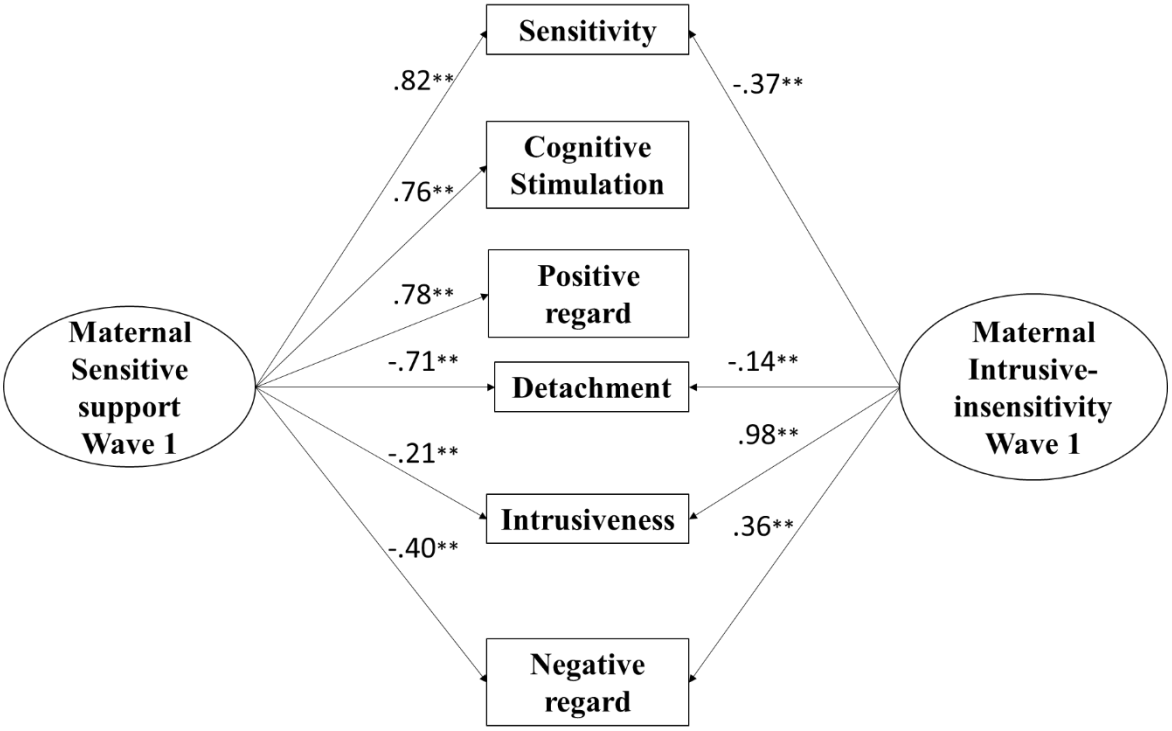

Figure 4-1. Bi-factor parenting measurement model.

Note. Standardized coefficients are shown in the figure. $^{*}p < .05$, $^{**}p < .01$.

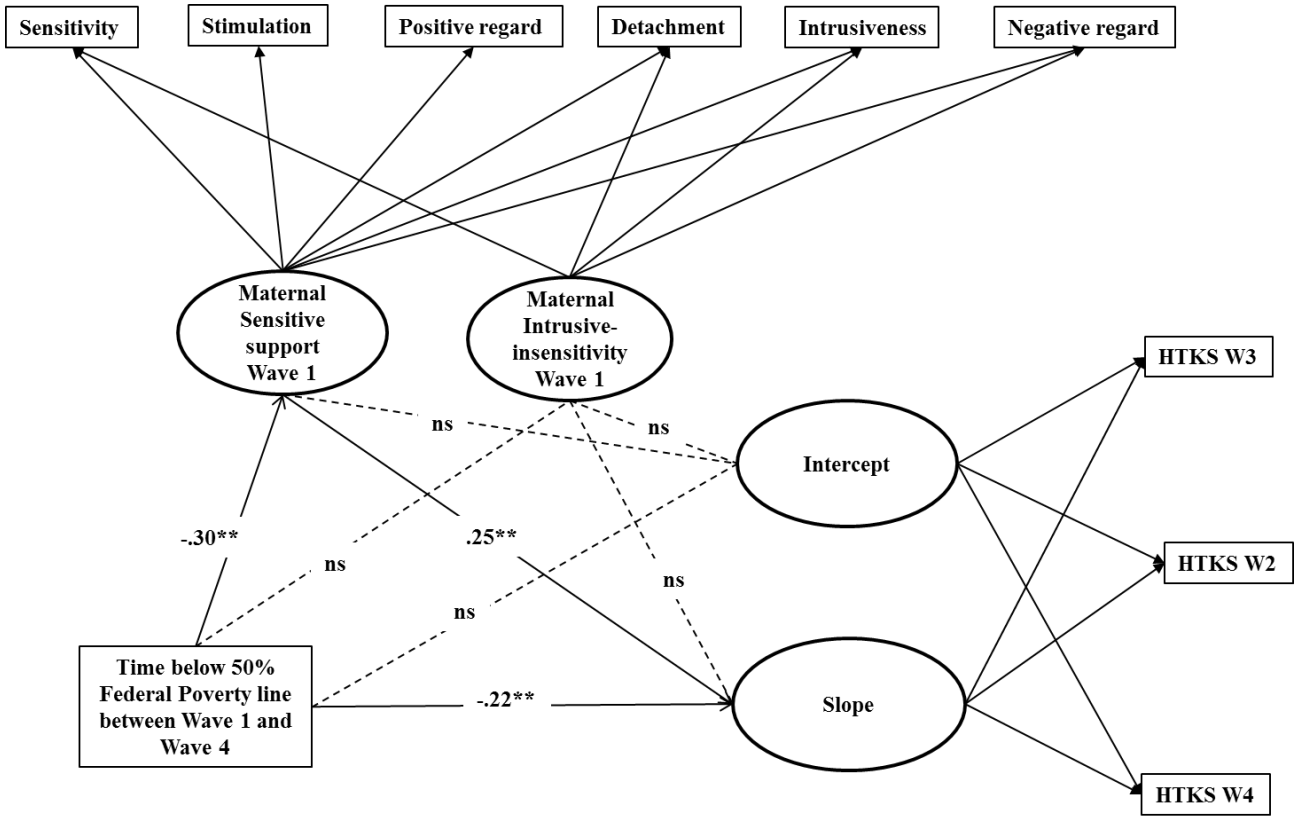

Figure 4-2. The mediation model linking poverty to SR trajectory through parenting quality.

CHAPTER 5

EXAMINING BIDIRECTIONAL RELATIONS BETWEEN PARENTING PRACTICES AND CHILD BEHAVIORAL SELF-REGULATION[2]

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Abstract

This study aimed to explore the transactional relations between parenting practices and child behavioral self-regulation in early childhood. A total of 359 low-income African American and Latino children and their mothers participated, and data were collected across four waves when the children were ages 2½ (Wave 1), 3½ (Wave 2), 6 (Wave 3) and 7 (Wave 4) years. Behavioral self-regulation was assessed at Waves 2 through 4 using the Head-Toes-Knees-Shoulder task. Parenting practices were observed at Waves 1, 2, and 3 during a semi-structured parent-child interaction. A cross-lagged model was tested to examine whether positive and negative mothering contributed to differences in child self-regulation and whether child self-regulation was associated with subsequent maternal behaviors. Maternal sensitive support at Wave 2 predicted better self-regulation at Wave 3, and maternal intrusive insensitivity at Wave 3 predicted worse self-regulation at Wave 4. Self-regulation at Wave 2 was prospectively associated with mothering practices. Implications of the study findings for the development of early intervention programs are discussed.

Keywords: Behavioral self-regulation, bidirectional effect, parent-child interaction, transactional model, early childhood

Introduction

Behavioral self-regulation is defined as a child's ability to manage his/her behavior to achieve a goal (McClelland et al., 2007; McClelland et al., 2014; McClelland & Cameron, 2012). Adequate behavioral self-regulation is essential for children's school readiness and early school success, and self-regulation skills at school entry are associated with a range of outcomes including math and reading proficiency as well as social competence (Blair, Ursache, Greenberg, & Vernon-Feagans, 2015; Denham, Warren-Khot, Bassett, Wyatt, & Perna, 2012; McClelland et al., 2014; Ponitz, McClelland, Matthews, & Morrison, 2009; Willoughby, Kupersmidt, & Voegler-Lee, 2012). Differences in parenting have been theorized as one of the most important determinants of individual differences in self-regulation development in early childhood (Carlson, 2003; Fay-Stammbach, Hawes, & Meredith, 2014).

Parenting and Self-Regulation Development

Both positive and negative parenting practices contribute to self-regulation development in different ways (Hughes & Devine, 2019). Parenting practices that are responsive, flexible, supportive, and warm foster self-regulation development (Calkins & Fox, 2002; Calkins, Smith, Gill, & Johnson, 1998; Fay-Stammbach et al., 2014; Hughes & Devine, 2017; Valcan, Davis, & Pino-Pasternak, 2018). As early as infancy, supportive parenting predicts improved infant behavioral regulation (Martinez-Torteya et al., 2014). Responsive, flexible, supportive and warm parenting is also linked to more advanced self-regulation in toddlerhood and preschool years (Brophy-Herb, Stansbury, Bocknek, & Horodynski, 2012; Eiden, Colder, Edwards, & Leonard, 2009; Lunkenheimer et al., 2008; Moilanen, Shaw, Dishon, Gardner, & Wilson, 2009). In contrast, harsh and over-controlling parenting practices contribute negatively to self-regulation development (Calkins & Johnson, 1998; Calkins et al., 1998). Parental control, including both

physical and verbal control, predicts lower self-regulation (Mathis & Bierman, 2015). Likewise, harsh parenting, characterized by negative affect, criticism/blame, and use of physical discipline is associated with less advanced self-regulation in children (Fabes, Leonard, Kupanoff, & Martin, 2001; Lucassen et al., 2015; Mathis & Bierman, 2015; Moilanen et al., 2009). However, there appear to be inconsistency in the findings of parenting practices. Parenting characterized by both intrusiveness and warmth is linked to better child school readiness for African American but not for Latino preschoolers (Dyer, Owen, & Caughy, 2014). However, intrusive parenting predicts poorer reading achievement for African American but not for Latino children (Caughy et al., 2017).

Impact of Child Self-Regulation on Parents

An abundance of research has explored the impact of parenting on self-regulation development (Fay-Stammbach et al., 2014; Hughes & Devine, 2017). However, child self-regulation may also influence parenting practices. According to the transactional model, there is a reciprocal relationship between child and parent that shapes child developmental outcomes over time (Sameroff, 2009, 2010). In the transactional model, Sameroff (2009, 2010) stresses the importance of viewing individuals and developmental context as plastic and dynamic. Both development context, in this case, parents, and children show plasticity and continuity, as characteristics of both are relatively consistent over time while still being susceptible to external influences. Sameroff (2009, 2010) also emphasizes the active role of children in their development, as children can influence their developmental context, which, in turn, shape children's developmental outcomes over time.

Parent-child interaction is an important context that socializes children to regulate their behaviors (Carlson, 2003). Child characteristics can influence how parents behave around them,

and a series of longitudinal studies have demonstrated the bidirectional relation between child and parenting practices (Kiff, Lengua, & Zalewski, 2011). For example, child temperament and externalizing behaviors can influence parenting practices. Specifically, difficult child temperament, such as negative emotionality, can motivate negative parenting practices (Bridgett et al., 1990; Feldman, Greenbaum, Mayes, & Erlich, 1997). Likewise, child fearfulness and positive emotionality evoke positive parenting practices such as encouragement and acceptance (Belsky, Rha, & Park, 2000; Lengua & Kovacs, 2005). Finally, child externalizing behavior problems, such as disruptive behaviors, predict lower levels of parental sensitivity and responsiveness and more harshness and negative affect (Besnard et al., 2013; Combs-Ronto, Olson, Lunkenheimer & Sameroff, 2009; Serbin, Kingdon, Ruttle, & Stack, 2015). The impacts of child characteristics exist because children's negative emotions, disruptive behaviors or inability to control their impulsivity may provoke parents' frustration, and such frustration may limit parents' ability to provide high-quality parenting practices (Tiberio et al., 2016).

A few longitudinal studies have examined the bidirectional association between parenting and child functioning in domains similar to behavioral self-regulation. For example, child effortful control ability, as evidenced by an ability to delay gratification, prospectively related to mothers' use of more positive and less harsh and directive parenting practices (Eisenberg et al., 2010; Tiberio et al., 2016). Children's inability to regulate emotion is associated with increased coercive and hostile parenting (Bridgett et al., 1990; Morrell & Murray, 2003). However, bidirectional relations between parenting and different aspects of child self-regulation may not be universal. Merz et al. (2017) find that higher parental responsiveness predicted better delay of gratification and cognitive flexibility, but only better child delay of gratification but not cognitive flexibility predicted more parental responsiveness.

Current Study

Although studies have examined the bidirectional relation between parenting and constructs that are similar to child behavioral self-regulation, there are important limitations to the current literature. First, there is a lack of research focusing on low-income families as most studies that examined the bidirectional relations between parenting and child self-regulation used middle-class samples or did not report the economic backgrounds of the participants (Eisenberg et al., 2010; Morrell & Murray, 2003; Tiberio et al ., 2016). This is a substantial gap because children from low-income families are at greater risk of inadequate self-regulation by the time they enter kindergarten (Obradović et al., 2012), and parenting quality is an important predictor of individual differences in self-regulation among low-income families (Blair et al., 2008; Mistry et al., 2010; Moilanen et al., 2009; Raver, Blair, & Willoughby, 2013). Testing how parenting practices and child self-regulation evolve can help us understand how self-regulation develops in the face of economic challenges in low-income families.

Another limitation in the current literature is the lack of studies on low-income African American and Latino children starting at a young age. Both African American and Latino children are disproportionately challenged by poverty and are at greater risk of inadequate self-regulatory abilities (Child Defense Fund, 2017; Evans & English, 2002; Evans & Kim, 2013; Evans & Rosenbaum, 2008; Mistry et al., 2010; Raver et al., 2013). In order to develop effective interventions, more developmental data on self-regulation development among low-income African American and Latino samples are needed to investigate potential mechanisms by which developmental context shapes self-regulation development. Although Tiberio et al. (2016) and Blair et al. (2014) did explore the bidirectional relation between parenting and self-regulation in the low-income population, their samples were predominantly White. To date, only Merz (2017)

included mostly Latino and African American children from low-income families. However, this study included only two time points of assessment. Thus, more studies are needed to investigate the bidirectional relation between both positive and negative parenting and behavioral self-regulation in low-income African American and Latino families across a longer period of time.

In sum, a crucial task for researchers today is to explore the bidirectional relations between both positive and negative parenting practices and child self-regulation development. To address the current limitations in the literature, this study aimed to explore these relations from early childhood to early elementary school. It was hypothesized that sensitive and supportive parenting would be prospectively associated with better child self-regulation skills. Furthermore, it was hypothesized that better child behavioral self-regulation would be prospectively associated with more sensitive parenting and poor child self-regulation would be prospectively associated with harsh parenting.

Method

Participants

Participants were recruited by distributing study information to organizations and agencies serving low-income communities (e.g., Head Start program & WIC clinics) and directly from community fairs in low-income communities. The eligibility criteria included 1) the family had a household income below 200% of the federal poverty line; 2) the child who was 2½ years old at time of enrollment; 3) child had at least one parent who self-identified as either African American or Latino; 4) the child was not hospitalized for more than 7 days at birth; and 5) the family intended to remain in the area for the next year. A total of 407 eligible families were enrolled. Children who did not have any behavioral self-regulation score between Wave 2 and Wave 4 were then excluded (N = 46). Families who were excluded from this study did not differ

from the families enrolled in the study in terms of child gender, family income-to-needs ratio at Wave 1, or maternal education. However, African American children were more likely to be excluded (15.8%) compared with Latino children (7.6%), χ^2 (1) = 6.85, $p < .01$. Of the remaining 361 families, two children were excluded because of a subsequent diagnosis of significant developmental disability.

The demographic characteristics of the participants are shown in Table 5-1. Among the 359 families, 43.3% were African American, and 56.7% were Latino. All of the primary caregivers were mothers or mother-figure female relatives. The child gender ratio did not differ by race/ethnicity. African American family incomes fell below 100% federal poverty line between Wave 1 and Wave 4 marginally more often than Latino families, even though more African American than Latino mothers attained a high school degree/GED or higher. The majority of the Latina mothers were born outside of the US and spoke Spanish as their primary language. Of the foreign-born Latina mothers, the vast majority (95.3%) were born in Mexico.

Procedure

Data collection was completed at four time points when the child was 2½ years old (Wave 1), 3½ years old (Wave 2), in kindergarten (Wave 3), and first grade (Wave 4) during home visits that lasted between 1.5 and 2 hours. A team of two visitors carried out the assessments of the child and a semi-structured video-recorded parent-child interaction. All measures were administered in parents' and children's preferred language. Both home visitors were bilingual for Spanish-speaking families. Measures that were not available in Spanish were forward-translated and then back-translated by trained bilingual researchers, and differences were resolved by consensus.

Measures

Behavioral self-regulation. Behavioral self-regulation was measured at Wave 2, 3 and 4 using the Heads-Toes-Knees-Shoulder (HTKS) task (McClelland et al., 2007; Ponitz et al., 2008; Skibbe, Grimm, Bowles, & Morrison, 2012). The task consisted of 3 phases. Children could only move on to the test trials when they responded correctly on at least 3 practice trials. The first phase consisted of 6 practice trials and 10 test trials. The child was told to do the opposite of what the researcher did (e.g., touch toes when researcher touches the head and vice versa). In the second phase, there were 5 practice trials and 10 test trials. The child was expected to touch his/her shoulders when the researcher touched his/her knees and vice versa. The last phase consisted of 5 practice trials and 10 test trials. The last 10 trials re-combined the paired rules in the first two phases. The child was expected to touch his/her head when the researcher touched his/her knees and touch his/her shoulders when the researcher touched his/her toes.

The HTKS task was coded based on the video recordings. Each test trial was scored as incorrect (0), self-correct (1), and correct (2). The possible score ranged from 0 to 60. The interrater reliability was .89 for Wave 2, .90 for Wave 3, and .90 for Wave 4.

Parenting. At Wave 1, Wave 2 and Wave 3, maternal parenting practices were measured during semi-structured interaction tasks adapted from the NICHD Study of Early Child Care and Youth Development (SECCYD) (NICHD Early Child Care Research Network, 1999, 2004, 2008). At Wave 1, when the children were 2½ years old, the mother was asked to introduce age-appropriate toys in three containers in a set order. The mothers were asked to first introduce a wordless picture book, then a small kitchen set, and last a small toy house that included toy figures and a vehicle. The home visitors asked the mothers to spend some time with each toy but told them they could do anything they wanted with the toys. The mother-child interactions lasted

around 15 minutes and were recorded and then coded. Several dimensions of parenting qualities were rated including sensitivity, intrusiveness, detachment, cognitive stimulation, positive regard, and negative regard using 5-point Likert global rating scales ranging from 1 (*not at all characteristic*) to 5 (*highly characteristic*) (Owen et al., 2010). Interrater reliability ranged from .81 to .87, and interrater reliability did not differ by maternal ethnicity.

At Wave 2, when the children were 3½ years old, mother-child interactions were observed in two tasks. The first task was to load plastic toppings atop a pizza crust balanced on a plastic chef's finger. The second task included a set of 11 Duplo blocks, and a picture of a bug was provided that could be constructed from the blocks. The mothers were asked to assist the children to finish the two tasks in the order stated above. The mother-child interactions lasted about 12 minutes and were recorded than coded. Similar to Wave 1, dimensions of parental sensitivity, intrusiveness, detachment, cognitive stimulation, positive regard, and negative regard were coded using 5-point Likert global rating scales ranging from 1 (*not at all characteristic*) to 5 (*highly characteristic*) (Owen et al., 2010). Interrater reliability was determined by a second coding of 20% of the interactions and ranged from .81 to .87.

At Wave 3, mothers and children were asked to work together to build a series of identical towers from blocks of varying shapes and sizes. The mother-child interactions were recorded and coded. Several dimensions of parenting qualities were rated including supportive presence, intrusiveness, detachment, cognitive stimulation, positive regard, and hostility using 5-point Likert global rating scales ranging from 1 (*not at all characteristic*) to 5 (*highly characteristic*) (Owen et al., 2010). Interrater reliability was determined by a second coding of 29% of the interactions and ranged from .73 to .86.

Covariates. Child age and the family income-to-needs ratio at each wave were included as covariates in this study. Income-to-needs ratio was computed as the total household income divided by the published federal poverty level for the family household size.

Analytic Plan

Mean, standard deviations, and bivariate correlations were computed as the first step to see whether parenting practices and HTKS scores were correlated. After conducting the descriptive analyses, a cross-lagged SEM model was fit to the data in M*plus* 8.2 (Muthén & Muthén, 1998–2017). Full information maximal likelihood was used to deal with missing data (Little & Rubin, 1987). Before testing the cross-lagged model, confirmatory factor analysis (CFA) was used to determine the best fit model for the mother rating items at each time point.

The cross-lagged model included autoregressive paths of variables across time and cross-lagged regression paths from Wave 1 parenting to Wave 2 HTKS score, Wave 2 parenting to Wave 3 HTKS score, Wave 3 parenting to Wave 4 HTKS score, and Wave 2 HTKS score to Wave 3 parenting. Family income-to-needs ratio and child age were included at each wave as covariates. Model fit was evaluated based on the chi-square goodness-of-fit test, comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). Adequate model fit is traditionally indicated by a non-significant chi-square, but it is possible to get significant chi-squares even for models that fit the data well. Thus, an RMSEA < .08, a CFI > .90, TLI > .90 and an SRMR < .08, even with a significant chi-square, can still indicate a good model fit (Brown, 2006).

Results

Means, standard deviations, and bivariate correlations are shown in Table 5-2. HTKS at Wave 2 was not significantly correlated with any parenting practices at Wave 1 or HTKS score

at Wave 3 or Wave 4. HTKS at Wave 3 was correlated with all parenting dimensions except intrusiveness at Wave 2. At the same time, HTKS at Wave 4 was positively correlated with supportive presence and positive regard and negatively correlated with intrusiveness and hostility at Wave 3.

Parenting Measurement Model

A bi-factor model is a complex measurement model with all items loading on a general factor, and a subset of items additionally loading on a specific factor (Reise, 2012). Previous study with this sample indicated that a bi-factor model fits the parenting rating items significantly better than simple factor structures such as a single factor model (i.e., all items loading on one latent factor) or a two-factor model (i.e., sensitivity, cognitive stimulation, and positive regard loading on one latent factor; intrusiveness, detachment, and negative regard loading on another latent factor) (Caughy, Mills, Owen, Dyer, & Oshri, 2017). In this study, all of the parenting dimensions loaded on the general factor, and sensitivity, intrusiveness, detachment, and negative regard also loaded on a second specific factor. As reported by Caughy et al. (2017), a general factor labeled "Sensitive Support" represented all six rating items (sensitivity, cognitive stimulation, positive regard, negative regard, detachment, and intrusiveness, with the last three items loading negatively). Additionally, negative regard and intrusiveness loaded positively and, detachment and sensitivity loaded negatively on a specific factor labeled "Intrusive Insensitivity" (Caughy et al., 2017).

To determine the best measurement model for parenting at Wave 3 for this sample, CFA models were tested for a single factor model, a two factor model, and a bi-factor model (see Table 5-3). In the single factor model, all 6 dimensions of parenting loaded on one factor. In the two-factor model, supportive presence, cognitive stimulation, and positive regard loaded on one

factor, while detachment, intrusiveness, and hostility loaded on another factor. In the bi-factor model, all six dimensions loaded on one general factor, and supportive presence, detachment, intrusiveness, and hostility loaded on a specific factor. The bi-factor model had a significantly better model fit than both the single factor model, $\Delta\chi^2$ (3) = 20.72, $p < .01$, and the two factor model, $\Delta\chi^2$ (2) = 20.71, $p < .01$. Thus, the bi-factor model was chosen for parenting practices at Wave 3. However, as supportive presence and detachment did not load on the specific factor significantly, I trimmed the two dimensions, and only intrusiveness and hostility loaded on the specific factor.

The final CFA results for parenting at Wave 3 are presented in Table 5-4, together with the CFA results for Wave 1 and 2. The model fit for CFA models were good for parenting practices at Wave 1, 2, and 3. For Wave 1 and Wave 2, the general latent factor was labeled as Sensitive Support as it was indicated by high levels of sensitivity, cognitive stimulation, and positive regard and low levels of detachment, intrusiveness, and negative regard. The second latent factor was labeled as Intrusive-Insensitivity because it was indicated by high levels of intrusiveness and negative regard coupled with low levels of sensitivity and detachment. I used the same factor names for parenting at Wave 3. The general latent factor was labeled as Sensitive Support as it was indicated by high levels of supportive presence, cognitive stimulation, and positive regard and low levels of detachment, intrusiveness, and hostility. The specific factor was labeled as Intrusive-Insensitivity as it was indicated by high levels of intrusiveness and hostility.

Cross-Lagged Structure Equation Modeling

When the cross-lagged model was first conducted, child age at each wave was found not to be related to parenting factors or HTKS at any wave. Thus, child age was excluded from the final model. Only the income-to-needs ratio at each wave was included as a covariate. The

results of this model are shown in Figure 5-1. The model fit was acceptable, $\chi^2 = 377.18$, $df = 223$, $p < .01$; CFI = .93; TLI = .92; RMSEA = .05; SRMR = .10. Parenting factors showed continuity over time, as Sensitive Support at Wave 1 was positively linked to Sensitive Support at Wave 2, and Sensitive Support at Wave 2 was positively linked to Sensitive Support at Wave 3. Likewise, Intrusive Insensitivity at Wave 1 was positively linked to Intrusive Insensitivity at Wave 2, and Intrusive Insensitivity at Wave 2 was positively linked to Intrusive Insensitivity at Wave 3. However, HTKS at Wave 2 was not predictive of HTKS at Wave 3. HTKS at Wave 3 was positively related to HTKS at Wave 4.

Neither Sensitive Support nor Intrusive Insensitivity at Wave 1 was associated with HTKS performance at Wave 2. Maternal Sensitive Support at Wave 2 was associated with better HTKS performance at Wave 3, but maternal Intrusive Insensitivity at Wave 2 was not significantly related to HTKS performance at Wave 3. However, while Maternal Sensitive Support at Wave 3 was not associated with HTKS performance at Wave 4, Maternal Intrusive Insensitivity at Wave 2 predicted significantly lower HTKS scores at Wave 4. HTKS performance at Wave 2 was not predictive of parenting factors at Wave 3.

Discussion

Previous studies have rarely explored the bidirectional association between parenting practices and child self-regulation among low-income African American and Latino families. To address the current limitation in the literature, this study utilized repeated assessments of both parenting and child self-regulation skills at four time points between ages 2½ and 7 years in a low-income African American and Latino sample. The first hypothesis was that sensitive and supportive parenting practices would be associated with better subsequent self-regulation while harsh and intrusive parenting would be associated with poorer child self-regulation across time.

The second hypothesis was that better child behavioral self-regulation would be associated with increased sensitive and supportive parenting, while poor child self-regulation would be associated with increased harsh and intrusive parenting.

The findings of this study supported the first hypothesis, as sensitive support parenting practices when the child was 3½ years old was positively associated with child self-regulation when the child was 6 years old, but sensitive support when the child was 6 years old was not prospectively linked to child self-regulation. Intrusive insensitivity when the child 3½ years old was not prospectively linked to child self-regulation, but intrusive and insensitive parenting practices when the child was around 6 years old was negatively associated with child self-regulation when the child was 7 years old. On the other hand, the findings of this study did not support the second hypothesis that child self-regulation skills would prospectively be related to differences in parent behavior. Child self-regulation when the child was 3½ years old was not associated with parenting practices 2½ years later.

Parenting when the child was 3½ and 6 years old were both prospectively associated with child self-regulation. The findings are consistent with previous studies, as higher levels of sensitive and supportive parenting practices predicted better self-regulation, whereas higher levels of insensitive and intrusive parenting practices predicted worse self-regulation (Carlson, 2003; Lucassen et al., 2015; Mathis & Bierman, 2015; Moilanen et al., 2009). Moreover, these findings add to our current understanding by suggesting that the significance of parenting practices may change over time. Specifically, sensitive and supportive parenting in early childhood may have a larger impact on self-regulation development, whereas harsh intrusive parenting practices play a more significant role for school-aged children.

One plausible explanation for the finding is that optimal parenting practices that can foster self-regulation development are different at different developmental stages. During early childhood, it is necessary for parents to monitor their children's' behaviors closely as children still need parental help to regulate their behaviors (Kopp, 1982). Therefore, intrusiveness is not a negative contributor to self-regulation development but a necessary dimension of parenting practices. However, support for autonomy become increasingly important for school-aged children. According to the self-determination theory, autonomy support motivates children to take responsibility for their own behaviors and internalize self-regulation independently (Grolnick & Farkas, 2002). Thus, at this developmental stage, parenting practices that are intrusive may undermine children's autonomy, which, in turn, can harm the internalization of self-regulation.

Another possible explanation for this is that the nature of intrusive and insensitive parenting may change over time. Intrusive and insensitive parenting when the child was 6 years old was partially indicated by hostility but negative regard when the child was 3½ years old. The negative emotions shown by parenting during parent-child interaction may be more intense when the children grew older. Negativity bias theory in social-emotional development argues that children tend to be impacted by negative information far more than positive information (Vaish, Grossmann, & Woodward, 2008). Thus, children were more likely to be impacted by intrusive and insensitive parenting practices while it was indicated by more intense negative emotions when they were 6 years old. However, we could not compare differences in intensity in negative emotions at different time points due to different coding systems for parenting practices. Thus, future studies should examine differences in parental emotionality over time.

Contrary to my hypothesis, I did not find the impact of child behavioral self-regulation on parenting practices over time. There are several plausible explanations of the null finding of child-to-parent effect. First of all, the construct of behavioral self-regulation focuses on decontextualized executive function abilities, which are less likely to provoke parental emotional reactions in real life. Previous studies that found the impact of child characteristics on parenting practices mainly focused on child temperament, disruptive behaviors, and delay of gratification. All these constructs may provoke parental emotional reactivity, which in turn can influence parental behaviors. Parents may get frustrated when their children show negative emotions, disruptive behaviors or inability to control their impulsivity in real life, and frustration may limit parents' ability to provide high-quality parenting practices (Tiberio et al., 2016). Since the HTKS score measures a construct that is less likely to provoke frustration or other negative emotions, parenting practices are less likely to be influenced.

Another plausible explanation was that the HTKS measurement did not fully capture the variance in child behavioral self-regulation at Wave 2 because of floor effect. The HTKS score at Wave 2 (when the children were around 3½ years old) was not linked to any study variable or covariate in this study. Previous studies suggest that self-regulation emerges around age 3 (Diamond, 2006), but the HTKS task requires children to use different components of executive functions and can be difficult for children younger than 4 years old (McClelland & Cameron, 2012). The HTKS score when the children were 3½ years old was the only child behavioral self-regulation that was used to predict parenting practices at a later time point, so the floor effect could have limited this study's ability to detect a child-to-parent effect.

Although we did not find the impact of child self-regulation on parenting practices, the findings still partially support the transactional model. Sameroff (2009, 2010)'s transactional

framework stresses the importance of viewing individuals and developmental contexts as plastic and dynamic, as they both show relative stability and susceptibility to external factors. The findings showed that both parenting practices and child self-regulation were continuous across developmental stages of the children, and child self-regulation was susceptible to the influence of parenting practices over time, which supported the transactional model.

There are strengths of the present study, including the direct assessment of parenting practices and child behavioral self-regulation using reliable assessment methods across several time points, but there are still a few limitations of the current study. As mentioned above, there appeared to be a floor effect of the HTKS at Wave 2. Future studies are needed to develop tools that can capture individual differences across different developmental stages in early childhood. Another limitation of this study was that I was not able to achieve cross-lagged paths for more than two time points because parenting practices were measured between Wave 1 and Wave 3, but behavioral self-regulation was measured between Wave 2 and Wave 4. Just because this study did not find that HTKS at Wave 2 was predictive of parenting behaviors at Wave 3, it does not mean that behavioral self-regulation did not have an impact on parenting practices. Future studies on parenting practices and behavioral self-regulation with more time points of cross-lagged paths are needed.

In conclusion, this study found that sensitive and supportive parenting practices when the children were 3½ years old were positively predictive of child behavioral self-regulation around 6 years old, and intrusive and insensitive parenting practices when the children were around 6 years old was negatively associated with child behavioral self-regulation around 7 years old. However, this study did not find the bidirectional relation between parenting practices and child behavioral self-regulation, as the findings did not support the predictive impact of child

behavioral self-regulation on parenting. The findings implied that intervention programs, which aim to promote self-regulation development among ethnic minority children from low-income families, should target the promotion of sensitive and supportive parenting practices during early childhood and the reduction of intrusive and insensitive parenting practices during early elementary school.

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Table 5-1
Demographic Characteristics of Participants

	Child Race/Ethnicity		
	African American (N = 154)	Latino (N = 205)	$\chi^2(df)$
Child gender			.71 (1)
Boy	88 (57.1%)	108 (52.7%)	
Girl	66 (42.9%)	97 (47.3%)	
Times below 100% poverty Wave1-Wave 4			9.07† (4)
0	21 (13.6%)	35 (17.1%)	
1	15 (9.7%)	34 (16.6%)	
2	38 (24.7%)	42 (20.5%)	
3	28 (18.2%)	47 (22.9%)	
4	52 (33.8%)	47 (22.9%)	
Maternal education			32.26**(2)
Less than high school	23 (14.9%)	86 (42.0%)	
High school / GED	68 (44.2%)	72 (35.1%)	
More than high school	63 (40.9%)	47 (22.9%)	
Latino mothers only			
Nativity			
U.S.-born		54 (26.3%)	
Foreign-born		151 (73.7%)	
Country of origin if foreign-born			
Mexico		144 (95.3%)	
Central/South America		7 (4.7%)	
Primary language			
English-dominant		11 (5.8%)	
Spanish-dominant		118 (61.8%)	
Bilingual		62 (32.5 %)	

$^{\dagger}p < .01$, $^{*}p < .05$, $^{**}p < .01$.

Table 5-2
Descriptive Statistics and Bivariate Correlation

		Mean (*SD*)	1	2	3	4	5	6	7	8	9
1	HTKS W2	1.42 (3.36)									
2	HTKS W3	35.99 (17.3)	.00								
3	HTKS W4	47.52 (12.5)	.07	.44**							
4	Sensitivity W1	3.14 (.97)	-.02	.21**	.21**						
5	Stimulation W1	3.29 (.92)	.02	.23**	.24**	.61**					
6	Positive regard W1	3.37 (1.02)	-.02	.15*	.20**	.64**	.61**				
7	Intrusiveness W1	2.60 (1.08)	-.05	-.03	-.09	-.54**	-.15**	-.17**			
8	Detachment W1	1.55 (.86)	.07	-.16**	-.18**	-.53**	-.56**	-.53**	.01		
9	Negative regard W1	1.42 (.81)	.07	-.12	-.13*	-.48**	-.26**	-.32**	.43**	.23**	
10	Sensitivity W2	3.17 (1.06)	.00	.24**	.23**	.40**	.35**	.33**	-.23**	-.28**	-.23**
11	Stimulation W2	3.11 (1.00)	-.07	.28**	.29**	.39**	.39**	.29**	-.13*	-.31**	-.19**
12	Positive regard W2	3.20 (.99)	-.03	.28**	.24**	.41**	.38**	.40**	-.12*	-.30**	-.21**
13	Intrusiveness W2	2.46 (1.07)	.00	-.14*	-.11	-.20**	-.02	-.06	.34**	-.02	.18**
14	Detachment W2	1.65 (1.00)	.04	-.22**	-.17**	-.35**	-.42**	-.36**	.01	.41**	.14**
15	Negative regard W2	1.40 (.74)	.09	-.21**	-.17**	-.27**	-.16**	-.15**	.24**	.08	.35**
16	Supportive presence W 3	3.23 (1.08)	.00	.19**	.16**	.35**	.34**	.20**	-.17**	-.23**	-.16**
17	Stimulation W3	2.70 (1.03)	.01	.09	.07	.16**	.17**	.04	-.14*	-.09	-.04
18	Positive regard W3	3.10 (1.14)	.00	.15*	.16*	.32**	.30**	.27**	-.14*	-.25**	-.13*
19	Intrusiveness W3	2.25 (1.05)	-.06	-.12*	-.28**	-.19**	-.10	-.13*	.20**	.02	.15*
20	Detachment W3	1.95 (1.08)	.11	-.17**	-.06	-.32**	-.29**	-.25**	.10	.33**	.19**
21	Hostility W3	1.28 (.62)	-.11	-.14*	-.24**	-.18**	-.17**	-.12	.16**	.11	.19**
22	Child age W2	41.58 (1.15)	.10	.10	.09	.13*	.09	.18**	-.08	-.07	-.09
23	Child age W3	75.58 (3.92)	-.06	.12*	.14*	.03	.09	.12*	.10	-.06	-.02
24	Child age W4	87.32 (3.88)	-.09	.14*	.15**	-.01	.04	.10	.06	.01	-.02
25	Income-to-needs ratio W2	.89 (.62)	.06	.23**	.15**	.19**	.14*	.11*	-.10	-.13*	-.02
26	Income-to-needs ratio W3	.90 (.66)	.00	.20**	.12*	.25**	.16**	.15**	-.16**	-.11	-.14*
27	Income-to-needs ratio W3	.93 (.67)	.02	.18**	.13*	.27**	.18**	.17**	-.16**	-.15*	-.11

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

Table 5-2
Continued

		10	11	12	13	14	15	16	17	18	19	20	21
11	Stimulation W2	.67**											
12	Positive regard W2	.74**	.66**										
13	Intrusiveness W2	-.58**	-.22**	-.35**									
14	Detachment W2	-.58**	-.65**	-.62**	.04								
15	Negative regard W2	-.42**	-.32**	-.43**	.46**	.15**							
16	Supportive presence W 3	.30**	.40**	.37**	-.07	-.29**	-.12						
17	Stimulation W3	.22**	.25**	.21**	-.03	-.18**	.04	.70**					
18	Positive regard W3	.38**	.37**	.42**	-.12	-.27**	-.13*	.75**	.59**				
19	Intrusiveness W3	-.25**	-.24**	-.22**	.30**	.08	.17**	-.39**	-.24**	-.33**			
20	Detachment W3	-.33**	-.38**	-.40**	.04	.32**	.16**	-.69**	-.48**	-.57**	.26**		
21	Hostility W3	-.20**	-.22**	-.23**	.19**	.13*	.20**	-.38**	-.15*	-.38**	.38**	.24**	
22	Child age W2	.09	.12*	.01	.03	-.16**	.01	.05	.07	.00	-.06	-.05	-.03
23	Child age W3	.04	.13*	.07	.00	-.13*	-.01	-.02	-.06	.00	-.02	-.09	-.12*
24	Child age W4	.06	.10	.06	-.04	-.09	-.03	-.05	-.11	-.02	-.08	-.05	-.12
25	Income-to-needs ratio W2	.26**	.24**	.24**	-.11*	-.19**	-.08	.14*	.11	.07	-.03	-.11	.03
26	Income-to-needs ratio W3	.31**	.21**	.26**	-.23**	-.16**	-.18**	.23**	.11	.18**	-.17**	-.20**	-.14*
27	Income-to-needs ratio W3	.26**	.21**	.18**	-.21**	-.08	-.11	.24**	.18**	.178**	-.26**	-.18**	-.09

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

Table 5-3

Comparing a Single Factor Model, a Two Factor Model, and a Bi-Factor Model for Parenting at Wave 3

			Two Factor				Bi-factor			
	Single Factor		Positive sensitivity		Detached-intrusive		Sensitive support		Intrusive-insensitivity	
Variable	β	95% CI	β	95% CI	B(β)	95% CI	β	95% CI	B(β)	95% CI
Supportive presence	.96	.93, .99	.96	.93, .99			.96	.93, .99	-.02	-.10, .06
Stimulation	.72	.66, .78	.72	.66, .78			.72	.66, .78		
Positive regard	.78	.73, 84	.78	.73, .84			.78	.73, .84		
Detachment	-.72	-.78, -.65			.41	.63, .80	-.72	-.78, -.67	-.02	-.12, .08
Intrusiveness	-.41	-.51, -.31			.71	.30, .51	-.39	-.51, -.27	.92	.87, .97
Hostility	-.39	-.49, -.29			.39	.28, .50	-.38	-.48, -.27	.25	.14, .36
Model fit										
χ^2	43.64		43.63				22.92			
df	9		8				6			
p value	<.01		<.01				<.01			
CFI	.95		.95				.98			
TLI	.92		.91				.94			
RMSEA	.12		.13				.10			
SRMR	.05		.05				.03			

Note. CI = confidence interval; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual.

Table 5-4

Bi-Factor Models for Parenting at Wave 1-3

	Wave 1		Wave 2		Wave 3	
	Sensitive support	Intrusive-insensitivity	Sensitive support	Intrusive-insensitivity	Sensitive support	Intrusive-insensitivity
Variable	β [95% CI]	β [95% CI]	β [95% CI]	β [95% CI]	β [95% CI]	β [95% CI]
Sensitivity	.82 [.77, .87]	-.37 [-.45, -.30]	.86 [.82, .89]	-.30 [-.37, -.23]	.96 [.93, 1.00]	
Stimulation	.76 [.70, .81]		.80 [.76, .85]		.72 [.66, .78]	
Pos regard	.78 [.73, .83]		.84 [.80, .88]		.78 [.73, .84]	
Detachment	-.71 [-.77, -.65]	-.14 [-.22, -.05]	-.76 [-.81, -.71]	-.24 [-.32, -.16]	-.72 [-.78, -.65]	
Intrusiveness	-.21 [-.33, -.09]	.98 [.95, 1.00]	-.35 [-.46, -.25]	.94 [.90, .98]	-.40 [-.50, -.30]	.92 [.87, 96]
Neg regard	-.40 [-.49, -.30]	.36 [.27, .44]	-.40 [-.50, -.30]	.34 [.25, .43]	-.38 [-.49, -.28]	.24 [.14, .35]
Model fit						
χ^2	5.87		28.54		23.70	
df	6		6		8	
p value	.44		<.01		<.01	
CFI	1.00		.98		.98	
TLI	1.00		.95		.96	
RMSEA	.00		.11		.08	
SRMR	.01		.03		.03	

Note. CI = confidence interval; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual. Pos = positive; Neg = negative. The dimension equivalent to sensitivity in Wave 3 is supportive presence, and the dimension equivalent to negative regard is hostility in Wave 3.

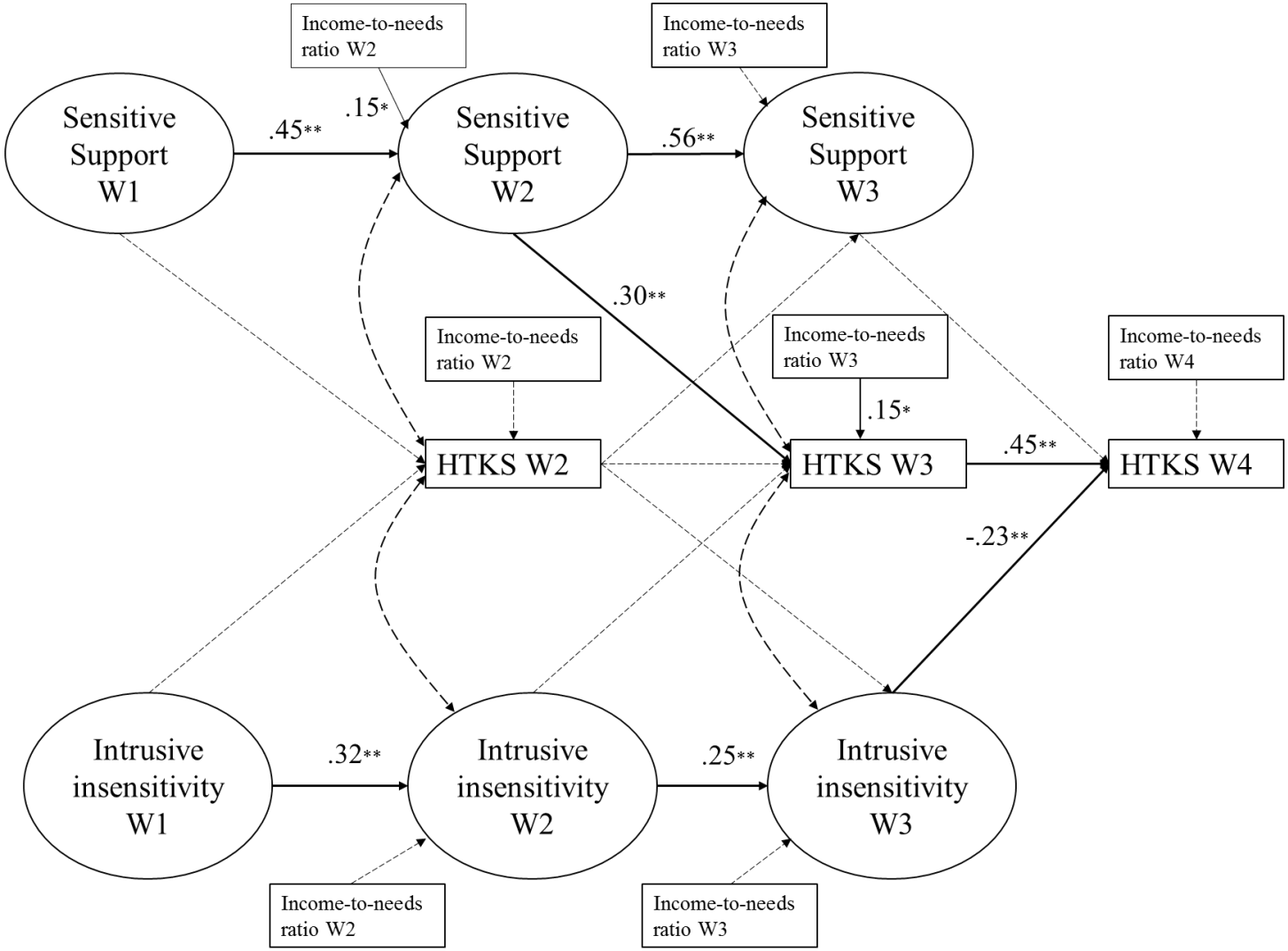

Figure 5-1. Cross-Lagged Model of Parenting and HTKS between Wave 1 and Wave 4.
Note. Only significant standardized coefficients are shown in the figure. Non-significant paths are shown with dash arrows.

CHAPTER 6

DISCUSSION

The purpose of this dissertation was to examine how poverty and parenting practices shape the early development of self-regulation in low-income African American and Latino families. The conceptual framework was drawn from the integrative model (Garc á-Coll et al., 1996) and the transactional model (Sameroff, 2009, 2010) as well as empirical findings. Specifically, this framework proposed that out-of-family contexts such as neighborhood environment, acculturation stress, and discrimination, as well as family contexts such as family level poverty, household environment, and parenting practices, can shape self-regulation development. At the same time, children, as active participants in their development, can have an impact on their developmental context, which in turn, influences their self-regulation development. This dissertation focused on the social determinant of family-level poverty and the mechanisms by which poverty shapes self-regulation development via influencing parenting practices. The two research questions proposed in this study were the following: 1) Does family-level poverty impact the growth of self-regulation via altering the quality of parenting practices? and 2) Is there a bidirectional relation between parenting practices and child self-regulation development.

This dissertation was a secondary data analysis of data from the Dallas School Readiness Project (DPReP). The sample of the study was a convenience sample recruited in low-income communities through agencies and organizations (e.g., Head Start Program and WIC clinics) as well as directly at community fairs. Data collection was completed during home visits at four

time points when the child was 2½ years old (Wave 1), 3½ years old (Wave 2), in kindergarten (Wave 3), and in first grade (Wave 4). A total of 359 families were included in this dissertation. The dependent variable for this dissertation is child self-regulation, which was measured at Wave 2, 3, and 4 by the Heads-Toes-Knees-Shoulder (HTKS) task. The HTKS task has demonstrated validity and reliability with diverse samples in previous research (Lipsey et al., 2014; McClelland et al., 2007; McClelland et al., 2014; Montroy et al., 2014; von Suchodoletz et al., 2013; Wanless et al., 2011). Parenting practices were measured at Wave 1, 2, and 3 in semi-structured parent-child interactions. Several positive and negative dimensions of parenting practices were rated globally using a 5-point Likert scale. Family-level poverty was indicated by the frequency of exposure to severe poverty and family income-to-needs ratio in Manuscript #1 and Manuscript #2, respectively. Structure equation modeling (SEM) analyses were conducted in M*plus* 8.2 to answer the research questions (Muthén & Muthén, 1998–2017). A mediation model was conducted in Manuscript #1, and a cross-lagged model was conducted in Manuscript #2. The results and discussions are presented in the summaries and discussions of the two manuscripts.

Summary of Manuscript #1

Manuscript #1 sought to answer two research questions. The first question was whether the frequency of exposure to severe poverty was linked to growth in self-regulation. It was hypothesized that more frequent exposure to severe poverty would be associated with slower growth in self-regulation. The second question was whether the association between exposure to severe poverty and growth in self-regulation would be mediated by parenting practices. It was hypothesized that more frequent exposure to severe poverty would be associated with lower levels of sensitive parenting and higher levels of harsh parenting, which, in turn, would both be linked to slower growth in self-regulation.

Regarding the first research question, it was found that more frequent exposure to severe poverty was associated with slower growth in self-regulation, which supported the first hypothesis. This finding is consistent with previous research findings regarding poverty and self-regulation development. Studies have linked low-income and related risks to less well-developed self-regulation and slower growth in self-regulation during early childhood (Blair et al., 2008; Chang et al., 2012; Ellis et al., 2014; Evans & English, 2002; Evans & Kim, 2013; Evans & Rosenbaum, 2008; Lengua et al., 2015; Mistry et al., 2010; Moilanen et al., 2010; Raver et al., 2013; Wanless et al., 2011). Moreover, as this study focused on different levels of exposure to severe poverty, the results that variations in economic well-being within low-income families are important. There is a wide range of poverty levels within the low-income population, with some families being exposed to severe poverty chronically and some families never experiencing extreme economic hardship. Previous studies have suggested that chronic exposure to poverty during childhood is linked to worse self-regulation development (Evan & Kim, 2007; Raver et al., 2013). The findings added to the current literature by demonstrating that frequent exposure to severe poverty may be especially detrimental to growth in self-regulation during early childhood among low-income African American and Latino families.

Regarding the second research question, more frequent exposure to severe poverty was linked to less sensitive support by mothers, which, in turn, was associated with slower growth in child self-regulation. However, more frequent exposure to severe poverty was not linked to more intrusive insensitivity, and intrusive insensitivity was not linked to slower growth in self-regulation. Thus, the second hypothesis was partially supported. These findings are consistent with previous empirical findings of the mediation path of parenting between family income level and growth in self-regulation in a more affluent sample (Lengua et al., 2014). Moreover, the

finding added more supportive evidence to the integrative model (Garc á-Coll et al., 1996) as well as the experiential canalization framework (Blair & Raver, 2012a) by demonstrating that social determinants of poverty can shape child self-regulation development through parenting practices, which is a more proximal context.

The findings that negative parenting practices did not play a significant role in mediating the impact of poverty on growth in self-regulation was inconsistent with previous empirical findings regarding poverty and negative parenting practices (Bocknek et al., 2009; Harvey et al., 2016; Lengua et al., 2007; Lengua et al., 2014; Lucassen et al., 2015; Mathis & Bierman, 2015). It is possible that the role of intrusive and insensitive parenting practices are complex in low-income ethnic minority families. A previous study found that parenting practices characterized by both intrusiveness and warmth are positively linked to better child school readiness for African American preschoolers (Dyer, Owen, & Caughy, 2014). Thus, intrusive and insensitive parenting may have different meanings when combined with positive parenting practices (Dotterer & Pungello, 2012). Because of the complex meaning of negative parenting practices, the absence of negative parenting practices may not be enough for optimal self-regulation development. It is essential to promote positive parenting practices to foster growth in self-regulation during early childhood in low-income ethnic minority families.

Positive parenting practices only partially mediated the link between exposure to severe poverty and growth in self-regulation, indicating that all possible mediating processes were not accounted for. This is also consistent with the integrative model (Garc á-Coll et al., 1996) and the experiential canalization framework (Blair & Raver, 2012a), as poverty may shape self-regulation development through a series of proximal contexts other than parenting. As reviewed in the introduction, poverty is also linked to household chaos, family conflict and unsafe

neighborhoods, all of which have been found to be detrimental to child socio-emotional development (Doom et al., 2018; Evans, Eckenrode, & Marcynyszyn, 2010; Palamar et al., 2015).

Summary of Manuscripts #2

Manuscript #2 aimed to address the current limitation in the literature by exploring the bidirectional relations between parenting practices and behavioral self-regulation from age 2½ to age 7 years in a low-income African American and Latino sample. The first hypothesis was that positive parenting practices would be prospectively associated with better child self-regulation skills, and harsh parenting would be prospectively associated with poorer child behavioral self-regulation. The second hypothesis was that better child behavioral self-regulation would be prospectively associated with more sensitive parenting and that poorer child self-regulation would be prospectively associated with more harsh parenting.

The findings of this study partially supported the first hypothesis. Sensitive support when the child was 3½ years old was associated with better self-regulation in kindergarten, and intrusive/insensitive parenting in kindergarten was associated with poorer child self-regulation in first grade. These findings are consistent with previous studies (Carlson, 2003; Lucassen et al., 2015; Mathis & Bierman, 2015; Moilanen et al., 2009). Moreover, the findings suggest that sensitive and supportive parenting in early childhood may have a bigger impact on self-regulation development than intrusive and harsh parenting, whereas negative parenting practices may have a more significant role for school-aged children. One plausible explanation for the finding is that optimal parenting practices that can foster self-regulation development are different at different developmental stages. While it is necessary for parents to monitor children's behaviors closely in early childhood, such intrusiveness may become harmful for school-aged

children (Grolnick & Farkas, 2002; Kopp, 1982). As the children grow older and the need for autonomy support increases, parenting practices that are intrusive may undermine children's autonomy, which, in turn, can harm the internalization of self-regulation (Grolnick & Farkas, 2002). Another plausible explanation of the change in the impacts of parenting practices is that the nature of parenting changes over time. Intrusive and insensitive parenting was partially indicated by hostility when the child was 6 years old but negative regard when the child was 3½ year old. The negative emotions shown by parents during parent-child interaction may be more intense with older children. Negativity bias theory in social-emotional development argues that children tend to be impacted by negative information far more than positive information (Vaish, Grossmann, & Woodward, 2008). Thus, children who were exposed to more intense negative emotions were more likely to be impacted by negative parenting practices. However, we could not compare the differences in intensity in negative emotions at different time points due to different coding systems for parenting practices. Thus, future studies should examine differences in parent emotionality over time.

Contrary to the second hypothesis, I did not find that child self-regulation skills had a prospective effect on parent behavior. There are several plausible explanations of the null finding of child-to-parent effect. First of all, the construct of behavioral self-regulation focuses on decontextualized executive function abilities, which may be less likely to provoke parental emotional reactions in real life. Previous studies that found the impact of child characteristics on parenting practices have primarily focused on child temperament, disruptive behaviors, and delay of gratification (Belsky et al., 2000; Besnard et al., 2013; Bridgett et al., 1990; Combs-Ronto et al., 2009; Feldman et al., 1997; Lengua & Kovacs, 2005; Merz et al., 2017; Serbin et al., 2015; Tiberio et al., 2016). All of these constructs are likely to provoke parental emotional

reactivity, which, in turn, can influence parent behavior. Parents may get frustrated when their children show negative emotions, disruptive behaviors or inability to control impulsivity, and such frustration may limit parents' ability to provide high-quality parenting practices (Tiberio et al., 2016). Low levels of behavioral self-regulation may be less likely to provoke frustration or other negative emotions on the part of parents. As such, individual differences in HTKS task performance specifically may be less likely to influence parenting practices.

Similar to manuscript #1, there may have been a floor effect for the HTKS measure at its first administration when children were 3½ years old. HTKS performance at this time point was not linked to any study variable or covariate in this study. As such, the HTKS task at age 3½ may have failed to capture the variation in child self-regulation. Because HTKS performance at age 3½ the only child behavioral self-regulation measure used to predict parenting practices at a later time point, the floor effect may have limited this study's ability to detect the impact of child self-regulation on parents. As recommended by the developer of the HTKS (M. McClelland, personal communication, March 2019), I attempted to increase the variability in the HTKS by including practice trials in the score total, but study results were unchanged.

Summary and Discussion of Overall Results

This dissertation aimed to address some important limitations of the current literature on self-regulation development among low-income children. The first limitation this dissertation aimed to address was that the previous studies fail to capture variability in poverty levels among low-income families when exploring the mechanisms by which poverty shapes self-regulation development. The extant literature either compares children living in poverty to their more affluent counterparts (Lengua et al., 2014) or fails to examine potential mediating paths between poverty and self-regulation development within low-income samples (Blair et al., 2008; Chang et

al., 2012; Mistry et al., 2010; Moilanen et al., 2010; Raver et al., 2013). Moreover, more studies focusing on African American and Latino children are needed. African American and Latino children are disproportionately challenged by poverty and are at greater risk of inadequate self-regulatory abilities (Child Defense Fund, 2017; Evans & English, 2002; Evans & Kim, 2013; Evans & Rosenbaum, 2008; Mistry et al., 2010; Raver et al., 2013). However, the current literature on low-income populations has focused on predominantly White samples (Blair et al., 2014; Tiberio et al., 2016). Thus, more developmental data on self-regulation development among low-income African American and Latino samples are especially needed to investigate potential mechanisms by which developmental context shapes self-regulation in order to support the design of intervention programs.

Another limitation of the current literature is that much of the existing research linking poverty to self-regulation development through parenting has measured self-regulation at a single point in time (e.g., Kim, Brody, & Murry, 2003; Lengua et al., 2007). Treating self-regulation as a time-invariant variable may not capture the nature of early self-regulation development, as self-regulation develops rapidly in the first a few years of life (Diamond, 2006; Kochanska et al., 2001; Kopp, 1982; Vaughn et al., 1984). We need to treat self-regulation development as a longitudinal and dynamic process. Thus, examining how poverty and parenting impact growth in self-regulation is especially needed.

A third limitation is that there is a lack of studies investigating the bidirectional relation between parenting practices and child self-regulation in low-income African American and Latino families. Among studies that specifically tested this bidirectional relation, Tiberio et al. (2016) and Blair et al. (2014) used low-income samples, but their samples were predominantly White. To date, Merz's study (2017) is the only study that included mostly Latino and African

American children from low-income families. However, this study only included positive parenting practices and two time points. Thus, studies are still needed to investigate the bidirectional relation between both positive and negative parenting practices and self-regulation in low-income African American and Latino families with more time points.

To address the limitations, this dissertation sought to answer the following research questions in two studies. The first question of Study 1 was "are individual differences in family poverty level associated with growth in self-regulation during early childhood among low-income African American and Latino children?" Hypothesized 1.1.1 was that higher levels of family poverty would be associated with slower growth in self-regulation. The findings in manuscript #1 supported Hypothesis 1.1.1. More frequent exposure to severe poverty was associated with slower growth in self-regulation among low-income African American and Latino children.

The second question of Study 1 in this dissertation was "does the quality of parenting mediate the link between family poverty level and growth in self-regulation during early childhood among low-income African American and Latino children?" There were two hypotheses for this question. Hypothesis 1.2.1 was that higher levels of family poverty would be associated with lower levels of positive parenting practices, which, in turn, would be associated with slower growth in child self-regulation. Hypothesis 1.2.2 was that higher levels of family poverty would be associated with higher levels of negative parenting practices, which, in turn, would be associated with slower growth in child self-regulation. The findings from manuscript #1 supported hypothesis 1.2.1. More frequent exposure to severe poverty was linked to less sensitive support, which, in turn, was associated with slower growth in self-regulation. The indirect effect was also significant. It was also found that more exposure to severe poverty was

not associated with more intrusive insensitivity, and intrusive insensitivity was not linked to slower growth in self-regulation. Therefore, Hypothesis 1.2.2 was not supported.

The first question of the second study was "does the quality of parenting predict child self-regulation among low-income African American and Latino families?" Hypothesis 2.1.1 was that higher levels of positive parenting practices would predict better child self-regulation. Hypothesis 2.1.2 was that higher levels of negative parenting practices would predict worse child self-regulation. Sensitive support at age 3½ years was associated with better self-regulation at kindergarten, but sensitive support at kindergarten was not predictive of HTKS in first grade. Intrusive insensitivity at age 3½ years was not predictive of self-regulation at kindergarten, but intrusive insensitivity at kindergarten was associated with poorer self-regulation in first grade. These findings of Study 2 partially supported both hypotheses.

The second question of the second study was "does child self-regulation predict the quality of parenting among low-income African American and Latino families?" Hypothesis 2.2.1 was that better child self-regulation would predict higher levels of positive parenting practices. Hypothesis 2.2.2 was that better child self-regulation would predict lower levels of negative parenting practices. Child self-regulation at age 3½ years was not associated with parent sensitive support or intrusive insensitivity in kindergarten. Thus, Hypotheses 2.2.1 and 2.2.2 were not supported in this dissertation.

Implications of the Study

Building upon the integrative model of minority child development (Garc á-Coll et al., 1996) as well as the transactional model (Sameroff, 2009, 2010), this dissertation proposed a conceptual framework by which family-level social determinants shape child self-regulation through processes in family contexts. This dissertation sought to examine one of the mechanisms

by which family-level poverty shapes self-regulation development through parent-child interaction context. Overall, the findings of this dissertation supported the conceptual framework. Family level poverty was influential in parenting practices, as a higher level of family poverty was associated with less positive parenting practices. Within the parent-child interaction contexts, both parenting practices and child self-regulation were continuous over time. The impact of parenting practices on self-regulation was evident across developmental stages from early to middle childhood.

The findings of this dissertation expand our understanding of self-regulation development in low-income African American and Latino families. Family experiences vary greatly within the low-income African American and Latino families. Despite all challenged by poverty, there are different levels of exposure to poverty as well as parenting quality, and such differences can contribute to the differences in the development of self-regulation. Only comparing children from low-income families to their more affluent peers may not be enough to capture the whole picture of self-regulation development in the face of poverty. Studying the within-group variability provided more information for us to understand the risks as well as resilience in low-income families. The within-group variability acknowledges that it is still possible for children to develop adequate self-regulation and thrive in the face of challenges, and understanding the intermediating mechanisms between poverty and outcomes can help us target the right processes in intervention to foster self-regulation development.

This dissertation also contributed to the current literature by treating self-regulation development as a longitudinal and dynamic process. This dissertation reassured that family poverty and parenting practices not only contribute to self-regulation at a given time point but also contribute to the trajectory of self-regulation during early childhood. Moreover, the findings

of this dissertation also suggest potential differentiated effects of positive and negative parenting practices at different timing. The first study found that sensitive and supportive but not intrusive and insensitive parenting practices when the child was 2½ years old contributed to the growth in self-regulation. Similarly, the second study found that sensitive and supportive but not intrusive and insensitive parenting practices when the child was 3½ years old contributed to self-regulation development. However, the significance of parenting practices shifted when children enter school. These findings suggest that intervention programs may need to target different parenting practices at different child ages. During the preschool years, promoting sensitive and supportive parenting practices may be more effective than reducing intrusive and insensitive parenting practices. However, after the children enter elementary school, the intervention programs may need to target more on reducing the intrusive and insensitive parenting practices than just promoting positive parenting practices.

Study Strengths and Limitations

This dissertation examined the understudied population of African American and Latino children and added developmental data to the mechanisms by which social determinants can shape self-regulation development among low-income families. In order to capture self-regulation development as a longitudinal and dynamic process, this dissertation used a longitudinal design. As self-regulation develops rapidly in early childhood (Diamond, 2006; Kochanska et al., 2001; Kopp, 1982; Vaughn et al., 1984), this longitudinal design captured the growth of self-regulation, which may be more informative than studies focusing self-regulation on a single time point. Moreover, the longitudinal design also helped us understand the potentially different impacts of parenting practices at different time points in the developmental processes. Another strength of this dissertation is the use of a reliable repeated measure of

behavioral self-regulation from Wave 2 to Wave 4 that enabled me to model the growth of behavioral self-regulation. This study also measured several dimensions of parenting practices in a semi-structured parent-child interaction. The observational measurement was superior to self-report data because it avoided social desirability bias from parents. Moreover, the parenting measurement was a comprehensive evaluation of parenting quality, as it included both positive and negative dimensions.

Despite these strengths, there are a few limitations to the methodology as well as the theoretical contribution that should be kept in mind. As mentioned above, there appeared to be a floor effect of the HTKS at Wave 2. As most of the children had a score close to zero, the study was unable to capture the variance in self-regulation development when the children were 3½ years old. The floor effect might have complicated the ability to describe the growth in self-regulation as well as the predictive effect of self-regulation on parenting. Previous studies suggest that self-regulation emerges around age 3 (Diamond, 2006), but the HTKS task requires children to use different components of executive functions and can be difficult for children younger than 4 years old (McClelland & Cameron, 2012). Self-regulation develops rapidly during early childhood, and measurement tools that can capture the variation in self-regulation across different developmental stages in early childhood are needed.

Another limitation of this dissertation was that I was not able to achieve cross-lagged paths for more than two time points because parenting practices were measured between Wave 1 and Wave 3, but behavioral self-regulation was assessed between Wave 2 and Wave 4. Just because this study did not find that HTKS at Wave 2 was predictive of parenting behaviors at Wave 3, it does not mean that behavioral self-regulation cannot impact parenting practices. Future studies on parenting practices and behavioral self-regulation with more time points of

cross-lagged paths are needed. Regarding parenting, only maternal parenting practices were included in this dissertation. The support of other family members is also critical in shaping child self-regulation outcomes (Li-Grining, 2012). Future studies could include father figures or even important extended family members (e.g., grandparents).

Besides the limitations to the methodology, there are a few limitations to this dissertations' theoretical contribution to the current literature. This dissertation only examined the path by which the social determinants of poverty shape child self-regulation development through parenting practices. However, there may be other pathways by which poverty can shape self-regulation development among low-income African American and Latino children. According to the literature review and conceptual framework, family poverty can also impact child socio-emotional development via household chaos, family conflict and unsafe neighborhoods (Doom et al., 2018; Evans et al., 2010; Palamar et al., 2015). In this dissertation, parenting only partially mediated the association between family-level poverty and growth in self-regulation, indicating that there may be other mediating paths that were not examined. Future studies need to examine the other potential paths, by which poverty can shape child self-regulation development. Moreover, African American and Latino families also face unique challenges besides disproportionately challenged by poverty. Previous studies found that being an ethnical minority is associated with lower self-regulation even when SES is controlled (Barnes et al., 2016; Moilanen et al., 2010; Sektnan et al., 2010). Therefore, other social determinants may also shape self-regulation development in African American and Latino children. For example, racial/ethnic discrimination and acculturation pressure are unique stressors that African American and Latino families experience, which can impact self-regulation development directly or through diminished parenting quality (Averhart & Bigler, 1998;

Barbarin et al., 2010; Berry, 2007; Branch & Newcombe, 1986; Cervantes & Bui, 2017; Doucet & Tudge, 2007; Keels & Raver, 2009; Lorenzo-Blanco et al., 2016; Pakizegi, 1985). Future studies should identify unique challenges African American and Latino children and their parents face to understand self-regulation development in African American and Latino families.

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