AN ABSTRACT OF THE DISSERTATION OF

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Children's early self-regulation skills have long-term implications for a variety of academic, social, and health outcomes. Unfortunately, children facing multiple family risk factors (e.g., harsh parenting, economic disadvantage) are more likely to struggle with early self-regulation. Despite early disparities in self-regulation, promising intervention evidence suggests that high quality prekindergarten experiences can improve children's self-regulation skills, especially for children with self-regulatory challenges. At this point, few studies have examined how children's self-regulation may differ according to the unique combinations of family risks they experience during their first three years of life. Furthermore, it remains largely unknown how children's experiences in typical early care and education settings relate to their self-regulation development. To address these gaps in the literature, this dissertation includes two studies focused on understanding children with low early self-regulation. The first study addressed how distinct combinations of family risk factors (i.e., family risk profiles), as experienced during the first three years of life, predicted children's self-regulation at 36-months.

Person-centered analyses indicated children's family risk experiences were captured by three distinct family risk profiles: 1) low risk, 2) low-income/low cognitive stimulation/single parent (ICS), and 3) low-income/low cognitive stimulation/high parental harshness (ICH). Each of the three profiles predicted significant differences in children's early self-regulation, with children characterized by the profile including high harshness (ICH) exhibiting the lowest self-regulation skills. Study 2 examined how two dimensions of early care and education process quality (positivity/responsivity and cognitive stimulation) experienced during children's prekindergarten year predicted their subsequent self-regulation in the fall of kindergarten. This study also considered children's earlier self-regulation as a moderator of both quality dimensions. Results indicated that higher positivity/responsivity predicted stronger self-regulation in the fall of kindergarten for children with low early self-regulation, but not for the overall sample. Cognitive stimulation did not predict children's self-regulation in kindergarten, regardless of early self-regulation skills. Overall, findings from these studies help explain *why* some children struggle more with early self-regulation than others, and *how* high quality early care and education can support children's transition to kindergarten, particularly for children with low early self-regulation.

# Supporting Children who Struggle with Self-Regulation:

# The Role of Early Family Risk and Child Care Quality

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Megan E. Pratt

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I understand that my dissertation will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my dissertation to any reader upon request.

Megan E. Pratt, Author

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## CONTRIBUTION OF AUTHORS

Shannon Lipscomb and Megan McClelland were contributing authors for the first and second manuscripts.

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## INTRODUCTION

A large proportion of children enter formal schooling without the self-regulation skills necessary to effectively engage in the learning process (Lin, Lawrence, & Gorrell, 2003; Rimm-Kaufman, Pianta, Cox, 2000). For example, kindergarten teachers frequently report that more than half of their students struggle with self-regulation skills, such as following directions and working independently (e.g., Rimm-Kaufman et al., 2000). Disparities in children's self-regulation skills have been linked to children's experiences of various family risk factors, ranging from demographic (e.g., low-income) to family process (e.g., parental harshness) realms (Evans, Kim, Ting, Tesher, & Shannis, 2007; Schatz, Smith, Borkowski, Whitman, & Keogh, 2008). Moreover, multiple risk factors, or cumulative risks, appear to have a greater negative relation with children's developmental outcomes than any single risk factor (Lengua, Honorado, & Bush, 2007; Sameroff, Seifer, Baldwin, & Baldwin, 1993). Although prior studies have shown that a wide variety of family risks are associated with poor self-regulation, limited work has examined how various combinations of risk, or family risk profiles, may impede children's early self-regulation development (Rhoades, Greenberg, Lanza, & Blair, 2011). Specifically, risk profile analyses enable researchers to identify subgroups of children experiencing similar *combinations* of risk, and can provide insight into how combinations of risk 'work together' to shape children's school readiness skills, including self-regulation.

Although adverse experiences during children's first three years can impede self-regulation development, these self-regulatory skills remain malleable and responsive to high quality experiences throughout the preschool period (ages 3-5 years; Diamond, 2002). Intervention research suggests that children's experiences within high quality early learning settings, such as preschools, may be effective in improving children's self-regulation skills (e.g., Connor et al., 2010; Raver et al., 2008). However, it is only recently that researchers have started to examine how variability in process quality (i.e., quality of instruction and nature of adult-child interactions) among more typically experienced early care and education (ECE) settings predict children's self-regulation improvements during preschool (Fuhs, Farah, & Nesbitt; 2013; Weiland, Ulvestad, Sachs, & Yoshikawa, 2013). Moreover, recent work suggests that high quality ECE experiences may hold heightened importance for certain subgroups of children at greatest risk for poor achievement and social outcomes (National Institute of Child Health and Development Early Child Care Research Network [NICHD ECCRN], 2005; Peisner-Feinberg et al., 2001). Considering low early self-regulation as a potential risk factor for an array of long-term developmental outcomes (Lengua, 2002; Nigg, 2006; Tarter et al., 2012), it remains largely unknown if children with lower early self-regulation at preschool entry (age 3 years) benefit more from high quality ECE experiences than children with higher self-regulation skills.

This dissertation has two primary foci. The first study examined how early family risk profiles, consisting of demographic and family process risk factors, predicted children's self-regulation at 36-months. The second study focused on how two dimensions of ECE process quality support children's self-regulation in kindergarten,

with an emphasis on children who enter the preschool period struggling the most with these skills.

**Defining Self-Regulation**

In recent years, various definitions have been used to conceptualize self-regulation in child development literature (Cole, Martin, & Dennis, 2004; Kochanska, Murray, & Harlan, 2000; Rueda, Posner, & Rothbart, 2004). This dissertation focuses on the behavioral aspects of self-regulation, defined as children's ability to control, plan, and execute goal-directed behaviors in various settings (Blair, 2002). Self-regulation draws upon children's cognitive executive functioning processes, which include attention, working memory, and inhibitory control (McClelland, Cameron, Wanless, & Murray, 2007). First, *attention* is the ability to resist distractions, maintain attention, and to switch focus from one object or task to another (McClelland, Cameron, Wanless et al., 2007). In the classroom, attention helps children stay on task and transition between activities with ease. Second, *working memory* refers to a child's ability to remember single and multi-step instructions. In the classroom, working memory helps students remember all of the steps involved in completing learning activities, such as a multi-step art project. Finally, *inhibitory control* refers to the ability to stop a dominant response in order to demonstrate a less automatic, but more adaptive, behavior (McClelland, Cameron, Connor et al., 2007). In the classroom, an example of inhibitory control is children's ability to sit still and resist the temptation to speak during a teacher-led circle time. Past work has shown that attention, working memory, and inhibitory control are all individually important aspects of cognition, however it is the integration of these skills that is critical to

successful self-regulated behaviors within classroom settings (Baumeister & Vohs, 2004; McClelland, Cameron, Connor et al., 2007; McClelland, Cameron, Wanless et al., 2007).

**Self-Regulation and Developmental Well-Being**

Recent work demonstrates that children's early self-regulation skills are predictive of their later developmental well-being in many areas of life, including academic achievement, mental health, and social outcomes (Blair, 2002; Buckner, Mezzacappa, & Beardslee, 2009; Eisenberg, Smith, Sadovsky, & Spinrad, 2004; Howse, Lange, Farran, & Boyles, 2003; McClelland, Cameron Ponitz, Messersmith, & Tominey, 2010). Children's self-regulation during preschool has emerged as an important predictor of concurrent and later academic success (McClelland, Acock, & Morrison, 2006; McClelland, Cameron, Connor, et al., 2007). For example, in a longitudinal study, children who were able to pay attention and persist through difficult tasks (two aspects of self-regulation) at age four had 49 percent greater odds of completing college by age 25 (McClelland, Acock, Piccinin, Rhea, & Stallings, 2013). Additionally, children with stronger self-regulation skills tend to demonstrate better social competence and fewer problem behaviors during middle childhood (Buckner et al., 2009). In contrast, deficits in early self-regulation have been related to later negative mental health outcomes, such as increased risk of psychopathology and substance abuse during adolescence (Nigg, 2006; Tarter et al., 2012). Collectively, evidence suggests that children's early self-regulation development may have long-term implications for a wide range of developmental outcomes. Thus, it is important to better understand how these skills initially develop before children enter formal schooling.

**Earliest Development of Self-Regulation**

Starting in infancy, self-regulation develops through a progression of phases whereby children achieve increasingly complex and adaptive self-control abilities to deliberately control their behaviors in socially appropriate ways. This signifies a progression from external to internalized control (Kochanska, Coy, & Murray, 2001; Kopp, 1982). Initially, infants largely rely on caregivers to externally manage their emotions and impulses (e.g., rocking, holding, cooing, patting), although infants also use internal attention-orienting techniques to help regulate and calm themselves when over-stimulated, such as sucking or looking away (Blair, Berry, & Friedman, 2012). In the second year of life, children rapidly develop abilities to purposefully control socially inappropriate impulses with adult support. *Situational compliance* is an early phase of self-regulation development that is limited to certain situations (e.g., child may be good at complying at home, but not at the store). At this point, children require close monitoring and external support from caregivers (e.g., verbal reminders of expected behavior) to successfully regulate their behaviors. The ability to comply with caregiver requests or directives (e.g., to hold a parent's hand when asked or to resist hitting another child when upset because parent reminds them) are early indicators of situational compliance. Between two to three years of age, children typically start to demonstrate *committed compliance*, a more sophisticated form of compliance (Kopp, 1982). At this point, children are able to react appropriately to diverse demands that require less intensive monitoring by a caregiver (Kochanska et al., 2001). However, during the compliance phases of self-regulation development, children demonstrate a limited ability to control themselves, especially when exposed to novel experiences and settings.

Early signs of formal self-regulation skills are first recognizable during the preschool period (ages 3-4 years). This is partly due to rapid brain development that increases children's capacity for more formal self-regulation skills (Blair, 2002). During the preschool period children begin to effectively integrate their attention, working memory and inhibitory control skills to more successfully navigate and appropriately engage in the expectations of more diverse environments. For example, formal self-regulation skills allow children to complete more complex tasks without assistance, such as working independently on a difficult puzzle. This task requires attention and inhibition to focus and persist, and working memory to keep in mind where specific puzzle pieces fit.

**Person-Centered Approach to Understanding Family Risk and Development**

Developmental theory suggests that children develop within dynamic person-environment systems that interact among various levels, including both demographic (e.g., income status) and family process experiences (e.g., parenting, maternal depression; Bronfenbrenner & Morris, 2006; Dick & Overton, 2010). A growing body of evidence suggests that children who experience multiple environmental risk factors are more likely to demonstrate lower self-regulation during the preschool period relative to their peers who experience few, if any, risk factors (Lengua, 2002; Wanless, McClelland, Tominey, & Acock, 2011). In general, variable-centered analyses have found that the accumulation of risk factors (rather than the unique contribution of each risk factor on its own) has the largest negative impact on developmental outcomes (e.g., Sameroff et al., 1993). Although cumulative risk models are valuable in understanding how the number of risk factors relate to developmental outcomes, these analyses must make the statistical

assumption that each risk factor in the model holds the same weight for each child, and are, thus, interchangeable (Flaherty & Kiff, 2012; Lanza & Rhoades, 2011). As such, cumulative risk models are unable to deduce which *combinations* of risks are most strongly predictive of self-regulation.

A complementary approach to understanding how multiple risks interact to predict children's outcomes is a person-centered approach, such as Latent Class Analysis (LCA) or Latent Profile Analyses (LPA; Collins & Lanza, 2010; Laursen & Hoff, 2006). Person-centered analyses can improve our understanding of commonly shared patterns of risk by inferring underlying subgroups (or profiles) of children experiencing similar risk characteristics (Lanza & Rhoades, 2011). The person-centered approach aligns well with the dynamic child development theories that assume that development is embedded within a dynamic and holistic process (i.e., the sum is greater than the individual parts; Bronfenrenner & Morris, 2006; Lerner, 2006). Specifically, a person-centered framework assumes that a single risk factor gains meaning to the degree that it is related to other aspects of the child's person-environment system (Laursen & Hoff, 2006). For example, one person-centered study found that profiles including multilevel risk factors at kindergarten (i.e., socio-demographic, familial, neighborhood, and child factors) provided a more nuanced understanding of which children were at greatest risk for negative achievement and behavioral outcomes at fifth grade compared to a cumulative risk index (Lanza, Rhoades, Nix, & Greenberg, 2010). Considering that risk factors rarely operate in isolation, it is important to better understand how multiple risk factors function together, rather than the independent contribution of each risk factor on children's development. A person-centered approach can illuminate how certain combinations of

family risk experiences may be more (or less) detrimental to children's emerging self-regulation skills. In addition, this approach could inform decisions at the policy level and have strong for implications for intervention programs designed to support children growing up in elevated risk contexts.

**Family Demographic Risks**

Although several studies have documented that demographic risk factors (i.e., low family income, living in a single-parent household, and racial/ethnic minority status) are related to poor self-regulation outcomes (Evans & Rosenbaum, 2008; Howse et al., 2003; Wanless et al., 2011), little is known about how patterns of family risks co-occur. For example, substantial evidence shows that young children living in low-income households are more likely to have trouble regulating their attention, emotions, and behavior than their more economically-advantaged peers (Evans & Rosenbaum, 2008; Howse et al., 2003; Noble, Norman, & Farah, 2005). But, this negative relationship between self-regulation and income may vary depending on other risk factors a child is experiencing. For example, in one study, multiple family demographic risk factors were only predictive of negative developmental outcomes when children also experienced low levels of maternal responsivity in the home (Evans et al., 2007).

In addition to income, children growing up in single-parent households are more likely to experience fewer economic and psychological resources than two-parent households, with the potential for negative developmental repercussions (Carlson & Corcoran, 2001; McLanahan & Sandefur, 1994). Similarly, although racial/ethnic minority status does not necessarily lead to poor outcomes independently, evidence suggests that when combined with low-income status, children's minority status

negatively predicts early self-regulation (Wanless et al., 2011), as well as other achievement-related outcomes (Connell & Prinz, 2002; Magnuson & Waldfogel, 2005). This may be because families who identify as racial/ethnic minorities are often faced with additional stressors such as discrimination and prejudice. These race-related stressors may magnify the effects of other risk factors (such as living in a low-income family), on children's development (Farkas, 2003; Spencer, 1990).

**Family Process Risks**

In addition to family demographic risks, children's family processes, such as aspects of the home learning environment and parenting experiences, have been linked to challenges in early self-regulation development (Linver, Brooks-Gunn, & Kohen, 2002; McClelland, Kessenich, & Morrison, 2003; Razza, Martin, & Brooks-Gunn, 2010). Three facets of family processes appear to consistently relate to children's lower self-regulation skills during the preschool period. First, *low cognitive stimulation*, or presence of few learning materials and activities in the home, has been negatively related to self-regulation (McClelland et al., 2003; McLoyd, 1998). Second, *parental harshness*, or the presence of punitive or demanding discipline practices negatively influences self-regulation development (Bradley & Corwyn, 2007; Colman, Hardy, Albert, Raffaelli, & Crockett, 2006). Finally, elevated *maternal depressive symptoms* have been linked to lower self-regulation in children (Dawson et al., 2003; Sektnan, McClelland, Acock, & Morrison, 2010). For example, children with mothers exhibiting clinical levels of depressive symptoms both before and during prekindergarten tended to exhibit lower self-regulation in kindergarten (Sektnan et al., 2010).

It is important to consider the interplay among various indicators of family risk experiences when understanding self-regulation development. In other words, although two children may look statistically equivalent in terms of one risk factor (e.g., low cognitive stimulation), the influence of this particular risk factor may depend on other risks factors the children are experiencing. For example, the influence of one aspect of family processes (e.g., harsh parenting) could depend on if this risk factor is experienced in combination with other risks, such as maternal depression and/or low-income levels. Examining common family risk profiles can increase our understanding of how specific patterns of early risk experiences relate to children's developmental well being, such as early self-regulation skills.

**Early Care and Education**

Although children's early risk experiences during the first three years of life may hinder self-regulation development, the prekindergarten year appears to be a particularly sensitive time for children's self-regulation development (Anderson & Reidy, 2012; Carlson, 2005; Kopp, 1982). Considering that approximately 57% of four-year-olds attend center-based programs and another 20% attend home-based care settings, such as family child care homes (National Center for Education Statistics Report, 2005), the quality of children's experiences within ECE settings in relation to development is important to examine. However, to date, little work has looked at how specific dimensions of ECE quality influence self-regulation (Fuhs et al., 2013; Weiland et al., 2013).

**Preschool is a sensitive period.** The prekindergarten year represents a sensitive period for self-regulation development, largely attributable to the rapid neurological

growth (i.e., prefrontal cortex brain maturation) characteristic of this period (Anderson & Reidy, 2013). Additionally, the prekindergarten year tends to be characterized by new social expectations and demands increasingly sophisticated levels of self-regulation (Pianta & Cox, 1999). Prekindergarten ECE is often children's first experience navigating more structured learning contexts with new social expectations, and larger peer groups to navigate. The self-regulation skills children develop during the prekindergarten year are thought to carry over into the more formal learning demands of kindergarten in the following year (Pianta & Cox, 1999). Given the potential for substantial growth in children's self-regulation during the prekindergarten year, it is important to understand how the quality of children's ECE experiences during this year can support their early self-regulation skills in preparation for the transition to kindergarten.

**Early Care and Education Quality**

High quality ECE experiences, characterized by attentive, responsive, and stimulating care, predict an array of positive child outcomes, such as social, linguistic and cognitive development (Belksy, 2006). Although the effects of ECE quality on child outcomes tend to be modest, they have been documented consistently across studies (Burchinal, Kainz, & Kai, 2011; NICHD ECCRN, 2002a; 2003b; Zaslow et al., 2011).

**Measurement.** ECE quality has been measured through structural and process features of the care environment (Lamb & Ahnert, 2005). Structural variables, often conceptualized as teacher-child ratio and staff qualifications, appear to indirectly influence children's development through process quality (Friedman & Amadeo, 1999; NICHD ECCRN, 2002). *Process quality* is broadly defined as the quality of instruction

and the dynamic nature of teacher-child interactions (Cassidy et al., 2005; La Paro, Pianta, & Stuhlamn, 2004; Lamb & Ahnert, 2005; Vandell & Wolf, 2000). Moreover, process quality has been largely evaluated in a global sense. Global process quality tends to be measured by aggregates, or composites, comprised of a combination of behaviors and interactions observed in the ECE environment, such as the nature of teacher-child interactions, teacher's language use, and the presence of emotionally supportive interactive activities (Cassidy et al., 2010; Vandell & Wolfe, 2000). Global process quality in preschool classrooms has shown to be predictive of concurrent achievement and behavioral competences (NICHD ECCRN, 2000, 2002b, 2003; Vandell, 2004), with some evidence of lasting effects into elementary school (Burchinal et al., 2008; Peisner-Feinberg et al., 2001). Less work has focused on children's self-regulation, although one study found that global process quality (i.e., a composite including cognitive stimulation, sensitivity, lack of intrusiveness, and lack of disengagement) predicted children's sustained attention (an aspect of self-regulation) at 54- months of age (NICHD ECCRN & Duncan, 2003). Although studies of global process quality have been informative, an important next step is to measure ECE process quality dimensions with more specificity to better delineate how specific aspects of quality relate to particular child outcomes (e.g., self-regulation; Zaslow et al., 2010). This work has the potential to inform current ECE quality-focused policy initiatives, such as the Quality Rating and Improvement Systems (QRISs) and professional development efforts (Zaslow et al., 2010).

**Distinct Dimensions of Process Quality and Child Outcomes**

In response to the need for more attention to process quality dimensions, scholars have been re-evaluating the utility of traditional ECE observational measures, such as the

Early Childhood Environmental Rating Scale (ECERS; Harmes, Clifford, Cryer, 1998) and the Observational Record of the Caregiving Environment (ORCE; NICHD ECCRN, 1996). Using factor analysis techniques to reanalyze quality measures as potential indicators of distinct dimensions of process quality, these re-evaluations suggest that more global observational measures of ECE processes may, indeed, be broken down into distinct dimensions (e.g., cognitive stimulation, teacher responsivity; Dowsett, Huston, Imes, & Gennetian, 2008) that are predictive of various social and cognitive outcomes (Bub, 2009). Additionally, new quality measurement tools designed to capture distinct dimensions of process quality, such as the CLASS (Classroom Assessment Scoring System; Pianta, La Paro, & Hamre, 2008), suggests there is wide variability among different preschool process quality dimensions, including instructional support, emotional support, and organizational support (La Paro et al., 2004). These distinct quality dimensions are also predictive of various academic and social child outcomes in dimension-specific ways (e.g., Burchinal et al., 2008; Mashburn et al., 2008; Rimm-Kaufman et al., 2009). Specifically, emotional support promotes positive social outcomes, such as social competence and fewer behavioral problems (Burchinal et al., 2008; 2009; Mashburn et al., 2008; Peisner-Feinberg et al., 2001). Instructional support tends to be most consistently related to achievement outcomes, such as early language and math skills (Burchinal et al., 2008; Mashburn et al., 2008; Peisner-Feinberg et al., 2001). Less is known about how distinct dimensions of process quality relates to children's self-regulation development outcomes, although two recent studies provide preliminary evidence that both emotional and instructional dimensions of quality are

modestly predictive of aspects of children's self-regulation during preschool (Fuhs et al., 2013; Weiland et al., 2013).

**Cognitive stimulation**. The degree of cognitive stimulation within ECE settings includes the stimulation of a learning setting and how caregivers may facilitate children's learning. This dimension of process quality is an important way to support self-regulation during the transition to kindergarten (Fuhs et al., 2013; Weiland et al., 2013). A cognitively stimulating environment may support children's early self-regulatory skills in a number of ways. First, engaging children in cognitively stimulating ECE settings may facilitate more complex thinking, as well as greater opportunities for activity choice and reflection. Encouraging complex thinking is important for supporting children's executive function skills central to self-regulated behavior (Bodrova & Leong, 2006; Fuhs et al., 2013). Second, high levels of cognitive stimulation may indicate the use of more language and literacy instruction in the classroom. More language use supports children's early language and vocabulary skills that may, in turn, support children's improved ability for self-talk or inner speech. Improved language skills have been shown to help children monitor and regulate their behaviors through self-talk strategies (Fuhs & Day, 2011; Zakin, 2007). Thus, it is possible that caregivers who provide high levels of cognitive stimulation are facilitating children's self-regulation.

**Positivity/responsivity.** The degree to which caregivers are positive and responsive with children also appears significantly related to children's self-regulation (Bodrova & Leong, 2009; Fuhs et al., 2014; Raver et al., 2008; Weiland et al., 2013). Higher levels of positivity/responsivity may be particularly important for fostering self-regulation in ECE settings. First, this dimension of quality may be reflecting the degree

to which caregivers provides scaffolding and individualized external supports by modifying their own behaviors and child-directed language (Bodrova & Leong, 2009). Moreover, greater positivity/responsivity may reflect a more emotionally supportive ECE setting where children feel comfortable and encouraged to explore their behaviors and practice their emerging self-regulatory strategies in a low-stress environment (Fuhs et al., 2013). In preschool settings, Fuhs and colleagues (2013) found that teacher's positive emotional tone, along with more behavior approving and fewer behavior disapproving interactions, predicted significant gains in children's cognitive self-regulation over the year. Moreover, in an intervention study, researchers found that preschoolers enrolled in more emotionally supportive preschool classrooms showed higher levels of observed engagement (similar to behavioral aspects of self-regulation) by the end of the school year compared to those in less emotionally supportive classrooms (Raver et al., 2008). In sum, both cognitive stimulation and the degree of positivity/responsivity in ECE settings appear to play a role in supporting children's self-regulation development.

**Process Quality and Children with Low Early Preschool Self-Regulation**

Although high-quality ECE appears to have modest effects on learning outcomes for all young children (Burchinal et al., 2008; Mashburn et al., 2008; Rimm-Kaufman et al., 2009), some evidence indicates that ECE quality may be a stronger predictor of school readiness for children living in high-risk families (Dearing, McCartney, & Taylor, 2009; Lambert, Abbott-Shim, & McCarty, 2002; Peisner-Feinberg et al., 2001; Vandell et al., 2010). Understanding 'for whom' high quality care has the most benefits is important to ECE research and policy implications (Phillips, Fox, & Gunnar, 2011). Until recently, the majority of this work has focused on socioeconomic risks, with children experiencing

economic disadvantage being more sensitive to the quality of ECE experiences (Magnuson, Ruhm, & Waldfogel, 2007; Peisner-Feinberg et al., 2001).

A new line of research suggests that children may differ in how they respond to the quality of ECE environments depending on child-based characteristics, such as temperament or genetics (Belksy & Pluess, 2013; Lipscomb et al., 2013; Phillips et al., 2011; Pluess & Belksy, 2009). Low self-regulation during early childhood appears to serve as an additional risk factor, as children with low self-regulation are more likely to struggle during the transition to kindergarten, both academically and socially (Blair & Razza, 2007; Lengua, 2002; Wanless et al., 2011). As such, children's early self-regulation skills at the beginning of the preschool period (around age 3 years) may act as a moderator of both dimensions of ECE quality cognitive stimulation and positivity/responsivity. Drawing from work suggesting that child-based characteristics may increase a child's sensitivity to the quality of ECE settings (Lipscomb et al., 2013; Pluess & Belsky, 2009;), it is possible that children with lower early self-regulation skills may be more sensitive to the quality of the caregiving environment.

Despite an absence of research examining children's early self-regulation as a potential moderator of ECE quality in observational research, there is some evidence of children's low self-regulation serving as a moderator in intervention work (Connor et al., 2010; Tominey & McClelland 2011). In both classroom-based intervention studies, children assigned to the treatment groups received either higher instructional quality (i.e., stronger teacher planning, classroom management, and independent and small group work; Connor et al., 2010) or were exposed to high quality activities (i.e., music and movement games; Tominey & McClelland, 2011). Results of both studies suggested that

children who began the study with the lowest self-regulation benefited *more* from the high quality intervention than their more regulated peers (Connor et al., 2010; Tominey & McClelland, 2011). This dissertation builds upon this work by utilizing an observational study to examine if children who exhibit the low levels of early self-regulation at the beginning of the preschool period benefit more from higher quality early learning experiences than their more regulated peers.

**Overview of Study 1**

The first manuscript presented in this dissertation extends the literature concerning how early contextual risk experiences impede children's early self-regulation development (Lengua, 2002; Morales & Guerra, 2006). Specifically, study 1 used a latent class analysis approach to identify distinct family risk profiles, and then, tested whether the profiles predicted differences in children's early self-regulation at 36-months (using a 3-step-approach to predict a distal outcome). Data came from the NICHD SECCYD data set ($N$ = 1,364). Each of the family risk factors used in the profile analysis were aggregated over children's first three years of life, and included both demographic and family process risk factors. Previous research has established a negative relation between early cumulative risk and children's self-regulation (e.g., Lengua, 2002), but, to date, only one known study has used a person-centered approach to evaluate how distinct combinations of early risk may differentially predict children's self-regulation skills (Rhoades et al., 2011). Further, compared to past work that examined self-regulation in terms of direct-child measures of self-regulation, this is the first study examined how family risk profiles predict differences in early self-regulation as reported by parents.

**Overview of Study 2**

The second study presented in this dissertation examined how two dimensions of ECE process quality during prekindergarten predicted children's self-regulation in the fall of kindergarten. This study builds upon research providing preliminary evidence that both the quality of cognitive stimulation and positivity/responsivity within preschool settings predicted improvements in children's self-regulation of the preschool year (Fuhs et al., 2013; Weiland et al., 2013). Similar to study 1, data came from the NICHD SECCYD data set. Analyses were restricted to children attending either formal or informal ECE settings during the prekindergarten year ($n$ = 996). Specifically, regression analyses were employed to examine: 1) how positivity/responsivity and cognitive stimulation each predicted self-regulation in the fall of kindergarten, controlling for earlier self-regulation; and 2) whether children with lower self-regulation experienced greater benefits of process quality on their self-regulation in the fall of kindergarten. The self-regulation outcome measure was assessed in in the fall of kindergarten via teacher-report. When graphing the continuous by continuous moderation analyses, children with low self-regulation were defined as being equal to or less than one standard deviation below the mean on a 36-months, parent-reported, measure of self-regulation. This study extends research in this area by examining if children with lower early self-regulation benefited more from high quality ECE settings than other children who entered the preschool period with stronger self-regulation.

Taken together, results from the two studies in this dissertation are expected to elucidate both: *why* some children struggle more with self-regulation than others, as well as *how* high quality early learning experiences can promote self-regulatory skills, especially for children who may benefit the most from them because of lower self-

regulation at preschool entry. As both researchers and policy-makers become more aware of the importance of early self-regulation for children's long-term well-being, it is increasingly important to understand how children's early life contexts influence their self-regulation development.

# Family Risk Profiles and Self-Regulation During Early Childhood: A Person-Centered Approach

## Abstract

The present study explored how combinations of family risk factors experienced during children's first three years of life predicted differences in self-regulation at 36-months. This study utilized data from the National Institute on Child Health and Development Study of Early Child Care and Youth Development (NICHD SECCYD). Results indicated that children's family risk experiences were best captured by three distinct profiles: 1) families with low risk (74%), 2) families with low-income levels, low cognitive stimulation, and high probability of single-parenting (ICS; 19%), and 3) families with low-income levels, low cognitive stimulation, and high parental harshness (ICH; 7%). The three profiles predicted significant differences in children's early self-regulation, such that children estimated to be in the low risk profile exhibited higher self-regulation compared to children characterized by either of the elevated risk profiles (labeled ICS and ICH). In addition, children estimated to be in the profile with high harshness (ICH) exhibited significantly lower self-regulation than those in the profile without parental harshness, but with single parenting (ICS). Findings provide evidence that children can be described in terms of distinct family risk profiles that reflect different combinations of demographic and family processes risks experienced over the first three years of life. Moreover, results suggest that distinct family risk profiles can predict differences children's early self-regulation skills. The discussion addresses how family risk profiles can inform programs and policies designed to support children at risk for lower early self-regulation at three years of age.

# Family Risk Profiles and Self-Regulation during Early Childhood: A Person-Centered Approach

Self-regulation, or the ability to intentionally monitor and modulate behaviors, emotions, and thoughts, is a foundational skill set important for social and academic well being throughout childhood (Buckner, Mezzacappa, & Beardslee, 2009; McClelland, Acock, & Morrison, 2006) and into adulthood (McClelland, Acock, Piccinin, Rhea, & Stallings, 2013). Variations within children's earliest environments play an integral role in shaping many aspects of their behavioral development, including self-regulation (Masten & Coatsworth, 1998; Shonkoff & Phillips, 2000). Specifically, exposure to various family risk factors (e.g., low-income levels, maternal depression, parental harshness) during the first three years of life have been negatively related to children's early self-regulation development (Rhoades, Greenberg, Lanza, & Blair, 2011; Sektnan, McClelland, Acock, & Morrison, 2010). Moreover, young children's experiences of multiple, co-occurring family risks factors are stronger predictors of poor childhood outcomes compared to exposure to a single-risk factor (Lengua, 2002; Lengua, Honorado, & Bush, 2007; Masten & Wright, 1998; Sameroff, Seifer, Baldwin, & Baldwin, 1993). However, relatively little is known about children's early experiences of distinct combinations of family risks (termed *family risk profiles*), and how those risk profiles may differentially predict children's early self-regulation development. As such, this study employs a person-centered approach to explore how different profiles of children's early family risk experiences predict differences in their self-regulation at 36-months of age.

## Self-Regulation and Well-Being

Early self-regulation has emerged as a key predictor of children's long-term healthy development (Center on the Developing Child, 2011). This study focuses on the behavioral aspects of self-regulation, or the ability to control, plan, and execute goal-directed behaviors in various settings (McClelland, Cameron Ponitz, Messersmith, & Tominey, 2010). Self-regulation skills enable children to behave in socially acceptable ways, allowing them to engage in learning experiences and successfully build and maintain social relationships (Rudasil & Rimm-Kaufman, 2009). Children's ability to exhibit self-regulated behaviors in home and school settings are thought to be related to the integration of three main mental processes: attention focusing, working memory, and inhibitory control (Blair, 2002; McClelland et al., 2010), as well as emotional regulation abilities (Cole, Martin & Dennis, 2004). The behavioral aspects of early self-regulation development have important implications for school adjustment, including achievement (McClelland et al., 2006; McClelland, Cameron, Connor, et al., 2007) and social well being (Buckner et al., 2009). For preschool-age children (defined as 3-5 years of age), learning how to self-regulate behaviors in early learning contexts sets the stage for long-term school success (McClelland et al., 2013; Sektnan et al., 2012). For example, in a recent longitudinal study, children who could pay attention and persist (two indicators of self-regulation) through a difficult task at age four had 49 percent greater odds of completing college by age 25 (McClelland et al., 2013).

**Self-Regulation Development during Early Childhood**

Starting in infancy, children develop self-regulation through a progression of phases whereby they gradually adopt and internalize increasingly complex and adaptive self-regulatory skills (Kochanska, Coy, & Murray, 2001; Kopp, 1982). Self-regulation

development is particularly sensitive to the quality of children's earliest family experiences (Glasser, 2000). During early infancy, parents act as the primary external regulators of infants' rhythms and affect to help them meet their basic emotional, physical, and cognitive needs (Glaser, 2000; Kopp, 1982). Infants rely heavily on their interactions with responsive parents who help them sooth when emotionally distressed, often by redirecting children's attention to important stimuli, such as a bottle to feed. In healthy relationships, parents and children learn to respond to each other's cues through a shared regulatory process, called co-regulation, which facilitates children's ability to begin to internalize these external processes as their own (Kopp, 1982). During late infancy and early toddlerhood children begin to demonstrate early signs of compliance (e.g., can follow a simple direction from parents), a precursor to formal self-regulation (Kochanska, 2002; Kopp, 1982). Around age two, children are able to comply with adult requests in increasingly diverse situations that require more internally driven self-control (Kopp, 1982). As children demonstrate their ability to comply with their parents' behavioral expectations, parents can begin to reduce the degree of external regulation, allowing children more opportunities to develop and practice their emerging self-regulatory skills (Kochanska, 2002; Kopp, 1982). Although children's compliance is beginning to emerge during the toddler period, these skills remain inconsistent. As such, toddlers require close monitoring and positive redirection by parents, especially when faced with novel situations. Around age three, children begin to demonstrate the potential for more internalized and flexible self-regulation skills (Kopp, 1982). This shift from compliance to early self-regulation is marked by substantially lower levels of external supports from parents than were needed during infancy and toddlerhood

(Kochanska, 2002). The beginning stages of formal self-regulation skills enable children to follow more complex, multistep rules and engage daily household routines with fewer reminders. Early signs of self-regulation are also exhibited by children's growing ability to inhibit inappropriate impulses, such as resisting the temptation to take an attractive toy from a friend without asking.

Understanding variability in self-regulation development at the start of the preschool period (age 3) is important because it marks the beginning of a major developmental and social transition for young children (Denham, Warren-Khot, Bassett, Wyatt, & Perna, 2012). Developmentally, children's cognitive capacity for self-regulation skills grows rapidly over the preschool period (Blair, 2002). Socially, children often begin attending preschool at age three and, for many, this is their first experience in a structured learning setting (Denham et al., 2012). Preschool entry marks an important social transition that calls upon more sophisticated self-regulation skills than ever before (Denham et al., 2012). For example, preschool is often the first time children are faced with new behavioral demands such as: navigating a structured learning environments, interacting within in larger peer groups, and understanding new social expectations of teachers and caregivers that are not their parents.

Taken together, self-regulation development can be understood as a gradual process that begins in infancy and is optimized within a supportive family context. Thus, it is important to understand how exposure to various profiles of family risk may interfere with children's early self-regulation development when the skill set is initially emerging.

**Family Risk Factors and Self-Regulation**

A risk factor is a status or condition associated with a higher probability of a negative or undesirable developmental outcome (Masten, 2001). A large body of research suggests that exposure to individual family risk factors during children's first three years of life, including low family income, single-parenting, racial minority status, and unsupportive family processes (i.e., low cognitive stimulation, parental harshness, and elevated maternal depressive symptoms), are detrimental to children's early self-regulation development (Evans & Rosenbaum, 2008; Howse, Lange, Farran, & Boyles, 2003; Wanless, McClelland, Tominey, & Acock, 2011). Further, family risks tend to cluster within the same individual (Cicchetti, 1993; Masten et al., 1995). Cumulative risk studies, which consider the total (or average) number of family risk factors a child is exposed to, have established that experiencing multiple risks is considerably more harmful to self-regulatory outcomes than the individual effects of each risk on its own (FLP Key Investigators, 2014; Morales & Guerra, 2006; Lengua, 2012). Children's experiences of multiple family risk factors, or cumulative risks, appear to be particularly problematic for their early self-regulation development (Family Life Project [FLP] Key Investigators, 2014; Lengua, 2012; Morales & Guerra, 2006). But, it remains largely unknown how distinct *combinations* of family risk factors experienced during the first three years of life relate to differences in early self-regulation at 36-months. Risk profile work has the potential to inform policy initiatives, such as recent efforts to create more integrated systems of early childhood program designed to more efficiently address the multiple needs of at-risk children and families (e.g., Oregon's Early Learning Hubs, Early Learning Division, 2014). To address this gap, the current study examines how various combinations of family risks relate to children's early self-regulation development. First,

we provide a brief summary of prior research linking each of these family risks to self-regulation in complex ways.

**Low-income levels.** Substantial evidence shows that young children living in low-income households are more likely to struggle with early self-regulation than their more economically-advantaged peers (Evans & Rosenbaum, 2008; Howse et al., 2003; Noble, Norman, & Farah, 2005). Children who live in low-income families are also more likely to experience additional family risks beyond income (Morales & Guerra, 2006). Further, growing evidence suggests that the relation between family income and self-regulation is complex, such that the relation between family income and children's self-regulation may vary depending on experiences of co-existing family factors, such as whether the child also identifies as a racial/ethnic minority or lives in a single-parent household (Rhoades et al., 2011; Sarsour et al., 2010).

**Single parent household.** Compared to dual-parent households, children living in single-parent households are more likely to experience additional family risk factors (Carlson & Corcoran, 2001; McLanahan & Sandefur, 1994; Sarsour et al., 2010). For example, a high proportion of single parents (mainly mothers) live in low-income homes (Rank & Hirschl, 2001) and often struggle to provide the economic and psychological resources that support children's self-regulation skills (Carlson & Corcoran, 2001; McLanahan & Sandefur, 1994). Moreover, a recent study suggested that the influence of living in a single-parent household (compared to a dual-parent household) magnified the negative influence of low-income status on early self-regulation skills (Sarsour et al., 2010).

**Racial/ethnic minority status.** When experienced in conjunction with other family risk factors (e.g., low-income status), children's racial/ethnic minority status has been negatively related to early self-regulation development (Connell & Prinz, 2002; Magnuson & Waldfogel, 2005; Mcloyd, 1998; Nesbitt, Backer-Ward, & Willoughby, 2013). For example, low-income children who also identified as racial/ethnic minorities are more likely to exhibit lower early self-regulation during the transition to kindergarten compared to their low-income, White peers (Blair et al., 2011; Nesbitt et al., 2013; Wanless et al., 2011).

A child's race/ethnicity may serve as a family risk factor for a couple of reasons. First, racial/ethnic minority status increases the likelihood that families face intergenerational discrimination and social inequalities that can lead to increased household stress, in turn, impeding children's early developmental well-being (Contrada et al., 2000; Farkas, 2003; Nesbitt et al., 2013; Spencer, 1990). Second, children who identify as a racial/ethnic minority are more likely to experience deeper or more chronic poverty compared to low-income, non-minority children (Burchinal & Willoughby, 2013; US Census, 2004). For example, compared to their European American peers, African-American and Latino American children remain two times as likely to be poor and are more likely to live in extreme poverty (US Census, 2004). In sum, minority status serves as a risk factor for children's self-regulation because it is a proxy for increased likelihood of more pervasive poverty and/or may indicate increased household stressors stemming from experiences of racial/ethnic inequality and discrimination (Dearing et al., 2006).

**Family processes.** In addition to the demographic family risk factors addressed above, various aspects of children's early *family processes*, or the nature of daily

interactions between children and their parents, shape children's social, cognitive, and self-regulatory skills (Gauvain, 2001). Three key aspects of family processes have been shown to hinder children's early self-regulation development, including low levels of cognitive stimulation, harsh parenting practices, and elevated maternal depressive symptoms (Linver, Brooks-Gunn, & Kohen, 2002; McClelland, Kessenich, & Morrison, 2003; Razza, Martin, & Brooks-Gunn, 2010).

Cognitive stimulation, or the presence of learning materials and engaging parent-child interactions in the home, provides children opportunities to hone their self-regulation skills through stimulating and mentally challenging activities (Hindman & Morrison, 2012; McClelland et al., 2003; McLoyd, 1998; Morrison & Cooney, 2002). Young children living in homes characterized by low cognitive stimulation tend to struggle more with early self-regulation (Downer & Pianta, 2006; Evans, 2003).

Parental harshness, or a parent's lack of acceptance and punitive interaction style, appears to stifle children's early self-regulation (Bradley & Corwyn, 2007; Coleman, Hardy, Albert, Raffaelli, & Crockett, 2006). Harsh parenting appears to reduce children's opportunities for, and motivation to, engage in responsive parent-child interactions important for supporting children's self-regulation development (Crossley & Buckner, 2011). For example, when parents of young children employ harsh parenting strategies (e.g., shouting, physical discipline), children are likely to become over-aroused or angry and may be unable to process the intended message from the parents (Grusec & Goodnow, 1994).

Finally, experiences of clinical levels of maternal depression during early childhood can be detrimental to children's behavioral outcomes, including early self-

regulation (Choe, Olson, & Sameroff, 2013; Crossley & Buckner, 2011; Dawson et al., 2003; Sektnan et al., 2010). Depressed parents appear more likely to demonstrate inconsistent and unpredictable parenting (e.g., inconsistent household routines) and may be more likely to exhibit harsh parenting practices, which impedes children's self-regulation development (Choe et al., 2013; Crossley & Buckner, 2011). Depressed mothers may also struggle with their own self-regulation and, in turn, model more unregulated and inconsistent coping strategies that their children may then internalize (Blandon, Calkins, Keane, & O'Brien, 2008). Moreover, maternal depression appears to have the greatest influence on child outcomes when experienced in conjunction with family risk factors (Choe et al., 2013; Feder et al., 2009; Lovejoy et al., 2000). For example, experiences of clinical levels of maternal depression during children's early years appears to be more detrimental to child outcomes in low income versus higher income families (Choe et al., 2013).

**Person-Centered Approach to Understanding Family Risk**

Person-centered analytic approaches, such as latent class analysis (LCA), can improve our understanding of combinations of family risk factors by inferring underlying family risk profiles (Lanza & Rhoades, 2011). Person-centered analyses are based on the assumption that populations are heterogeneous and can be described in terms of similarities and differences among individuals' experiences (Laursen & Hoff, 2006). Past risk profile work provides evidence that person-centered techniques are indeed a fruitful way to understand how family risk experiences co-occur and differentially predict children's developmental outcomes (Lanza et al., 2010; Parra, DuBois, & Sher, 2006).

Researchers have utilized person-centered analyses to explore how family risk profiles relate to a variety of social well-being outcomes (e.g., behavior problems, social competence; Lanza et al., 2010; Parra, DuBois, & Sher, 2006). To date, much of this work has focused on risks experienced during middle-childhood and adolescence, with less attention given to the early childhood period. An exception is a study by Rhoades and colleagues (2011) that assessed demographic risk profiles during early infancy (age 2-7 months), and then used the profiles to predict children's early executive function skills at 36-months (the cognitive underpinnings of self-regulation; Rhoades et al., 2011). This study also examined two aspects of parenting (positive engagement and maternal intrusiveness) as potential mediators of the risk profiles detected. Overall, latent class analyses revealed a total of six demographic risk profiles (Rhoades et al., 2011). Results suggested that profiles reflecting elevated demographic risks predicted significantly poorer performance on executive function tasks at 36-months compared to low risk profiles. Further, maternal positive engagement mediated the relationship between risk profiles and executive function in both White and African American samples, although maternal intrusiveness mediated the relation between profiles and executive function exclusively in the White sample.

The current study complements and extends the work by Rhoades et al. (2011) in two ways. First, the current study considers family risk factors as experienced over children's first 36 months rather than children's first 2-7 months of life. Capturing average risk over a wider timeframe allows for a more robust picture of early childhood family risk. Also, by considering the average risk experiences within the birth to three developmental period, the current study was able to reduce the influence of fluctuations

in risks across time points, such as income variability or changes in household structure and parenting dynamics across waves.

Second, distinct from the Rhoades et al. (2011) study, which included family processes as mediators, the current study considers three specific family process risk factors *within* the family risk profiles (parental harshness, cognitive stimulation, and maternal depression). This decision was made based on past work suggesting that when children experience family process risk factors, such as negative parenting, in combination with other family demographic risks (e.g., income status, single-parent status), they are more likely to exhibit poor behavioral adjustment outcomes (Dearing et al., 2006; Evans et al., 2007; Schleider, Chorpita, & Weisz, 2013). For example, in one study, multiple socio-demographic risk factors were predictive of early developmental outcomes, but only when children *also* experienced harsh parenting (Evans et al., 2007). Thus, including family processes within the current study's family risk profiles can inform early childhood policy initiatives designed to target the needs of families facing multiple risk factors spanning both demographic and family process domains.

**The Present Study**

The aim of this study was to gain a better understanding of how children's experiences of multiple family risks during the first three years of life, or family risk profiles relate to differences in early self-regulation. Specifically, we asked, *do family risk profiles differentially predict children's self-regulation at 36-months of age*?

To address this question, we first conducted an LCA to identify family risk profiles. Although profile analyses are exploratory in nature, previous research was used to form some general hypotheses about the risk profile patterns that would emerge. First,

similar to past studies, we expected that a low risk profile characterized by few (if any) family risk factors would be detected (Lanza et al., 2010; Rhoades et al., 2011). We also expected that the higher-risk profile(s) would be characterized by lower-income levels, but that they would be distinguished from one another by the other risk factors in the models (i.e., single parent household, racial/ethnic minority status, maternal depressive symptoms, cognitive stimulation, parental harshness; Lanza et al., 2010; Rhoades et al., 2011). Second, we addressed our main study aim by examining how the family risk profiles predicted differences in children's self-regulation at 36-months of age. Specifically, we expected the children characterized by the low risk profile would exhibit the strongest early self-regulation at 36-months, whereas the higher risk profiles would exhibit lower self-regulation.

## Methods

### Participants

This study utilized data from the National Institute on Child Health and Development Study of Early Child Care and Youth Development (NICHD SECCYD; U.S. Department of Health and Human Services, NIH, NICHD policy report, 1996). Families were recruited in 1991 from 24 hospitals in recruitment sites across the U.S. ($N$ = 1,364, 52% male). When children were one-month old, 22% of families were living at the poverty level and another 23% of families were living near poverty (i.e., between 100% and 200% of the poverty level). Additionally, although maternal education was fairly high (i.e., about 69% of mothers reported at least some college) a substantial portion of the mothers reported relatively low-educational attainment (i.e., 31% had a high school diploma or less). Seventy-six percent of the children in the study were

identified by their parents as White, 13% Black, 6% Hispanic, and 5% reported other races/ethnicities.

**Procedure**

We analyzed data from Phase I of the longitudinal NICHD SECCYD project, which includes data from waves spanning infancy through 36-months (data utilized were collected at 1-, 6-, 15-, 24-, and 36-month waves). At each wave, mothers were interviewed during home visits to gather information about household demographics, family-life, and their child's development. Additionally, at 6-, 15-, and 36-months, researchers made home visits and conducted 30-minute observations of the home environment to gather information about parenting practices and learning materials in the home.

**Measures**

**Family risk factors**. Family risk factors included family income, racial/ethnic minority status, single parent household, observed cognitive stimulation in the home, observed parental harshness in the home, and self-reported maternal depressive symptoms.

***Family income.*** Parents reported family income and the number of individuals in their households during parent interviews conducted at 1-, 6-, 15-, 24-, and 36- months. At each wave, an income-to-needs ratio was calculated by dividing the total family income by the number of individuals in the home. Because income often fluctuates over time, these ratios were averaged across all five time-points to obtain an overall measure of family income during the first three years of children's lives. This variable was then log transformed to account for non-normality.

***Racial/ethnic minority status.*** To measure racial/ethnic minority status as a potential risk factor, a dichotomous variable was created from the 1-month interview, during which mothers reported children's race/ethnicity from a selection of identification options (e.g., Caucasian, Asian, African American). Parents who identified their child's race/ethnicity as White/Caucasian were considered a non-minority. This variable was coded: 1 = racial/ethnic minority and 0 = non-minority status.

***Single parent household.*** Mothers reported whether they were the only adults in their households at the 1-, 6-, 15-, 24-, and 36-month interviews. A dichotomous variable was created and coded as: 1 = single-parent household during at least one wave, and 0 = dual-parent household at all waves.

***Low cognitive stimulation.*** To measure the degree of cognitive stimulation at home, research assistants observed and rated the availability of learning materials and parent-child interactions using the infant/toddler and early childhood versions of the HOME inventory during home visits conducted at 6-, 15- and 36-month waves (Caldwell & Bradley, 1984). To ensure the home observations were age appropriate, different versions of the HOME inventory were used at each wave. At 6-months, cognitive stimulation was indicated by a 9-item observed enrichment composite including indicators of both learning materials (e.g., toys and books) and parent-child interactions (e.g., parent facilitated learning; Cronbach's $\alpha = .66$). At 15-months, cognitive stimulation was indicated by a 6-item home enrichment composite, including indicators of learning materials and parent-child interactions (Cronbach's $\alpha = .69$). At 36-months, the early childhood version of the HOME was used, whereby cognitive stimulation was indicated by an aggregate of both an 11-item learning materials composite, including

items such as the availability of puzzles in the home, (Cronbach's α = .74) and a 4-item academic stimulation composite, including items such if is encouraged to learn numbers (Cronbach's α = .71). Because the exact content of the observational tool varied from 6-, 15- and 36-months, the total scores for each wave were standardized to ensure comparability. An aggregate of cognitive stimulation in the home was calculated across the three time points to represent children's overall exposure to cognitive stimulation in the home during the first three years of life (*r*s = .46 - .50, *ps* < .001).

***Parental harshness.*** Parental harshness was also measured during home observations of parent-child interactions at 6-, 15-, and 36-month waves using the infant/toddler- and early childhood-versions of the HOME inventory (Caldwell & Bradley, 1984). Similar to the cognitive stimulation variable, age-appropriate versions of the HOME inventory were used at each wave. Consistent with prior studies utilizing this measure to assess observed parental harshness during children's early years (Bradley & Corwyn, 2007; 2012; National Institute of Child Health and Development Early Child Care Research Network [NICHD ECCRN], 1997), the scale scores at each wave were standardized before aggregating to allow for comparability. At six months, harsh parenting was measured with a reverse coded composite of a 5-item lack of negativity subscale in the infant/toddler version of the HOME. Specifically, observers noted the *absence* of parenting behaviors such as a lack of shouting at the child or interfering with or restricting the child more than three times during the visit (Cronbach's α = .50). At 15-months, the same observational measure was used, with an additional item (6-items total). Observers also asked parents if the child, "...received less than two physical punishments per week" (Cronbach's α = .57). Finally, at 36-months, a 4-item acceptance

scale was reverse coded from the early childhood version of the HOME (Cronbach's α = .62). An example of the item from 36-months included, "Mother does not scold or derogate or yell at child more than once during visit." Standardized total scores of the composites at each wave were then aggregated across the three time points (*rs* = .11 - .25, $p < .001$) to represent the average harsh parenting in the home during early childhood. Although reliability coefficients for each wave ranged from weak to modest, past work supports predictive validity of this subscale (Bradley & Corwyn, 2007, 2012; NICHD ECCRN, 1997). For example, in one study, this observational scale of early parental harshness predicted children's self-control at both fourth and fifth grades (Bradley & Corwyn, 2007). Parental harshness was coded so that higher scores indicated greater parental harshness.

***Maternal depressive symptoms.*** Finally, maternal depressive symptoms were reported at 6-, 15-, 24-, and 36-months with the My Feelings Questionnaire. This scale was adapted from the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). The composite was computed as a sum of mother responses to 20-items, with higher values representing higher levels of maternal depressive symptoms. A score of 16 or higher indicates clinical levels of depressive symptoms (CES-D; Radloff, 1977). This scale demonstrated high levels of internal reliability with this sample (Cronbach's α = .90). Few parents reported more than one wave of clinical levels of depressive symptomology (i.e., 19% of the sample reported elevated symptoms at one wave, 8% at two waves, 5% at three waves, and 3% at four waves). Thus, a dichotomous measure was derived to represent whether a parent reported clinical levels of depressive symptoms

in at least one wave, coded: 1 = clinical level depressive symptoms during at least one wave and 0 = no clinical level of depressive symptoms at any wave.

**Early self-regulation**. Early self-regulation at 36-months was measured by a 10-item subscale from the Adaptive Social Behavior Inventory (ASBI) parent survey, with larger scores reflecting higher self-regulation (Hogan, Scott, & Bauer, 1992). For each item, mothers indicated the frequency of various child behaviors along a Likert-type scale. Codes were: 1 (*rarely or never*), 2 (*sometimes*), and 3 (*almost always*). The subscale demonstrated good internal reliability in this sample (Cronbach's $\alpha = .82$). Although this subscale was originally labeled as a measure of children's early compliance (Hogan et al., 1992), a close examination of the items suggested that this variable reflects behavioral aspects of early self-regulation. Example items include: "cooperates with adult requests*",* *"*follows rules in games*",* "accepts change", and "waits his/her turn." Also, an examination of associations of this subscale with more commonly used preschool self-regulation measures provides evidence that this is a valid measure of early self-regulation at early preschool. Specifically, this subscale was significantly associated with the inhibitory control ($r = .52$, $p < .001$) and attention focusing subscales ($r = .35$, $p < .001$) of the Child Behavior Questionnaire (CBQ) measure at 54-months. The CBQ has been used as a valid indicator of self-regulation in past work with this data set, but was not available at the 36-month wave (e.g., Sektnan et al., 2010).

**Analytic Plan**

The goal of the present study was to understand how family risk profiles predict children's early self-regulation at 36-months of age. First, a Latent Class Analysis (LCA) approach was used to identify family risk profiles using Mplus 7.1 (Muthén & Muthén,

1998-2012). To identify the optimal number of risk profiles or classes, several models with varying number of classes were compared in terms of statistical measures of model fit and theoretical interpretability.

When specifying a LCA model, there is no single model fit index that can used to determine the most appropriate number of family risk profiles, or latent classes. Thus, based on best-practices, statistical indices were compared simultaneously (Masyn, 2013; Nylund, Asparouhov, & Muthén; 2007). Drawing from recommendations by Nylund and colleagues (2007), we evaluated models according to a variety of fit statistics including: the *Bayesian Information Criteria* (BIC), *Lo-Mendell-Rubin Likelihood Ratio Test* (LMR-LRT; Lo, Mendell, & Rubin, 2001), and *Bootstrap LRT* (BLRT; McLachlan & Peel, 2000). The BIC simultaneously accounts for model fit, sample size, and number of parameters in the model. The model with the lowest BIC is considered to have the most optimal fit. The LMR-LRT and BRLT are used to compare nested models and are both alternatives to the traditional LRT. For both the LMR-LRT and BRLT, a significant *p*-value suggests that the given solution has a significantly better fit than the solution with one fewer class (Nylund et al., 2007). It is not uncommon for fit indices, particularly the LMR-LRT and BLRT, to conflict during model comparisons. When fit indices are inconsistent across models, it is recommended to consider the conceptual interpretability of each solution along side model fit statistics, with preference for the most parsimonious model solution that is able to conceptually explain the data (Nylund et al., 2007; Muthén, 2012).

Additionally, *entropy,* or the precision of classification for the whole sample across all latent classes, was used to evaluate the extent of separation between classes

(Ramasway, DeSarbo, Reibstein, & Robinson, 1993). Entropy values range between zero and one, with higher values suggesting better separation between classes. Dramatic shifts in entropy across different models are an indication of potential model misspecification (Masyn, 2013).

Therefore, in this study, after four potential candidate models were established through the evaluation of fit indices, the final model was determined by closely comparing the substantive interpretation of the risk profiles, along with the statistical indicators of fit and class separation indicators, to determine final family risk profile solution.

After establishing a model of family risk profiles, we examined risk profiles as differential predictors of children's early self-regulation, using a 3-step-approach in Mplus (Asparouhov & Muthén, 2013; Muthén & Muthén, 1998-2012). Traditionally, when using latent class models to predict a distal outcome, a *classify-analyze* approach is used. This strategy assigns individuals to latent classes based on posterior probabilities (i.e., treats latent class membership as known) and then uses those assignments to predict a distal outcome (Collins & Lanza, 2011). This approach commonly attenuates the predicted estimates because it does not taking account classification error. Thus, more sophisticated approaches have been designed that take into account that a child's latent class membership is never fully known (Masyn, 2013). For example, Mplus's 3-step approach is designed to reduce classification uncertainty and to reduce or eliminate issues of attenuation common with the classify-analyze approach (Asparouhov & Muthén, 2013). Thus, we used this approach to predict children's early self-regulation according to children's probabilities of membership to each family risk profile (Asparouhov &

Muthén, 2013). Further, the equal variances option of the 3-step approach (DE3STEP) was used, which tests for difference in means across classes, but constrains variances of the outcome across classes to be equal. Descriptive evidence supports the assumption that equal variances across classes on early self-regulation was reasonable across the three risk profiles (*SDs* = 3.24 – 3.69; *F* test *p* values all >.22).

**Missing data.** Overall, there were few missing data among all of the study variables. Variables with missing data included parental harshness (4% missing), cognitive stimulation (5% missing), and early self-regulation (14% missing). Compared to families without missing data on self-regulation, those missing data on this variable had significantly lower incomes ($t[1353] = 4.95$, $p < .001$) and lower levels of stimulation in the home ($t[1294] = 3.5149$, $p < .001$). Additionally, families with missing data were less likely to exhibit at least one wave of elevated (i.e., clinical) depressive symptoms (*OR* = .51, $p < .001$) but were more likely to be a single parent during at least one wave (*OR* = 1.70, $p = .002$). Families with missing data did not appear to differ from those without missing data on parental harshness, or across a range of potential auxiliary variables not included in the model (e.g., child gender, life stress, maternal education). In order to reduce potential bias that could result from using listwise deletion, we used full information maximum likelihood (FIML) to account for the small amount of missing data present (Acock, 2012).

## Results

### Descriptive Statistics

Descriptive statistics are presented in Table 1.1. The variability among risk factor indicators appeared sufficient for the detection of distinct family risk profiles. For

example, although the average family income level (measured by an income-to-needs ratio) for the sample as a whole was three times the poverty line ($M$ = 3.27), 25% of families reported an average income-to-needs ratio < 1.5 (1 = federal poverty line). Additionally, 35% of the overall sample reported elevated maternal depressive symptoms during at least one wave, and 23% reported living in a single-parent household during at least one wave. Bivariate correlations (see Table 1.2) among study variables provided preliminary tests of associations among the family risk factors and early self-regulation at 36-months. Early self-regulation was negatively associated with living in a single parent household ($r$ = -.11, $p$ < .001), elevated depressive symptoms ($r$ = -.17, $p$ < .001), parental harshness ($r$ = -.17, $p$ < .001), and identifying as a racial/ethnic minority ($r$ = -.20, $p$ < .001). Early self-regulation was positively associated with family income ($r$ = .19, $p$ <.001) and cognitive stimulation ($r$ = .19, $p$ < .001). Overall, the associations suggested that, although the risks co-varied for the same as a whole, they did they did not appear to share too much variance to combine into risk profiles.

**Family Risk Profiles**

Results from LCA analyses in Mplus (Muthén & Muthén, 1998-2012) were used to determine the final family risk profile solution. Both the three- and four-class solutions demonstrated adequate absolute, but conflicting estimates of relative model fit (see Table 1.3). Specifically, in terms of the relative fit statistics, the more conservative LMR-LRT statistic indicated the three-class solution was preferred, while the BLRT and BIC statistics indicated the 4-class solution had a better fit. Although Nylund and colleagues (2007) suggest the BLRT is the strongest relative fit index, it appears that when used in practice, the BRLT may be less dependable than expected (Muthén, 2013).

Specifically, with non-simulated data, the BLRT often indicates that each successive model is significantly better than the prior, regardless of the other fit indices (Muthén, 2013). When two candidate model solutions have similar model fit, best practice recommendations are to choose the most parsimonious solution with a clear substantive interpretation (Masyn, 2013; Muthén, 2013). In the current study, the substantive interpretation of the four-class solution was not as clear as the three-class solution (see detailed description of the three class model in following section labeled: Three Class Model of Risk). The four-class model included one low risk profile and three elevated risk profiles. Similar to the three class model, one of the elevated risk profiles was uniquely marked by higher parental harshness, but the other two elevated risk profiles that emerged did not meaningfully differ from each other. For example, the other two elevated risk profiles followed nearly identical patterns of elevated risk, including: lower cognitive stimulation, higher probability of living in a single-parent household, elevated depressive symptoms, and identifying as a racial/ethnic minority.

Moreover, risk profiles comprising small proportions of the data are estimated with greater uncertainty (i.e., more error) than profiles explaining a larger proportion of a study sample (Masyn, 2013). In this case, the four-class solution included relatively small numbers of children estimated to belong to the two high risk profiles. Specifically, two of the four risk profiles detected each explained only five and six percent of the estimated study sample (*n*s = 70 & 88, respectively). In comparison, the two elevated risk profiles in the three-class model each explained larger proportions of the study sample (i.e., 19% and 7%). Overall, compared to the four-class solution, the three-class model had a more parsimonious and straightforward interpretation (see below) and the elevated

risk profiles explained larger proportions of the sample, in turn, reducing the risk of classification error.

**Three-class model of family risk.** The parameter estimates for the final three-class model are presented in Table 1.4. Results indicated that children's family risk experiences were best captured by three distinct family risk profiles. First, families with few risks across all risk indicators accounted for about 74% of the study sample. This profile was labeled *low risk.* Second, families with low-income levels, low cognitive stimulation, and single-parent status accounted for about 19% of the study sample. This profile was labeled *low-income/low cognitive stimulation/single parent* (ICS). Finally, families with low-income levels, low cognitive stimulation, and high parental harshness accounted for about 7% of the study sample. This profile was labeled *low-income/low cognitive stimulation/high harshness* (ICH).

The low risk profile reported an average income-to-needs ratio that was about 4 times above the poverty threshold value of 1 (estimated income to needs ratio = 4.50). Also, relative to the overall study sample, this profile was characterized by relatively low parental harshness, and higher cognitive stimulation in the home. Finally, the low risk profile demonstrated minimal prevalence of other risks considered in the family risk profiles, including low probabilities of: living in a single-parent household (<10%), experiencing clinical levels of maternal depressive symptoms (26%), and identifying as a racial/ethnic minority (< 10%).

Compared to the low risk profile, the other two family risk profiles, ICS and ICH, were both marked by elevated risk experiences. On average, children in both high family risk profiles exhibited low-income levels (income-to-needs ratios, ICS = 1.90; ICH =

1.74). The two high family risk profiles also showed other similarities. For example, compared to the low risk profile both elevated risk profiles had higher probabilities of identifying as a racial/ethnic minority (ICH = 36%; ICS = 57%) and had higher probabilities of exhibiting clinical levels of maternal depressive symptoms during at least one wave (ICH = 63%; ICS = 61%). The two high risk profiles were also characterized by average cognitive stimulation values below the sample mean (both ICS & ICH estimated averages near -1; overall sample average = 0).

The two risk factors that most clearly distinguished between the high risk profiles were parental harshness and living in a single-parent household. First, children characterized by the ICH profile experienced higher levels of harsh parenting (e.g., frequent shouting, interfering with child's play, criticizing), with an average harshness score of nearly 2 (vs. overall sample average = 0 and ICS estimated average = -.05).

Second, the two high risk profiles also differed in terms of single-parent status. Specifically, the ICS profile was characterized by a high probability of living in a single-parent household during at least one wave (70%). In contrast, the ICH profile was not characterized by household status. In fact, children in the ICH profile appeared just as likely to live in a dual-parent household throughout the first three years of life (53%) than they were to live with a single parent during at least one wave (47%). Although this risk factor did not characterize the ICH profile, the ICH profile did exhibit a substantially higher probability of single-parent status compared to the low risk profile, which exhibited an 8% probability of reporting single-parenthood.

**Family Risk Profiles and Self-Regulation at 36-Months**

Results from the 3-step analysis supported our hypothesis that family risk profile membership would predict differences in children's self-regulation at 36-months. Specifically, children most likely to be in the low risk profile exhibited significantly higher levels of early self-regulation at 36-months ($M$ = 23.58) than children in both the profile including high prevalence of living in a single-parent household (ICS; $M$ = 21.64; $\chi^2$ = 12.09; $p$ = .001) and the profile including high parental harshness (ICH; $M$ = 20.45; $\chi^2$ = 287.61, $p$ < .001). Significant differences in self-regulation were also detected between the two high family risk profiles. Specifically, The ICH profile predicted significantly lower average self-regulation than ICS profile ($\chi^2$ = 4.10, $p$ = .043), suggesting that children characterized by the ICH profile were at greatest risk for exhibiting low early self-regulation.

## Discussion

In the present study we explored how combinations of family risk factors experienced throughout a child's first three years of life related to differences in early self-regulation skills at age three. Results indicated that children's risk experiences were best captured by three distinct profiles: low risk, low-income/low cognitive stimulation/single-parent (ICS), and low-income/low cognitive stimulation/high parental harshness (ICH). The three family risk profiles predicted significant differences in children's early self-regulation. Children in the low risk profile exhibited higher self-regulation than those in both of the higher risk profiles. Children characterized by the profile including high parental harshness (ICH) appeared at greatest risk for low levels of early self-regulation, with lower self-regulation than both the profile including single-parent status (ICS) and low risk profile.

**Family Risk Profiles**

The majority of the children in this study sample (74%) could be described by the low risk profile (i.e., high family income levels and low prevalence of the other risk factors). The detection of a large low risk profile is consistent with NICHD SECCYD sample characteristics (e.g., a proportion of families who were considered not poor). Because this sample is not statistically representative of the US as a whole, we cannot say that the three risk profiles identified in this study are generalizable to larger populations, like the US population. Yet, findings do provide an initial indication that LCA can be used to understand patterns of risk experienced by children during the first three years of life. The two high risk profiles (labeled ICH and ICS) shared similarly low-income levels and low levels of cognitive stimulation. The two elevated risk profiles also demonstrated greater probabilities of identifying as a racial/ethnic minority and experiencing maternal depression during the first three years. The multiple co-occurring risk experiences illustrated in both high risk profiles aligns with past work suggesting that individual family risk factors rarely operate in isolation, and tend to be highly interrelated with each other (Cicchetti, 1993; Lanza et al., 2010).

Although the two high family risk profiles appeared similar across many of the family risk factors, two risk factors (parental harshness and single-parent status) clearly differentiated the two profiles. Specifically, the ICH profile was uniquely characterized by higher average parental harshness. In contrast, the ICS risk profile was uniquely characterized by single-parent household status during at least one wave (70% probability).

Results of the LCA complement, as well as extend, recent risk profile work also focused on early childhood family risk experiences. For example, similar to past risk profile analyses, lower family income levels commonly characterized higher risk profiles (Lanza et al., 2010: Rhoades et al., 2011). Moreover, similar to risk profile results from Rhoades et al. (2011), the current study's higher risk profiles were differentiated by single-parent status. Furthermore, this study extends the family risk profile and early self-regulation literature. For example, the Rhoades et al. (2011) study showed that family processes partially mediated the relation between demographic risks and children's early self-regulation. In comparison, the present study suggests that family processes may also serve as risk factors themselves such that when experienced in combination with other family risk factors, family processes differentially predict children's early self-regulation. Additionally, the current study was able to identify family risk profiles with meaning for children's early self-regulation spanning a longer developmental window than past work (i.e., children's first three years vs. 2-7 months of age; Rhoades et al., 2011).

**Family Risk Profiles Predict Differences in Early Self-Regulation**

Findings indicated that children's early self-regulation differed across the three family risk profiles. Not surprisingly, children characterized by the low risk profile exhibited the strongest self-regulation at 36-months. Further, children characterized by the risk profile with high parental harshness (ICH) exhibited significantly lower self-regulation than children characterized the other high risk profile (ICS). This finding suggests that, for children facing multiple co-occurring risks, the additional presence of

higher average parental harshness may be more detrimental to early self-regulation than the additional risk experience of living in a single-parent household.

We speculate that children in the ICH profile predicted the lowest self-regulation because this profile was characterized by more risk factors within the family process domain compared to the children in the ICS risk profile. The co-occurrence of two elevated risks in the family process domain (i.e., low cognitive stimulation and high harshness) may be particularly stressful for children, in turn, impeding their self-regulation development. In contrast, the ICS profile was uniquely characterized by single-parent status. Although living in a single-parent household also appears to magnify the negative relation between income and children's self-regulation (Sarsour et al., 2010), when examined in the context of multiple risks, this risk factor may not convey the same level of risk for children's self-regulation when compared to parental harshness. Perhaps the single parent household status risk factor reveals less about the type of daily experiences a child is experiencing, or proximal processes, which are theorized to have a greater influence on children's early developmental trajectories than other more distal contextual influences (Bronfenbrenner & Morris, 2006). Future work would benefit from including risk indicators that help explain why single-parent status serves as a risk factor for child outcomes. For example, risk factors such as lower levels of perceived social support and fewer psychological resources are common in single-parent families and may be more detrimental for children's development than the family structure itself (Cairney, Boyle, Offord, & Racine, 2003).

Harsh parenting during the early childhood period is particularly concerning (i.e., birth to three years) because parental harshness appears to reduce children's opportunities

and motivation to engage with their environments in ways that promote the self-regulation development process (Bradley & Corywn, 2007; Grolnick & Farkas, 2002; Karreman, van Tuijl, van Aken, & Dekovic, 2006; Olson, Ceballo, & Park, 2002; Schaffer, 1996). For example, when parents of young children are punitive and unaccepting, children are more likely to become over-aroused and upset to the point of being unable to cognitively process the message the parent is trying to convey (Grusec & Goodnow, 1994). Moreover, the attachment literature suggests that harsh parenting behaviors threaten the formation of a secure parent-child attachment relationship (Ainsworth, Blehar, Waters, & Wall, 1978). This is troubling because it is within these early attachment relationships that parents and children learn to respond each other's cues through a shared regulatory process (i.e., co-regulation) whereby children gradually internalize parents' external agendas as their own (Ainsworth et al., 1978; Bernier, Carlson, & Whipple, 2010; Kopp, 1982). As such, it is possible that high parental harshness may be related to a more insecure attachment relationship between parent and child, which could lead to weaker self-regulation at 36-months. Overall, findings suggest that the presence of negative or harsh parenting, when experienced in combination with other family risk factors, may be particularly detrimental for children's early self-regulation development.

Finally, both the high risk profiles (ICS and ICH) were characterized by a 60% probability of reporting elevated maternal depressive symptoms (compared to only 26% probability in the low risk group). The higher prevalence of elevated maternal depressive symptoms within the two elevated risk profiles compared to the low risk profile is consistent with past research suggesting that elevated maternal depressive symptoms are

more common among low-income families (Choe et al., 2013). Maternal depression is thought to impede children's early self-regulation through compromised parenting, such as more inconsistent parenting practices and higher prevalence of harsh parenting practices (Choe et al., 2013; Crossley & Buckner, 2011). Although both elevated risk profiles were similarly marked by an increased prevalence of depressive symptoms, the association with parenting processes differed across profiles (i.e., one profile was marked by low cognitive stimulation, whereas the other profile was marked by low cognitive stimulation *and* high parental harshness). Thus, we speculate that maternal depressive symptoms may hold different meaning for children's early self-regulation depending on what other co-occurring risks are also being experienced (e.g., parenting process risks, low income levels).

**Practical Implications**

By exploring patterns of young children's family risk experiences, this study offers potential explanations for why some children struggle more with self-regulation than others. By identifying risk profiles associated with children's early development, we may be able to better inform and target intervention and prevention efforts designed to support the school readiness of young children and their families (Collins, Murphy, & Beirman, 2004). For example, the LCA risk profile results serve as a reminder that risks tend to co-occur and provide evidence suggesting that intervention efforts designed to promote children's early self-regulation would benefit from considering multiple family risks simultaneously. For example, dual-generational programs that are equipped to provide an array of supportive services, which are then tailored to meet the needs of both children and parents during the earliest years, may be particularly beneficial for

supporting children at risk for lower self-regulation. Early Head Start and the Nurse-Family Partnership, are promising examples of these dual-generational, evidence-based, programs are designed to target both children's development and parent well-being through various supports (e.g., financial resources, mental health supports; Ayoub et al., 2009; Olds, 2006).

Additionally, in recent years, policy makers have recognized that the majority of services directed to young children and their families are largely siloed and uncoordinated (Early Learning Division, 2014). Growing awareness around this disconnect in early childhood services has sparked a number of policy initiatives focused on fostering more coordinated systems within early childhood programming (e.g., Early Learning Hubs; Early Learning Division, 2014; Project LAUNCH [Linking Actions for Unmet Needs in Children's Health]; U.S. DHHS, 2010). For example, the state of Oregon is in the process of creating Early Learning Hubs, which aim to integrate traditionally isolated efforts of early childhood-focused programs within the state (e.g., health care, home visiting services, food assistance resources; early learning programs; Early Learning Division, 2014). This study provides evidence that children are indeed facing unique combinations of co-occurring family risks, and that such risk combinations can predict differences in self-regulation during the formative preschool period. As such, policy initiatives focused on creating systems that integrate early childhood services would help service providers more effectively identify and meet the multiple needs of at-risk families, in turn, supporting children's early self-regulation.

Additionally, the results of this study suggest that particular attention should be paid to families where parents demonstrate harsh parenting in addition to other risk

factors, such as elevated maternal depressive symptoms, low cognitive stimulation, and low-income levels. It is possible that many at-risk families may benefit from an intervention approach that teaches supportive parenting strategies to address parental harshness and low cognitive stimulation, but also addresses potential mental health issues that may underlying parenting behaviors. An example of a program that may be beneficial for high-risk families is the federally funded Project LAUNCH (US DHHS, 2010). For example, many Project LAUNCH grantees are home visiting programs that have partnered with mental health clinicians to improve mental health consultation during home visits that are typically focused on child development and teaching positive parenting (Goodson, Mackrain, Perry, O'Brien, Gwaltney, 2013). The prevalence of elevated levels depressive symptoms (i.e., at clinical levels) among the two elevated risk profiles suggest that the integration of mental health supports in programs and services designed to support at-risk families may be particularly important, especially among families also demonstrating high harshness (in addition to low cognitive stimulation and low income levels). When tailoring intervention efforts to best meet the complex needs of at-risk families with young children, future work should continue work on including mental health supports for parents and children.

**Strengths, Limitations, and Future Research**

A limitation of all person-centered work is that profiles are sensitive to the size and characteristics of the study sample (Masyn, 2013). Although the current study recruited an economically diverse sample of children from a variety of geographic regions throughout the US, the study was not designed to be nationally representative (NICHD ECCRN, 1996). Thus, making generalizations from the specific combinations

of risks, as well as prevalence rates, identified in the current study may be inappropriate. Despite this limitation, the current study is the first to show that variability in combinations of family risks have meaning for early self-regulation. Future research would benefit from utilizing study samples that are recruited to ensure they are statistically representative of a given population of children and families.

Second, the study sample was limited in terms of racial/ethnic diversity (i.e., about 20% of the overall sample identified as a racial/ethnic minority). Some work suggests that the salience and impact of various risk factors may function differently depending on a child's racial/ethnic, or cultural, background (Garcia Coll & Magnusson, 1999; Rhoades et al., 2011). However, rather than running separate models by race, we included racial/ethnic minority status as a potential risk factor within the risk profiles because we were focused on understanding how racial/ethnic minority status functioned when combined with other risks. In fact, children in the two elevated family risk profiles were substantially more likely to identify as a racial/ethnic minority (40-50% identified as a minority), compared to the low risk profile (8% identified as a minority). This finding aligns with past work suggesting racial/ethnic minority children are more likely to live in low-income families and other related risk factors than non-minority families (Dearing et al., 2006). Future work should replicate this type of risk profile analysis with nationally (or regionally) representative samples that better reflect the racial/ethnic make-up of a given population. This would allow for greater generalizability of findings. Additionally, future work should include more specific process indicators of race-related risks thought to explain why racial/ethnic minority status functions as a proxy for risk, such as the degree of perceived discrimination reported by parents.

Third, although this study addressed a variety of family risk factors, we were unable to include all potential indicators of risk that may shape early self-regulation. Future work should consider how children's own characteristics (e.g., temperament) also contribute to shaping family risk profiles. For example, during early childhood, children who are more reactive and less inhibited tend to demonstrate lower rates of effortful control (a similar construct to self-regulation, but based in temperament; Raikes et al., 2007). Furthermore, early reactivity appears to serve as an additional risk factor for children's well-being when experienced in combination with other family risks (Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2007; Lengua, 2002). For example, in terms of children's early social adjustment, evidence suggests that children who exhibit more emotional negativity (similar to reactivity) are more developmentally vulnerable to experiences of multiple family risk when compared to less emotionally negative children (Lengua, 2002). Although we were unable to capture how child-based factors interplay with family factors to help explain children's self-regulation development, this study did consider how family demographic and family process risks combine to predict children's self-regulation.

Finally**,** this study had measurement limitations. First, the early self-regulation construct was measured by parent-report. This can be considered both a limitation and a strength. One the one hand, parent-reported questionnaires may be susceptible to reporter-bias when compared to direct child measures of self-regulation (Goodman & Gotlib, 1999). On the other hand, adult reports may provide better assessments of children's patterns of self-regulation as they are exhibited across time, settings, and situations with varying social complexity (Lengua, 2012). In contrast, direct measures of

self-regulation tend to be restricted to short-term assessments and are measured in more controlled environments. Thus, parent-reported self-regulation assessments may be picking up on a different set of skills than direct measures. Further, the maternal depressive symptoms and self-regulation outcome measures both relied on parent report, suggesting potential bias attributable to shared method variance (Spector, 2006). Future work should continue to evaluate children's self-regulation through a variety of assessment tools.

**Conclusion**

The present study detected three distinct constellations of early family risks, or family risk profiles, that predicted differences in children's self-regulation at 36-months. Compared to the low risk profile, the two high risk profiles showed both a few similarities as well as some important differences. Children characterized by the low risk profile exhibited stronger self-regulation than the children in the two elevated risk profiles. In addition, results indicated that the family risk profile with high harshness (ICH) conveyed the greatest risk, predicting the lowest self-regulation among the three family risk profiles. This study extends previous early childhood risk research by providing preliminary evidence that unique combinations of family risk experiences spanning both demographic and family process domains have meaning for children's early self-regulation development. Family risk profiles can help us understand how early family risks 'work together' to differentially impede children's early self-regulation skills. Continued risk profile work has the potential to inform early childhood policies and programming designed to more effectively support young children's school readiness by identifying and addressing the complex needs of at-risk families.

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Table 1.1

*Descriptive Statistics for all Study Variables* (*N* = 1364)

| Categorical variables | % Yes | % No | | |
|---|---|---|---|---|
| Indicator variables | | | | |
| Single-parent household (yes = at least one wave) | 22.80 | 77.20 | | |
| Racial/ethnic minority status [b] | 19.60 | 80.40 | | |
| Maternal depressive symptoms (yes = at least one wave) | 35.12 | 64.88 | | |
| **Continuous variables** | ***M*** | ***SD*** | **Min** | **Max** |
| Indicator variables | | | | |
| Income-to-needs ratio | 3.27 | 2.80 | 0.00 | 18.76 |
| Parental harshness[a] | 0.00 | 0.69 | -0.86 | 3.93 |
| Cognitive stimulation[a] | -0.02 | 0.89 | -4.76 | 1.27 |
| Outcome variable | | | | |
| Early self-regulation at 36-months | 23.10 | 3.37 | 12.00 | 30.00 |

*note.* In analyses, income-to-needs was log transformed. [a]Variable is aggregate of standardized observational variables from waves 6-, 15-, and 36-months. [b]0 = non-minority, 1 = racial/ethnic minority.

Table 1.2

*Correlations Among all Study Variables* (*N* =1364)

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1. Early self-regulation at 36-months | — | | | | | | |
| 2. Income-to-needs ratio | .19*** | — | | | | | |
| 3. Single-parent household [b] | .11*** | -.37*** | — | | | | |
| 4. Racial/ethnic minority status [c] | -.17*** | -.25*** | .31*** | — | | | |
| 5. Cognitive stimulation | -.19*** | .39*** | -.36*** | -.39*** | — | | |
| 6. Parental harshness | -.17*** | -.26*** | .20*** | .16*** | -.30*** | — | |
| 7. Maternal depressive symptoms[b] | .20*** | .27*** | .27*** | .14*** | -.24*** | .20*** | — |

[b]0 = no, 1 = yes; [c]0 = non-minority, 1 = racial/ethnic minority.
***$p < .001$.

Table 1.3

*Model Fit Indices for Latent Class Analysis of Family Risk Variables* (*N* = 1364)

| Number of Classes | BIC | Sample-size adjusted BIC | Entropy | LMR-LRT[a] p-value | BLRT[a] p-value | Estimated proportion of children in smallest class | Estimated number of children in smallest class |
|---|---|---|---|---|---|---|---|
| one | 13323.71 | 13295.12 | n/a | n/a | n/a | n/a | n/a |
| two | 12049.44 | 11998.62 | 0.85 | 0.00 | .000 | 0.24 | 322 |
| three | 11793.80 | 11720.74 | 0.87 | 0.05 | .000 | 0.07 | 91 |
| four | 11603.54 | 11508.24 | 0.85 | 0.09 | .000 | 0.05 | 70 |

*Note.* BIC = Bayesian information criterion; LMR LRT = Lo-Mendel Rubin likelihood ratio test; BLRT = Bootstrapped likelihood ratio test.
[a]The null hypotheses for the *p* values indicate that a solution with the given number of classes provides the same fit to the data as a solution with one less class.

Table 1.4

*Class Averages (Continuous Indicators), Item Response Probabilities (Dichotomous Indicators), and Prevalence Rates for Three-Class Model* (*N* = 1364)

| | Risk Profile | | |
|---|---|---|---|
| Risk Factor | Low risk | Low income/low cognitive stimulation/high parental harshness (ICH) | Low income/low cognitive stimulation/ single parent (ICS) |
| *Continuous indicators* | | | |
| Income-to-needs ratio (log) | 4.50 (1.51) | 1.90 (0.64) | 1.74(0.55) |
| Parental harshness[a] | -0.18 | 1.77 | 0.06 |
| Cognitive stimulation[a] | 0.31 | -0.82 | -1.01 |
| *Dichotomous indicators* | | | |
| Single-parent household | .08 | .47 | .70 |
| Racial/ethnic minority status [b] | .08 | .36 | .57 |
| Maternal depressive symptoms | .26 | .64 | .61 |
| *Prevalence rates* (%) | 74.50 | 6.67 | 18.84 |

*Note.* Income-to-needs ratio was log transformed for analyses and estimates exponentiated for table. [a]Variable is aggregate of standardized observational variables from waves 6-, 15-, and 36-months. [c]0 = non-minority, 1 = racial/ethnic minority.

# Caregiver Responsiveness Predicts Self-Regulation for At-Risk Children in Kindergarten

# Caregiver Responsiveness Predicts Self-Regulation for At-Risk Children in Kindergarten

High quality early care and education (ECE) experiences support an array of school readiness skills important for children's transition to formal schooling (Vandell, 2004; Zaslow et al., 2010). For example, findings from two large studies, the Cost, Quality, and Outcomes study and NICHD Study of Early Child Care, demonstrate that children who attend higher quality ECE tend to have better language and pre-academic skills in early elementary school (National Institute of Child Health and Development Early Child Care Research Network [NICHD ECCRN], 2002; Peisner-Feinberg et al., 2001). Moreover, high quality ECE experiences may be more strongly predict school readiness outcomes for children facing early vulnerabilities, or risk factors. Much of this work has focused on children facing elevated socioeconomic risk factors (NICHD ECCRN, 2005; Peisner-Feinberg et al., 2001), although an emerging line of work suggests that child-based characteristics (e.g., reactive temperament) may also increase a child's sensitivity to the quality of ECE settings (Phillips, Fox, & Gunnar, 2011; Pluess & Belsky, 2009). The current study adds to this body of research by focusing on children at-risk for later school challenges because of low early self-regulation skills at preschool entry (36-months). Children with low early self-regulation skills are more likely to struggle during the transition to kindergarten in terms of achievement and social competence (Blair & Razza, 2007; Lengua, 2002; Wanless et al., 2011). The present study examined the role of two ECE quality dimensions on self-regulation in the fall of kindergarten, and tested if the relationship between quality and self-regulation was

stronger for children who exhibited lower early self-regulation skills at early preschool (i.e., 36-months).

**Self-Regulation and School Readiness**

The behavioral aspects of self-regulation can be understood as the integration of three cognitive components (attention, working memory, and inhibitory control) as they apply to children's ability to control, plan, and execute goal-directed behaviors in various settings (Blair, 2002). Past work suggests that although attention, working memory, and inhibitory control are all individually important aspects of cognition, it is the integration and application of these skills to behavior that is critical to children's ability to successfully navigate classroom settings (Baumeister & Vohs, 2004; McClelland, Cameron, Connor et al., 2007; McClelland, Cameron, Wanless et al., 2007). For example, a child with strong self-regulation is able to navigate a multi-step art project in a busy classroom by: 1) executing all of the steps involved in the correct order (working memory), 2) resisting distraction by other exciting projects or peers (inhibitory control), and 3) staying on task to complete the project and, when finished, independently transitioning from the project to another appropriate activity (attentional flexibility). In sum, self-regulation skills allow children to successfully engage in the learning process within the formal classroom environment (Rimm-Kaufman, Pianta, & Cox, 2000).

Early self-regulation skills have long-term implications for many areas of life, including academic achievement and social competence outcomes (Blair, 2002; Buckner, Mezzacappa, & Beardslee, 2009; Eisenberg et al., 1997; Eisenberg, Smith, Sadovsky, & Spinrad, 2004; Howse, Lange, Farran, & Boyles, 2003; McClelland, Cameron Ponitz, Messersmith, & Tominey, 2010). For example, in a longitudinal study, after controlling

for a host of background covariates, children who were better able to pay attention and persist through a difficult task (two aspects of self-regulation) at age four had 49 percent greater odds of completing college by age 25 (McClelland, Acock, Piccinin, Rhea, & Stallings, 2013). In another study, children with stronger self-regulation skills demonstrated better social competence and fewer problem behaviors during middle childhood (Buckner et al., 2009).

Unfortunately, many children transition from preschool to kindergarten struggling with these early self-regulation skills (Rimm-Kaufman et al., 2000). Research suggests that children with lower self-regulation during early childhood are more likely to struggle later on with many aspects of school functioning (Blair & Razza, 2007; Lengua, 2002; McClelland, Acock, & Morrison, 2006; Wanless, McClelland, Acock, et al., 2011). For example, children with lower self-regulation skills appear to be a greater risk for subsequent negative outcomes, such as an increased risk for psychopathology and increased substance use during adolescence (Nigg, 2006; Tarter et al., 2012). Overall, early deficits in self-regulation appear to function as a developmental risk factor for children's subsequent well-being (Lengua, 2002). However, growing evidence suggests that self-regulation skills are malleable and exposure to high quality early learning experiences can improve children's self-regulation, in turn, preparing them for a more successful transition to kindergarten (Duncan et al., 2007; Raver et al., 2008; Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009).

**Early Care and Education Quality**

High quality ECE settings are typically characterized by attentive, responsive, and stimulating care that is supportive of social, linguistic, and cognitive aspects of children's

school readiness (Belksy, 2006; Burchinal, Kainz, & Kai, 2011; NICHD ECCRN, 2002a; 2003b; Peisner-Feinberg et al., 2001; Zaslow et al., 2011). ECE quality can be understood in terms of both structural and process features (Harms & Clifford, 1980; Lamb & Ahrnet, 2005). Structural indicators of quality include features of ECE settings, such as teacher-child ratio and staff qualifications. Structural features of quality appear to indirectly influence children's development through process quality (Friedman & Amadeo, 1999; NICHD ECCRN, 2002). *Process quality* is broadly defined as the quality of instruction and the dynamic nature of teacher-child interactions. Measures of process quality capture the daily interactions occurring within children's ECE settings, and thus, tend to be more directly related to children's school readiness outcomes than other quality features (Cassidy et al., 2005; La Paro, Pianta, & Stuhlamn, 2004; Lamb & Ahnert, 2005; Vandell & Wolf, 2000). Past work has examined the influence of global process quality on development, which is typically measured by a composite, including a range of indicators, such as cognitive stimulation, sensitivity, lack of intrusiveness, and lack of disengagement. Global process quality has shown small to modest associations with children's achievement and behavioral competences (Burchinal et al., 2008; NICHD ECCRN & Duncan, 2003; Peisner-Feinberg et al., 2001; Vandell, 2004).

The current study takes a more nuanced approach to examining process quality that is based on recent work calling for the need for a better understanding of how *specific* dimensions of process quality relate to *specific* child outcomes. For example, research suggests that compared to global process quality, the influence of specific dimensions of quality on children's school readiness outcomes appear more pronounced (Burchinal et al., 2011). Moreover, evidence of domain specificity between dimensions

of process quality and child outcomes has also been found. For example, aspects of the emotional quality of ECE settings tend to predict children's social outcomes, while aspects of instructional quality tend to predict children's achievement outcomes (Mashburn et al., 2008; Peisner-Feinberg et al., 2001; Rimm-Kaufman et al., 2009). Although dimensions of quality appear to differentially predict an array of school readiness outcomes, little work has examined how distinct dimensions of ECE process quality relate to children's self-regulation. Recent research examining specific domains of ECE process quality on children's self-regulation, suggests that both affective and cognitive ECE quality dimensions are significantly (albeit modestly) related to preschoolers' self-regulation (Fuhs, Farran, & Nesbitt, 2013; Weiland, Ulvestad, Sachs, & Yoshikawa, 2013).

First, *cognitive stimulation*, or the degree to which a learning setting stimulates children's thinking and caregivers facilitate children's learning, appears to modestly promote self-regulation over the prekindergarten year (Fuhs et al., 2013; Weiland et al., 2013). A cognitively stimulating environment is theorized to support children's early self-regulatory skills in numerous ways. First, engaging children in cognitively stimulating ECE settings may facilitate children's more complex thinking, as well as provide greater opportunities for activity choice and reflection. These are both important processes for supporting the executive function skills central to self-regulated behavior (Bodrova & Leong, 2006; Fuhs et al., 2013). Moreover, greater cognitive stimulation may indicate the use of more language and literacy instruction in ECE settings. Language use in ECE settings appears to support children's own language and vocabulary skills, which may, in turn, support children's improved ability for self-talk or inner speech.

Improved language skills have shown to help children learn how to monitor and self-regulate their behaviors through self-talk strategies (Fuhs & Day, 2011; Zakin, 2007).

Second, *positivity/responsivity*, or the degree to which an ECE setting is emotionally positive, and to which caregivers are responsive to children's needs and interests, may play an important role in supporting self-regulation (Bodrova & Leong, 2009; Fuhs et al., 2014; Raver et al., 2008; Weiland et al., 2013). For example, Fuhs and colleagues (2013) found that preschool teachers' positive emotional tone, along with more behavior approving and less behavior disapproving interactions, each predicted significant gains in children's self-regulation over the year. Moreover, in an intervention study, preschoolers enrolled in more emotionally supportive preschool classrooms showed higher levels of observed engagement (measured similarly to the behavioral aspects of self-regulation) by the end of the school year compared to those in less emotionally supportive classrooms (Raver et al., 2008). Higher levels of positivity/responsivity in ECE settings may foster self-regulation in a number of ways. First, greater positivity/responsivity may reflect a more emotionally supportive climate where children feel comfortable and encouraged to practice their emerging self-regulatory skills in a low-stress environment (Fuhs et al., 2013). This dimension of quality may also reflect how well caregivers can modify their interactions with children to optimally support their self-regulation development through scaffolding and individualized external supports (e.g., verbal/visual reminders of behavioral expectations; Bodrova & Leong, 2009).

The current study extends this emerging literature on ECE process quality and children's self-regulation in a couple of ways. First, past work has utilized study samples

based in center-based preschool programs (Fuhs et al., 2013; Weiland et al., 2013). Not all children attend formal center-based programming during their prekindergarten year. In fact, has been estimated that about 20% of children attending ECE settings during the preschool years are in informal care settings (National Center for Education Statistics Report, 2005). Thus, the present study sample includes children attending a variety of ECE settings, including both formal (e.g., center-based) and informal care types (e.g., relative care, home-based child care). Although informal and formal care settings differ structurally, we can analyze quality across setting types because of our focus on process quality, or the nature of children's daily adult-interaction, a commonality among all early childhood settings. By including children attending both center-based programs and informal care experiences within our analyses of ECE quality (using a common observational measure of process quality designed for use in both formal and informal ECE types) we can glean a more representative estimate of how typically-selected ECE quality experiences relates to children's development.

**Early Care and Education and Children with Low Self-Regulation**

Although high quality ECE experiences demonstrate modest positive effects on school readiness outcomes for preschoolers as a whole (Burchinal et al., 2008; Mashburn et al., 2008; Rimm-Kaufman et al., 2009), the quality of ECE settings may have a larger effect on school readiness outcomes for young children facing elevated risk factors (Dearing, McCartney, & Taylor, 2009; Lambert, Abbott-Shim, & McCarty, 2002; Peisner-Feinberg et al., 2001; Vandell et al., 2010). For example, research suggests that children from economically disadvantaged homes experience greater benefits from high quality ECE, in terms of their school readiness skills compared to their more

economically-advantaged peers (Magnuson, Ruhm, & Waldfogel, 2007; McCartney, Dearing, & Taylor, 2003; Peisner-Feindberg et al., 2001). Additional research suggests that children's individual characteristics may also serve as potential moderating risk factors between the effect of ECE quality and school readiness (NICHD ECCRN & Duncan, 2003; Pluess & Belsky, 2009; Phillips, Fox, & Gunnar, 2011). For example, children with relatively lower early cognitive skills than their peers benefited more from high quality ECE settings (as measured by a global positive caregiving composite) on their achievement outcomes during preschool (NICHD ECCRN & Duncan, 2003). Considering low self-regulation may serve as an early risk factor for children's later school outcomes, we anticipated that children with low early self-regulation would see greater benefits of both dimensions of process quality (positivity/responsivity and cognitive stimulation) on their subsequent self-regulation in the fall of kindergarten, compared to the sample as a whole.

Despite a dearth of research examining low self-regulation as a potential moderator of ECE quality in observational research, a few intervention studies suggest that children's low self-regulation may moderate the influence of high quality classroom-based practices on children's self-regulation growth (Connor et al., 2010; Tominey & McClelland, 2011). Results of both intervention studies suggested that children who exhibited low levels of self-regulation in the fall benefited *more* from the high quality, classroom-based, intervention programming by the end of the school year compared to their more regulated peers (Connor et al., 2010; Tominey & McClelland, 2011). The present study builds upon this work by examining whether children's relatively lower early self-regulation at the beginning of the preschool period related to greater self-

regulation improvements from higher ECE process quality compared to their peers who entered the preschool period with stronger early self-regulation skills.

### Present Study

The present study examined how children's experiences of two dimensions of ECE process quality during the prekindergarten year predicted their subsequent self-regulation in the fall of kindergarten. First, we hypothesized that cognitive stimulation and positivity/responsivity would each uniquely predict self-regulation in kindergarten for the sample as a whole, controlling for children's earlier self-regulation. This hypothesis aligns with past work showing that distinct dimensions of process quality (related to positivity/responsivity and cognitive stimulation) modestly predicted gains in children's self-regulation over the prekindergarten year (Fuhs et al., 2013; Weiland et al., 2013). Second, we hypothesized that early self-regulation would serve as a moderator between ECE process quality and later self-regulation in the fall of kindergarten. Considering that some children benefit more from high quality ECE than others, we expected children who entered preschool with relatively lower (vs. higher) early self-regulation would benefit more from both dimensions of process quality.

## Methods

### Participants

This study utilized data from the National Institute on Child Health and Development Study of Early Child Care and Youth Development (NICHD SECCYD). Families were recruited in 1991 ($N$ = 1,364, 52% male) from 24 hospitals across the U.S.. At one month of age, 22% of families were living in poverty (income-to-needs ratio < 1) and another 23% of families were living near poverty (income-to-needs ratio between 1

and 1.99). Although maternal education was fairly high in this sample (about 69% of mothers obtained at least some college), a substantial portion of the mothers also had relatively low-educational attainment (i.e., 31% had a high school diploma or less). Seventy-six percent of the children in the study identified as White, 13% identified as Black, 6% identified as Hispanic, and 5% reported other ethnicities. A little over half the full sample (54%) attended center care (including part-time preschools), 12% attended child care homes, and 11% experienced informal care (e.g., grandmother or neighbor care). The analytic sample was restricted to children who attended some type of formal or informal ECE setting at 54-months ($n$ = 996). Children were excluded from the analyses ($n$ = 368) if they did not attend any type of ECE setting at 54-months. The excluded children differed from those in the analytic sample in a few ways. On average, families included in the analytic sample exhibited higher incomes (t[1353] = -6.61, $p$ < .001), stronger early self-regulation (t[1175] = -2.20, $p$ = .03), lower levels of parental harshness (t[1302] = 2.63, $p$ =.01), and were less likely to identify as a racial minority ($OR$ = .60, $p$ < .001).

**Procedure**

This study utilized data from Phases I and II of the longitudinal NICHD SECCYD project. Parents were interviewed at 1-, 6-, 15-, and 36-month waves on background characteristics, and completed a survey of children's early self-regulation at 36-months. The quality of the ECE setting was assessed during the prekindergarten year (i.e., the 54-month wave collected during Phase II). At 54-months, researchers conducted two 44-minute observations of ECE quality at participating children's primary ECE settings. In

the fall of the following year, kindergarten teachers filled out a survey to rate children's self-regulation in the classroom.

**Measures**

**Self-regulation in kindergarten**. Children's self-regulation in fall of kindergarten was measured by the teacher-rated cooperation subscale of the Social Skills Rating System – Teacher form (SSRS; Gresham & Elliott, 1990). Items addressed children's ability to follow directions, use time appropriately, make transitions without being disruptive, follow teacher's instructions, and finish classroom assignments within time limits (Gresham & Elliott, 1990). The subscale showed strong internal reliability in this sample (Cronbach's $\alpha = .92$). This measure has been selected as a measure of self-regulation in past work because the items address the behavioral aspects of self-regulation needed to engage in a formal classroom environment (Sektnan et al., 2010). This subscale has also been significantly associated with parent-reported self-regulation ratings of self-regulation as measured by the Children's Behavior Questionnaire (attention focusing, $r = .23$, $p < .001$, and inhibitory control, $r = .28$, $p < .001$), further supporting the construct validity of the measure as an indicator of children's self-regulation (Sektnan et al., 2010).

**Early self-regulation at early preschool**. A 10-item subscale from the Adaptive Social Behavior Inventory (ASBI) measured early self-regulation at 36-months, with higher scores reflecting higher early self-regulation (Hogan, Scott, & Bauer, 1992). For each item, mothers indicated the frequency of various behaviors. Codes ranged from: 1 (*rarely or never*), 2 (*sometimes*), to 3 (*almost always*). The subscale demonstrated moderate internal reliability in this sample (Cronbach's $\alpha = .82$). Example items

included: "cooperates with adult requests*"* and *"*follows rules in games." Although this scale was originally labeled as a measure of children's compliance (Hogan et al., 1992), a close examination of the items suggested that this subscale reflects early behavioral aspects of self-regulation. An examination of associations between this subscale and more commonly used self-regulation measures further supports the use it as a valid measure of early self-regulation. For example, the subscale was significantly associated with two subscales from the Child Behavior Questionnaire (CBQ) designed to measure early self-regulation, including inhibitory control ($r$ = .52, $p$ = .00) and attention focusing ($r$ = .35, $p$ = .00). Children's scores on this measure of early self-regulation were employed as a continuous variable for both the main effects model (hypothesis 1) and interaction models (hypothesis 2).

**Process quality dimensions**. The Observational Record of the Caregiving Environment (ORCE), a measure that was developed specifically for use by the NICHD SECCYD, was used to measure distinct dimensions of ECE process quality. The ORCE measurements are based on two setting visits where observers rated the settings according a variety of items capturing both broad aspects (e.g., emotional climate) and more specific aspects (e.g., frequency of teaching social rule) of setting quality (NICHD ECCRN, 1996). A strength of the ORCE measure is that it was designed to evaluate children's experiences of quality spanning a wide range of ECE types, including both formal (e.g., centers) and less formal settings (e.g., family child care homes). This is unique, as the majority of quality measurement tools have been designed only for use in center-based care settings (e.g., CLASS; La Paro et al., 2004). It is important to include children attending both form and informal care setting in this study because children in

informal settings tend to differ among family characteristics. For example, families utilizing informal settings are often lower-income (Bainbridge, Meyers, Tanaka, & Waldfogel, 2005; Early & Burchinal, 2001), which has been associated with lower self-regulation skills (Evans & Rosenbaum, 2008; Howse, Lange, et al., 2003; Noble, Norman, & Farah, 2005).

The ORCE observations were used to examine two distinct process quality dimensions during children's prekindergarten year: cognitive stimulation and positivity/responsivity. To determine the ECE process quality variables utilized in the current study, confirmatory factor analyses of the theoretically chosen ORCE items were conducted. Process quality items included both qualitative ratings (caregiver-child interactions and global setting quality) and behavior counts (specific caregiver-child behaviors). For the qualitative ratings, trained observers rated each item using a four-point scale, ranging from 1(*not at all characteristic*) to 4 (*highly characteristic*). Observers also collected behavior counts of the total frequency of observed key caregiver-child behaviors. Counts were recorded during 60-second intervals. The behavior count items were computed by summing the number of total observed behaviors and then scaling each variable to 60- segments to reflect the number of times a given behavior occurred during an average of 60-seconds. Before aggregating items to create the dimension variables, all process quality items were standardized to account for potential differences in scale that existed between the qualitative ratings and behavior ratings ($M = 0$, $SD = 1$). Items that were both theoretically related to one of the two constructs (cognitive stimulation and positivity/responsivity) and had a factor loading of at least .45 were included in the aggregates.

***Cognitive stimulation.*** Cognitive stimulation was measured by the aggregate of three items: stimulation of cognitive development, caregiver facilitates learning, caregiver teaches social rule (*rs* = .21 - .50, *ps* < .001; Cronbach's α = .65). Stimulation of cognitive development was a qualitative item, whereas the teacher/caregiver facilitates learning and teacher teaches social rule were both behavior count items.

***Positivity/responsivity.*** Positivity/responsivity was measured by the aggregate of six quality items: caregiver sensitivity/responsivity, caregiver detachment (reverse coded), caregiver frequently encourages or praises child, negative emotional climate (reverse coded), positive emotional climate, and setting chaos (reverse coded; *rs* = .26 - .75, *p* < .001; Cronbach's α = .68). All items were qualitative ratings, with the exception of the caregiver frequently encourages or praises item, which was a behavior count.

**Background covariates.** Family and child background covariates were gathered during parent interviews at 1-, 6-, 15-, and 36-month waves and included: family income, racial minority status, child gender, and parental harshness.

***Family income.*** Parents reported family income and the number of individuals in their households during parent interviews conducted at 1-, 6-, 15-, 24-, and 36- month waves. At each wave, an income-to-needs ratio was calculated by dividing the total family income by number of individuals in the household. Considering that income fluctuates over time, these ratios were averaged across all five time-points to obtain an overall measure of family income.

***Gender.*** Gender was measured at the 1-month interview and coded 1 = female and 0 = male.

***Parental harshness.*** Parental harshness was measured during home observations of parent-child interactions at 6-, 15-, and 36-month waves using the infant/toddler- and early childhood-versions of the HOME inventory (Caldwell & Bradley, 1984). Age-appropriate versions of the HOME inventory were used at each wave. Consistent with prior studies examining parental harshness with this scale (Bradley & Corwyn, 2007; 2012; NICHD ECCRN, 1997), the scores at each wave were standardized before aggregating to allow for comparability. Standardized total scores of the composites from each wave were then aggregated across the three time points to represent the average harsh parenting in the home (Cronbach's αs = .57 - .62; *rs* = .11 - .25, *ps* < .001).

**Early care and education covariates.** We controlled for type of ECE at 54-months, coded as 1(*center-based care*) and 0 (*other ECE setting*) and the number of hours per week the child was in some type of ECE setting. These ECE factors are important covariates because of their associations with children's development (Lamb & Ahrnet, 2006).

**Analytic Strategy**

Data analyses were conducted by running regression models using the structural equation model (SEM) package in Stata 13.0 (StataCorp., 2013). First, a main effects model was estimated to examine how positivity/responsivity and cognitive stimulation predicted children's self-regulation in the fall of kindergarten, controlling for early preschool self-regulation. Both dimensions of quality ($r = .51$, $p < .001$) were included within the same model to test the relative contribution of each aspect of quality on self-regulation in kindergarten, controlling for demographic and ECE setting covariates, and self-regulation at 36-months. To address the second study aim, we examined whether

early self-regulation acted as a moderator of quality. To test for potential moderation, the process quality indicators and the early self-regulation moderator were centered at the mean and multiplied to create two continuous by continuous interaction terms: cognitive stimulation by early self-regulation and responsivity/positivity by early self-regulation. The interaction terms were introduced into the model in a stepwise fashion, first testing the moderation between early self-regulation cognitive stimulation (i.e., Model 2) and then introducing the positively responsivity interaction (i.e., Model 3). To ensure adequate statistical power to detect an interaction effect with a relatively small sample (i.e., reduce type II error), non-significant interactions were trimmed.

**Missing data.** Within the study sample, there were few missing data, and no variables had greater than 15% missingness. Specifically, data were missing on self-regulation in kindergarten (12% missing) and early self-regulation (3% missing), as well as on both the ECE quality measures (positivity responsivity and cognitive stimulation; both 14% missing). Very few data were missing among the covariates, with family income and hours in care variables both missing in less than one percent of cases. To deal with the missing data, full information maximum likelihood (FIML) was employed for hypotheses testing using the SEM package in Stata Version 13.0 (StataCorp., 2013). We assumed all data were missing at random (MAR), requiring that all variables associated with missingness be included in the models, and assuming any other patterns of missingness were random (Schafer & Graham, 2002). There is no way to definitively test the MAR assumption; however, tests were conducted to determine whether auxiliary variables not included in original models were related to missingness. For study variables with >5% missing, we ran logistic regressions using derived dichotomous

variables for each variable with missing data (1= missing, 0 = present). None of the potential auxiliary variables were related to missingness on the study variables (e.g., household stress, maternal education, racial/ethnic minority status). In sum, to reduce potential bias that could result from using listwise deletion and to maintain statistical power (Acock, 2012), we utilized FIML to account for the small amount of missing data present.

## Results

The present study aimed to examine the relations between positivity/responsivity and cognitive stimulation dimensions of ECE quality on children's self-regulation in the fall of kindergarten. An additional goal was to examine whether children's early self-regulation skills moderated the relation between ECE process quality and self-regulation in the fall of kindergarten.

### Descriptive Statistics

Descriptive statistics are presented in Table 2.1. Nearly 74% ($n$ = 733) of children in the analytic sample attended center-based care during the prekindergarten year, of which 9% ($n$ = 68) attended Head Start programs. The remaining 26% ($n$ = 263) of the sample experienced a variety of care types, including family child care and informal care settings (e.g., grandmother, neighbor). Children spent about 30 hours per week in one or more ECE settings.

Correlations among study variables can be found in Table 2.2. Children's self-regulation in the fall of kindergarten was not associated with type of ECE setting ($r$ = -.00, *ns*). Self-regulation in kindergarten was modestly related with ECE positivity/responsivity ($r$ = .09, $p$ = .01), and showed a trend-level association with

cognitive stimulation ($r$ = .06, $p$ = .09). Cognitive stimulation and positivity/responsivity were positively associated with each other ($r$ = .51, $p$ < .001). Although the two dimensions of quality were strongly associated, multicollinearity was not a concern (*VIF* = 1.04, *tolerance* = .96). In terms of covariates, self-regulation in kindergarten was positively related to earlier self-regulation as rated by parents at 36-months ($r$ = .21, $p$ < .001). Family income was positively associated with self-regulation in kindergarten ($r$ = .23, $p$ < .001) and girls exhibited higher self-regulation than boys ($r$ = .21, $p$ < .001). Harsh parenting and attending more hours of ECE per week were both associated with children's lower self-regulation in kindergarten ($r$ = -.23, $p$ <.001; $r$ = -.14, $p$ < .001, respectively).

**Testing the Relation Between Process Quality and Self-Regulation**

First, results of the main effect model did not support our first hypothesis that the two dimensions of ECE quality would predict self-regulation in the fall of kindergarten. Specifically, for the overall sample, neither positivity/responsivity nor cognitive stimulation predicted children's self-regulation in the fall of kindergarten, controlling for earlier self-regulation and relevant covariates (See Table 2.3, Model 1). Second, findings partially supported our second hypothesis that ECE process quality would more strongly predict children's self-regulation in kindergarten for children who entered the preschool period with lower early self-regulation skills. Specifically, no interaction effect was detected between early self-regulation and cognitive stimulation on self-regulation in the fall of kindergarten (see Table 2.3, Model 2). As such, the cognitive stimulation by early self-regulation interaction term was trimmed before running Model 3, which included the second interaction term (positivity/responsivity by early self-regulation). In Model 3 (see

Table 2.3) we detected a significant interaction between early self-regulation and positivity/responsivity on later self-regulation in the fall of kindergarten (β = -.11, *p* = .047). Model three suggests that the lower a child's self-regulation, the stronger the effect of positivity/responsivity during prekindergarten on his or her self-regulation in the fall of kindergarten. The interaction model suggests that children who enter the preschool period with lower early self-regulation, may particularly benefit from higher levels of positivity/responsivity on their self-regulation as rated by kindergarten teachers in the fall of kindergarten (see Figure 1).

## Discussion

This study found that children's early self-regulation skills moderated the relation between the degree of positivity/responsivity and later self-regulation in the fall of kindergarten. Specifically, higher levels of positivity/responsivity during children's prekindergarten year predicted self-regulation in the fall of kindergarten, but only for children who entered preschool with lower self-regulation skills (age 3 years). No moderation effect was detected for cognitive stimulation. Additionally, the main effects model revealed that neither positivity/responsivity nor cognitive stimulation predicted self-regulation in the fall of kindergarten for the overall sample. Results further our understanding of how distinct dimensions of ECE quality promote self-regulation for children who enter preschool struggling with these skills.

### Process Quality and Self-Regulation

The main effects model did not detect a significant relationship between the two dimensions of quality (positivity/responsivity and cognitive stimulation) on children's self-regulation in the fall of kindergarten for the sample as a whole. Results were

inconsistent with recent work finding significant, albeit small, relations between both affective and cognitive dimensions of preschool process quality on children's self-regulation (Fuhs et al., 2013; Weiland et al., 2013). The current study's results may differ from past studies examining the role of ECE quality and self-regulation for a few reasons. Study design differences between the present study and past work may partially account the inconsistencies. Specifically, the current study measured self-regulation with kindergarten-teacher reports, whereas previous work assessed self-regulation through direct-child assessments (Fuhs et al., 2013; Weiland et al., 2013). Although the teacher-rating and direct-child assessments are both measuring children's self-regulation skills (Cameron Ponitz et al., 2008; McClelland et al., 2007), contextual variations in assessment may help explain why our results were inconsistent. Direct-child assessments tend to be individually administered and evaluate children's performance on a set of cognitively demanding tasks. In contrast, teacher reports of children's self-regulation focus on the perception of children's classroom behaviors. It is possible that, for the sample as a whole, teacher-report of self-regulation are less sensitive to variations among the dimensions of process quality assessed.

Another study design dissimilarity that may have contributed to differences in results may be related to the duration of the study. Past work assessed the contribution of ECE quality on children's self-regulation development over a single school year (i.e., baseline was fall and outcome was spring). In contrast, the present study evaluated self-regulation across two years (i.e., baseline was 36-months and outcome was fall of kindergarten). The present study's focus on a larger developmental window may have introduced the opportunity for more confounding events to influence children's self-

regulation development (i.e., attending different ECE settings between 36-54 months; Lamb & Ahrnet, 2006).

A third explanation for the null relations may be attributed to the idea that ECE experiences do not affect all children in the same way (Belsky et al., 2007). Theory suggests that some children are more sensitive to the quality of their early learning experiences (including ECE) than other children, which may lead to inconsistent and small effect sizes when examining the influence of child care quality for children overall (Phillips et al. 2011; Pluess & Belsky, 2009). Thus, it may be that null or small effects detected in overall samples may be masking the importance of ECE process quality, which we hypothesize in this study may be more pronounced for children with lower early self-regulation skills.

**Early Self-Regulation as a Moderator of Process Quality**

Findings suggest that early self-regulation moderated the relation between positivity/responsivity and self-regulation in kindergarten. Specifically, ECE experienced marked by higher quality positivity/responsivity promoted children's subsequent self-regulation in the fall of kindergarten, but only for children who entered the preschool period with lower self-regulation skills. This result suggests that experiences of positivity/responsivity in ECE settings may play a unique role in supporting self-regulation development for children who enter the preschool period (age 3) with relatively lower self-regulation skills. Children with low early self-regulation are likely to exhibit behavioral challenges, such as: trouble waiting their turn, more resistance to changes/transitions, and more trouble cooperating with adult requests (Rimm-Kaufman et al., 2000). Thus, children with low early self-regulation are more likely to require very

intentional and skilled external supports from their caregivers to learn these important self-regulation skills. Drawing from recent work illustrating that mothers who are warm and better able to scaffold children's early autonomy had children with stronger self-regulation skills (Bernier et al., 2010), it is possible that caregivers in settings marked by high positivity/responsivity may be providing more external support and scaffolding, especially for these children more likely to struggle. Although positivity/responsivity may be beneficial to supporting school readiness outcomes for *all* children they care for in terms of social competence, etc., this dimension of quality may be particularly beneficial for supporting self-regulation skills for children who struggle with self-regulation.

Additionally, the significant interaction findings may also reflect the unique importance of fostering a positive emotional climate in ECE settings to support children with lower self-regulation skills. Research suggests that children who are more temperamentally reactive are more likely to face self-regulatory challenges during early childhood (Rothbart, 2004). As such, it is possible that for many children with lower self-regulation, the emotional climate of the classroom may have a larger influence on their stress-level, or arousal, which may either support (if the setting is calm) or impede (if the setting is stressful) their self-regulation (e.g., Pluess & Belsky, 2009). For example, for children with low early self-regulation skills, a stressful ECE climate (e.g., emotionally negative, chaotic) may exacerbate their own stress and arousal levels more than for other children, making it more difficult for them to think clearly, which is important for children's emerging self-regulation skills (Blair & Diamond, 2008; Liston, McEwen, & Casey, 2009). In contrast, an emotionally positive ECE climate may be

particularly beneficial for these children's self-regulation skills by establishing a trustworthy setting for children to learn and practice their emerging self-regulation skills in a lower stress environment that allows them to keep their stress level to a low enough point that they can think clearly (Fuhs et al., 2013). Overall, the moderation findings suggest that children with lower early self-regulation skills at preschool entry may be more sensitive to the degree of positivity/responsivity during the prekindergarten year.

Although the degree of positivity/responsivity in ECE settings predicted stronger self-regulation for children some children, no moderation effect was detected for cognitive stimulation. Perhaps children who enter the preschool period year struggling with self-regulation have not yet developed strong enough self-regulation skills to fully benefit from aspects of cognitive stimulation common in preschool settings, such as early literacy or practicing math problems that require working memory, inhibition, attention, etc. We speculate that, for these children, positivity/responsivity may be more essential to helping children first learn how to master the basic self-regulation skills needed to navigate the classroom. Another potential explanation for a lack of interaction effects for cognitive stimulation may reflect a measurement issue for self-regulation and ECE quality. Specifically, both positivity/responsivity and teacher-rated self-regulation are closely related to social aspects of functioning. In contrast, when past work examined cognitive and affective dimensions of process quality, similar patterns of both dimensions predicted gains on direct-child assessments of self-regulation (Fuhs et al., 2013; Weiland et al., 2013). It may be that distinct dimensions of ECE process quality may predict children's self-regulation differently depending on the type of assessment used (i.e., direct assessment, teacher-report).

**Practical Implications**

The current study has practical implications for addressing the needs of children with low early self-regulation skills through high quality ECE experiences. Professional development efforts (e.g., trainings, coaching, higher education coursework) are a key component of policy initiatives concerning ECE quality improvement (Tout et al., 2010). As such, designing professional development opportunities for ECE caregivers to include skill building related to promoting positivity/responsivity in ECE settings to support children with lower self-regulation may be particularly beneficial. One reason for this is that children who struggle with self-regulation often pose unique challenges and frustration for caregivers because they often have difficulty with many aspects of classroom behavior such as waiting for their turn, and being more resistant to changes and transitions. In fact, children's problem behaviors, which are often attributed to self-regulatory challenges (Blair & Diamond, 2008), have been recognized as a major reason why children are expelled from preschools at a rate that is over three times that found during formal schooling (Gilliam, 2005). More explicit training for caregivers on how to maintain an ECE setting high in positivity/responsivity and helping caregivers learn how to more effectively work with children with lower self-regulation is needed. For example, training may be useful if focused on teaching caregivers how to redirect inappropriate behavior in a positive manner and individualize the degree of external supports as needed by each child.

Second, professional development in this area can also help empower caregivers to recognize that their efforts to be positive and responsive with children who exhibit lower self-regulation do, indeed, appear to make a difference. By helping caregivers

realize that their efforts to maintain a positive and responsive ECE setting is particularly important for the children in their care who demonstrate self-regulatory challenges and who are often the more frustrating children to work with. Thus, by sharing these findings with caregivers through professional development efforts, we can increase recognition in the field that the efforts caregivers are making to establish and maintaining a positive and responsive environment is benefiting those children who are more likely to behaviorally struggle in the classroom context.

Although these findings provide preliminary evidence of the importance of positivity/responsivity for children with lower self-regulation skills, more work needs to be done in this area. At this point, it remains largely unknown which aspects of the positivity/responsivity domain are most helpful to promoting children's self-regulation (e.g., is it the emotional climate or caregivers scaffolding skills?). In addition, more work needs to be done to design professional development programs and coursework that is effective in helping caregivers establish and maintain high levels of quality positivity/responsivity in their settings, particularly for caregivers who work with many children that are struggling with self-regulation (Zaslow et al., 2010).

**Limitations and Future Directions**

Although this study expands our understanding of how children's ECE experiences during prekindergarten contribute to the self-regulation skills they need to be successful in kindergarten, some limitations must be noted. First, the use of adult-reports of children's self-regulation skills (parent-report at 36-months; teacher-report in kindergarten) can be considered both a limitation and a strength. One the one hand, adult-reported assessment of self-regulation tends to be more susceptible to reporter-bias

when compared to direct child measures of self-regulation (Goodman & Gotlib, 1999). On the other hand, adult reports provide a broader assessment of children's patterns of self-regulated behavior because they capture how children's behaviors are exhibited across time and settings, and with varying social complexity (Lengua, 2002). Also, kindergarten teacher reports are important sources of children's self-regulation skills because they can assess children's behaviors in the classroom; the very place they need self-regulation skills to engage in the learning process.

An additional measurement limitation is related to the process quality measurement tool employed in this study. First, it is possible that the current study's measures of quality were not as sensitive to the distinct dimensions of process quality compared to past work. For example, the Weiland et al. (2013) study utilized the CLASS, which was specifically designed to capture various dimensions of process quality. Also, the Fuhs et al. (2013) study utilized the Teacher Observation in Preschool (TOP; Bilbray, Vorhaus, Farran & Shufelt, 2010). The TOP focuses on specific behaviors reflecting the emotional climate and cognitive learning environment. In contrast, the ORCE, although including items that reflect specific dimensions of process quality, has been mainly utilized to evaluate global process quality. Further, efforts to define more distinct dimensions with the ORCE have been difficult, with process dimension variables reflecting commonly low internal reliability coefficients (e.g., Bub et al., 2009). It has been argued that many of the currently available observational measures of quality may simply not be sensitive enough to capture the quality of dimensions or interactions that are most important to predicting children's school readiness (Burchinal et al., 2010; Zaslow et al., 2010). Newer measures specifically designed to adequately

capture distinct dimensions of process quality, such as the CLASS and TOP, are an improvement. Future work should continue developing more sensitive measures of ECE that capture the specific caregiver behaviors and adult-child interactions that may matter most for children's self-regulation.

**Conclusion**

The current study provides insights into the relationship between dimensions of ECE process quality during prekindergarten and children's subsequent self-regulation in the fall of kindergarten. Our results suggest that for children with lower self-regulation at early preschool, higher levels of positivity/responsivity predicted greater self-regulation in the fall of kindergarten. In contrast, cognitive stimulation did not predict children's self-regulation in kindergarten, regardless of children's earlier self-regulation skills. Findings suggest the importance of looking beyond overall main effects of ECE to examine potential differential effects of quality dimensions based on children's earlier self-regulatory skills. Together, this study provides preliminary evidence efforts to promote greater positivity/responsivity in ECE settings (e.g., professional development) would be beneficial for ECE caregivers working with children who struggle with self-regulation.

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Table 2.1

*Descriptive Statistics for all Study Variables* (*N* = 996)

| Categorical variables | % Yes | % No | | |
|---|---|---|---|---|
| Indicator variables | | | | |
| Gender (yes = male, no = female) | 50.30 | 49.70 | | |
| Setting type (yes = center, no = other arrangement) | 73.59 | 26.41 | | |
| **Continuous variables** | ***M*** | ***SD*** | **Min** | **Max** |
| Indicator variables | | | | |
| Cognitive stimulation[a] | 0.00 | 0.87 | -1.11 | 3.74 |
| Positivity/responsivity[a] | 0.00 | 0.70 | -2.77 | 2.55 |
| Early self-regulation at 36-months | 23.20 | 3.31 | 12.00 | 30.00 |
| Income-to-needs ratio | 3.57 | 2.80 | 0.00 | 18.75 |
| Hours in care per week | 29.68 | 16.82 | 0.00 | 119.00 |
| Parental harshness | 1.83 | 0.67 | 1.10 | 5.79 |
| Outcome variable | | | | |
| Self-regulation in kindergarten | 15.93 | 4.05 | 0 | 20 |

*note.* In analyses, income-to-needs was log transformed. [a]Variable is aggregate of standardized observational items to account for different metrics and allow for comparability.

Table 2.2

*Correlations Among all Study Variables* (*N* =996)

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1. Self-regulation in kindergarten | — | | | | | | | |
| 2. Positivity/responsivity | .09** | — | | | | | | |
| 3. Cognitive stimulation | .06† | .51*** | — | | | | | |
| 4. Early self-regulation at 36-months | .20*** | .06† | .07† | — | | | | |
| 5. Income-to-needs ratio | .23*** | .11** | .12*** | .22*** | — | | | |
| 6. Gender (1 = female) | .21*** | .03 | .03 | .10** | .02 | — | | |
| 7. Parental harshness | -.23*** | -.05 | -.02 | -.20*** | -.31*** | -.05 | — | |
| 8. Setting type (1 = center) | -.00 | .08* | .24*** | .05 | .19*** | .02 | -.07* | — |
| 9. Hours in care per week | -.14*** | .17*** | .08* | .05† | -.05† | -.04 | .10** | .01 |

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

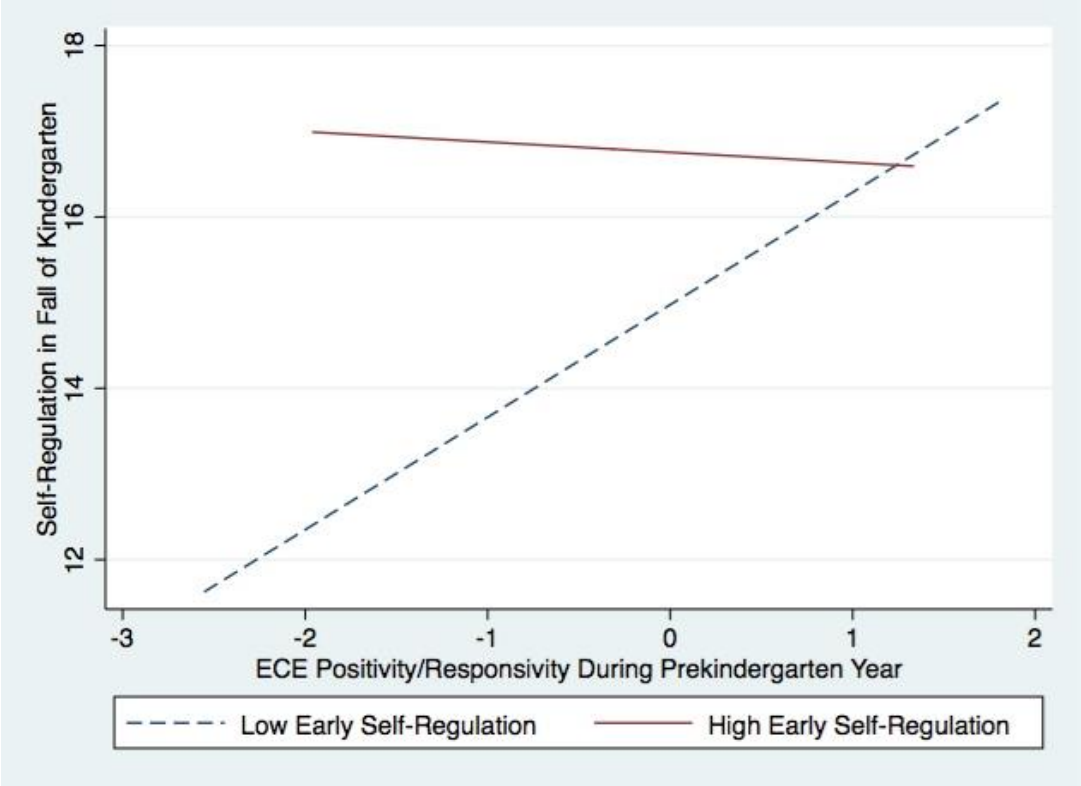
Table 2.3

*Regression Models Testing Main and Interaction Effects Between ECE Process Quality at 54-months and Self-Regulation in the Fall of Kindergarten (N=996)*

| | Model 1 | | | Model 2 | | | Model 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| Variable | *B* | *SE* | β | *B* | *SE* | β | *B* | *SE* | B |
| Predictor variables | | | | | | | | | |
| Cognitive stimulation | 0.06 | 0.18 | .01 | 0.07 | 0.18 | .02 | 0.07 | 0.18 | .01 |
| Positivity/responsivity | 0.21 | 0.22 | .04 | 0.18 | 0.23 | .03 | 0.16 | 0.23 | .02 |
| Early self-regulation | .15 | 0.04 | .12*** | 0.15 | 0.04 | .12*** | 0.15 | 0.04 | .12*** |
| Income-to-needs ratio | 1.02 | 0.23 | .15*** | 0.99 | 0.23 | .15*** | 1.01 | 0.23 | .15*** |
| Gender (1 = male) | 1.41 | 0.25 | .17*** | 1.41 | 0.25 | .17*** | 1.40 | 0.25 | .17*** |
| Parental harshness | -0.82 | 0.21 | -.14*** | -0.81 | 0.21 | -.13*** | -0.81 | 0.20 | -.13*** |
| Type of care (1 = center) | -0.53 | 0.31 | -.06† | -0.50 | 0.31 | -.05 | -0.55 | 0.31 | -.06† |
| Hours in care per week | -0.03 | 0.01 | -.10** | -0.03 | 0.01 | -.11** | -0.03 | 0.01 | -.11** |
| Interaction terms (centered) | | | | | | | | | |
| Cognitive stimulation X early self-regulation | — | — | — | -.07 | 0.05 | -.05 | — | — | — |
| Positivity/responsivity X early self-regulation | — | — | — | — | — | — | -0.12 | 0.06 | -.07* |

Analyses utilized Full Information Maximum Likelihood estimation to deal with missing data.
†$p < .10$. *$p < .05$. **$p < .01$.***$p < .001$.

Figure 1. Moderating Effect of Early Self-Regulation on Relation Between Positivity/Responsivity and Self-Regulation in the Fall of Kindergarten.




Low and high early self-regulation plotted lines were defined as one *SD* below and above the mean, respectively.

# CONCLUSION

Children's early self-regulation has important ramifications for an array of long-term developmental outcomes, such as academic achievement (McClelland et al., 2013), social competence (Buckner et al., 2009), and health outcomes (Evans, Fuller-Rowell, & Doan, 2012). Unfortunately, many young children transition to kindergarten struggling with self-regulation, including the ability to follow directions and work independently (Lin et al., 2003; Rimm-Kaufman et al., 2009). For example, in a national survey of kindergarten teachers, 46% of teachers reported that at least half of their class had difficulty following directions (Rimm-Kaufman et al., 2009). The large number of children struggling with these skills at the onset of formal schooling is concerning and deserves further attention. This considerable variability in children's early self-regulation skills can be partially attributed to disparities related to the growing socioeconomic gaps between rich and poor in the U.S. (Reardon, 2011). Moreover, children who concurrently experience multiple family risk factors are at substantially greater risk for lower self-regulation than those facing any single risk factor (Lengua et al., 2007; Sameroff et al.,1993). Although risk factors appear to impede children's emerging self-regulation, preschool-based intervention research provides encouraging evidence that high quality early learning experiences are, indeed, effective in promoting children's early self-regulation, especially for children at greatest risk for lower early self-regulation skills (e.g., Raver et al., 2008).

Despite what we know about the role of early contextual risk factors and self-regulation, much remains to be learned regarding how various patterns, or combinations, of early family risk experiences relate to children's self-regulation development.

Additionally, although intervention evidence suggests that high quality early learning settings benefit early self-regulation, it remains largely unknown how *typically* experienced early care and education (ECE) settings may support children's self-regulation for the transition to kindergarten. This dissertation addresses these gaps with two studies.

Using the National Institute on Child Health and Development Study of Early Child Care and Youth Development (NICHD SECCYD) data set, study 1 investigated how different combinations of family risk (termed *family risk profiles*) predicted children's early self-regulation at age three. Study 2 evaluated the effect of ECE quality during prekindergarten on children's subsequent self-regulation at the fall of kindergarten, with particular attention to a subgroup of children who struggled with these skills during early preschool (i.e., 36-months). Together, findings from both studies will inform future early childhood research and policy by highlighting how the dynamic nature of early-childhood experiences can both *impede* (i.e., early risk) and *support* (i.e., high quality ECE) children's early self-regulation development.

**Overview of Study Findings**

Results from the first study, *Family Risk Profiles and Self-Regulation During Early Childhood*, indicated that children's family risk experiences were best captured by three distinct family risk profiles: 1) families with low risk (74%), 2) families with low-income levels, low cognitive stimulation, and a higher likelihood of being a single-parent household (ICS; 17%), and 3) families with low-income levels, low cognitive stimulation, and high parental harshness (ICH; 9%). Further analysis suggested that these family risk profiles appeared to have meaning for children's early self-regulation

abilities. Specifically, the three profiles predicted significant differences in children's early self-regulation at early preschool (36-months). Children estimated to belong to the low risk profile exhibited higher self-regulation than children in the profile including single-parent status (ICS) and the profile including high parental harshness (ICH). Moreover, children in the ICH profile exhibited significantly lower self-regulation than children in the ICS profile. Results suggest that children in the ICH profile were at greatest risk for low levels of self-regulation at early preschool.

Results from Study 2, *Early Self-Regulation Moderates the Relationship Between Child Care Quality and Children's Self-Regulation in Kindergarten,* indicated that children's experiences of a high degree of positivity/responsivity in the ECE setting led to significantly stronger self-regulation in kindergarten, but only for children with lower self-regulation skills at early preschool (not for the overall sample). The degree of cognitive stimulation in the ECE setting did not predict children's self-regulation in kindergarten, regardless of children's earlier self-regulation skills.

Together, findings from both studies suggest that we can support children with low early self-regulation skills: first, by identifying early family risk factors that help explain *why* some children exhibit lower early self-regulation, and second, by examining *how* ECE quality can support self-regulation skills for those who enter the preschool period struggling with self-regulation. Three important themes emerged from the two studies: 1) Distinct combinations of contextual and individual factors shape self-regulation; 2) Adult-child interactions play an important role in early self-regulation development; and, 3) Understanding more about children with low early self-regulation has policy and practice implications.

**Distinct Combinations of Contextual and Individual Factors Shape Self-Regulation**

In both studies in this dissertation, distinct combinations of contextual and individual factors appeared to have meaning for children's self-regulation. In study 1, using a person-centered approach, children were described by three distinct combinations (or profiles) of family risk. Children characterized by the low risk profile demonstrated the strongest self-regulation, while the two higher risk profiles exhibited significantly lower self-regulation. In line with past work suggesting that family risks tend to cluster within the same individual (Cicchetti, 1993; Masten et al., 1995), children characterized by the two higher family risk profiles were best described by three risk factors each. There were qualitative differences between the makeup of the two high-risk profiles that had meaning for children's later self-regulation. In particular, although low-incomes and low levels of cognitive stimulation in the home described both high-risk profiles, the two profiles differed by their third risk factors (ICH: parental harshness & ISC: single-parent household). Between two higher risk profiles, children estimated to belong to the profile with high harshness (ICH) exhibited significantly lower self-regulation than children estimated to belong to the profile without harshness, but with single parent status (ICS). In sum, although the two higher risk profiles were described by a similar *number* of risk factors, differences in the *combinations* of risk experiences predicted differences in children's early self-regulation, suggesting that the specific combinations of risks had distinct implications for self-regulation development.

In study 2, the distinct combinations of factors that helped shape self-regulation were illustrated by testing if children's lower self-regulation moderated the effect of ECE quality on their subsequent self-regulation. Findings suggest that children with lower

self-regulation at early preschool exhibited stronger self-regulation in kindergarten when they experienced higher levels of positivity/responsivity in ECE during the prekindergarten year. This finding aligns with past research suggesting that although all young children may modestly benefit from supportive ECE experiences, children who exhibit early challenges in self-regulation may be particularly sensitive to adult support (Center on the Developing Child, 2011). In addition, results support recent theorizing suggesting that ECE quality may have a greater influence for children who are more sensitive to the quality of their environmental experiences because of individual child characteristics (Phillips, Fox, & Gunnar, 2011l; Pluess & Belsky, 2009). Much of this work on differences in children's sensitivity to their experiences has focused on the interplay between the environment and children's individual characteristics, such as early temperament, stress reactivity, or genetics (Belsky & Pluess, 2013; Boyce & Ellis, 2005; Lipscomb et al., 2013). The current study provides preliminary evidence that children with low levels of early self-regulatory skills may also be more sensitive to variation in environmental quality. This may be because children with lower self-regulation are more reliant on a caregiver's ability to be actively responsive to children's needs (e.g., provide scaffolding) to make improvements in their self-regulation abilities. Future work should continue to ask questions about *for whom* variation in quality of care has the greatest impact (Phillips et al., 2011).

Taken together, both studies suggest that we can further improve our understanding of children's variability in early self-regulation skills by examining relationships among distinct combinations of contextual and individual child factors. To gain a fuller understanding of how self-regulation is shaped throughout early childhood,

it will be important for future work to continue to consider how various factors work together to facilitate (or undermine) children's self-regulation development.

**Adult-Child Interactions Play an Important Role in Early Self-Regulation Development**

Both studies highlight the importance of responsive adult-child interactions for children's self-regulation development. During the early childhood period, children gradually develop early self-regulation skills through a progression from external regulation (provided by adult caregivers) to an internalized set of regulatory skills (Kochanska et al., 2001; Kopp, 1982). Research shows that self-regulation development is largely contingent on the quality of children's daily experiences with caregivers. More responsive caregiving promotes self-regulation, while harsh (or negative) caregiving impedes self-regulation (Bernier, Carlson, & Whipple; 2010; Darling & Steinberg, 1993; Kopp, 1982). Both studies in this dissertation highlight the role of parents and ECE caregiving in shaping children's self-regulation development, including both the negative (study 1) and the positive (study 2) aspects of caregiving.

First, the results of study 1 provided evidence in support of research suggesting that, in the context of family risk, caregiving characterized by harshness during the first three years undermines children's self-regulation development (Crossley & Buckner, 2011; Silverman & Ragusa, 1990). Specifically, the family risk profile including a high degree of parental harshness (ICH) exhibited the lowest self-regulation (even compared to the other high risk profile, ICS). Although the ICS and ICH profiles were similarly low-income and both experienced low cognitive stimulation in the home, the ICS profile was uniquely characterized by lower levels of harshness in the home. These results

support the notion that for children facing multiple family risk factors, the added presence of high parental harshness may be more detrimental to early self-regulation than the added risk of living in a single-parent household. This finding aligns with the bioecological model which suggests that *proximal processes*, or the interactions within a child's immediate environment, are powerful predictors of children's development, compared to more distal factors such as single-parent status (Bronfenbrenner & Morris, 2006).

The results of study 2 align with research suggesting that caregiving characterized by high degrees of positivity and responsivity can support children's self-regulation development in the progression from externally supported to internalized self-regulation (Kochanska et al, 2001). This study focused on caregivers within the ECE setting, rather than parents. Specifically, study 2 found that that stronger positivity/responsivity in ECE settings had a positive effect on children's self-regulation at kindergarten, but only for children who entered the preschool period with lower self-regulation skills. We speculate that this may be because positive and responsive caregivers are better skilled at scaffolding children's emerging self-regulation by flexibly adjusting their external supports in positive ways. This responsiveness may be particularly beneficial for children who enter the preschool period with lower levels of self-regulation, as children with low early self-regulation may be more receptive to warm and responsive interactions as they learn to self-regulate their behavior (Phillips et al., 2011).

Taken together, results of both studies suggest that the emotional qualities of adult-child interactions play an important role in early self-regulation development for children facing additional contextual risks (study 1), or lower initial self-regulation skills

(study 2). Future research on the qualities of adult-child interactions and self-regulation may benefit from a closer examination of how distinct dimensions of home and ECE quality may differentially predict self-regulation depending on how self-regulation is operationalized (e.g., a direct child measure vs. teacher or parent report). For example, cognitively supportive interactions in the home and at school (e.g., joint book reading) appear to predict children's self-regulation as measured by direct-child assessments (Hindman & Morrison, 2012; Morrison & Cooney, 2002), whereas in this dissertation, the emotional aspects of adult-child interactions appeared most predictive of children's self-regulation in the classroom, reported by teachers.

Additionally, future work would benefit from taking a closer look at the bidirectional or dynamic nature of adult-child interactions (Bronfenbrenner & Morris, 2006). For example, although caregivers influence child outcomes, it also appears that children who behave in a more regulated way may elicit parental guidance that is more supportive and warm. In contrast, a child who is less behaviorally regulated may be more likely to elicit harsh/negative types of caregiving (Kochanska, Askin, Silverman, & Ragusa, 1990). Future work should examine how children actively contribute to the nature of interactions with their caregivers, and how adults and children work together to facilitate or impede self-regulation development.

**Understanding More about Children with Low Early Self-Regulation has Policy and Practice Implications.**

A final theme that emerged from both studies in this dissertation is that research focused on understanding children with low early self-regulation can be used to inform early childhood policy and practices (e.g., professional development). There is a growing

awareness in practice and policy realms that early self-regulation is a key developmental indicator of school readiness, and is predictive of academic, social, and psychological well-being throughout life (Evans et al., 2012; McClelland et al., 2013). For example, the state of Oregon has included a measure of self-regulation in the Kindergarten Assessment, which is being administered to every entering kindergartener to evaluate the school readiness of the state as a whole (Oregon Department of Education, 2014). There is also a growing understanding that self-regulation is a malleable skill set that can be improved through high quality early learning experiences, and that children who struggle with this skill set are also likely to benefit the most in these settings (e.g., Bodrova & Leong, 2008; Connor et al, 2010; Tominey & McClelland, 2011). The studies in this dissertation provide a starting place to understand how research on children with low self-regulation can inform policy and practice.

First, in study 1, the family risk profile results have practical implications for informing program and policies targeting at-risk children and their families. For example, risk profile results highlighted the co-occurring nature of distinct combinations of various family risks and children's lower self-regulation. This finding provides evidence in support of dual-generational programs designed to meet the needs of parents as well as children in order to effectively support children's development. Dual-generational programs that have been shown to be effective include Early Head Start and the Nurse-Family Partnership (Ayoub, Vallotton, & Mastergeorge, 2011; Collins, Murphy, & Beirman, 2004; Olds, 2006). Findings also point to the need for a more integrated system of early childhood services that have been traditionally siloed and uncoordinated within communities (e.g., WIC and parenting programs; Early Learning

Division, 2014). For example, Oregon is in the process of creating a more systematic approach to coordinating the efforts of previously disjointed early childhood policies and programs designed to support families with young children, called Early Learning Hubs (Early Learning Division, 2013). Future work should continue to analyze common family risk profiles in specific communities in relation to child outcomes. A better understanding of the common co-occurring needs of at-risk families within a community can be utilized to inform early childhood programs (e.g., Early Head Start), as well as larger policy initiatives designed to improve children's school readiness (e.g., Oregon's Early Learning Hubs; Early Learning Division, 2014).

The results of Study 2 also hold practical implications for addressing the needs of children with low self-regulation. Study 2 found that the degree of positivity/responsivity in ECE settings predicted stronger self-regulation in the fall of kindergarten for children who entered the preschool period with lower self-regulation skills. It appears that caregivers who are able to foster a positive and responsive environment may be most effective at supporting self-regulation for these children. Findings suggest that promoting positivity/responsivity in early learning settings through professional development efforts, such as teacher training, coaching, and higher education coursework, would be fruitful. Professional development efforts around the importance of positivity/responsivity for children who struggle with self-regulation is important for two reasons. First, a high degree of positivity/responsivity appears to be important for supporting self-regulation skills for a group of children who are likely to find themselves at risk for later school challenges. Second, maintaining a positive and responsive environment when working with children who struggle with self-regulation (e.g.,

frequent off-task behavior, trouble waiting their turn) may be particularly challenging for ECE caregivers. Thus, professional development efforts focused on how to be emotionally positive and responsive, even when faced with these types of frustrating behaviors common in children who struggle with early self-regulation, is very important. For example, it may be that professional development efforts need to teach caregivers more individualized strategies to help scaffold and support the more unregulated children in their classroom, while ensuring a positive setting for all. Future work should look into understanding *how* professional development efforts can most effectively promote higher positivity/responsivity in ECE settings for caregivers working with children with low self-regulation skills, and how to maintain those quality improvements in settings overtime (i.e., avoid fade-out; Zaslow, 2009). Although more work needs to be done in this area, recent professional development programs, such as My Teaching Partner (Downer, Kraft-Sayre, & Pianta, 2009) and Banking Time (Driscoll & Pianta, 2010), provide promising initial evidence that programs focused on promoting more supportive caregiver-child interactions can, indeed, improve children's behavioral outcomes (Downer et al., 2009; Driscoll & Pianta, 2010). In sum, early childhood practice and policy initiatives would benefit from research-based knowledge concerning children who struggle with self-regulation.

**Limitations**

Although the findings of both studies 1 and 2 improved our understanding of how children's experiences of family risk factors and ECE experiences influenced early self-regulation development, they were not without limitations. First, the studies were limited in how well they were able to measure key constructs of interest. For example, children's

early self-regulation was measured by parent- and teacher-reports. Adult-reports can be limited because they are susceptible to reporter-bias (Goodman & Gotlib, 1999). They are, however, also valuable because they provide a broad assessment of children's patterns of self-regulated behaviors exhibited across various times of the day, in diverse settings, and with varying social complexity (Lengua, 2002). Moreover, kindergarten teacher reports are important because they capture children's behaviors in the classroom, the very place they need self-regulation skills to engage in the learning process. For example, in one study comparing the utility of adult- and direct-assessment measures of self-regulation, teacher reports were a stronger predictor of children's early literacy than a direct child-measure of self-regulation (Schmitt, Pratt, & McClelland, 2014). In contrast, direct measures tend to be less susceptible to rater bias, but tend to be restricted to short-term assessments within more controlled environmental settings. Future work should evaluate children's self-regulation using a variety of assessment tools, including adult-reports, to help identify children at greatest risk for later school challenges.

Another limitation of both studies concerns the issue of generalizability. Both studies used data from the NICHD SECCYD study (NICHD ECCRN, 1996). Although the NICHD SECCYD study recruited an economically diverse sample of children from various regions throughout the U.S., it was not designed to be nationally representative (NICHD ECCRN, 1996). This is a limitation for study 1 because person-centered analyses (e.g., Latent Class Analysis) are sensitive to the sample size and characteristics of the study sample (Masyn, 2013). Because the sample characteristics were not statistically representative of a specific population, the combinations of risks that comprised each risk profile, and prevalence rates of each profile, are not generalizable to

the U.S. population overall. Despite this limitation, study 1 indicated that distinct family risk profiles that included risk factors in both demographic and family process domains were significantly related to children's early self-regulation.

Study 2 was also limited in terms of generalizability. First, like most ECE research, this study was correlational. Although we controlled for a number of family and child measures as covariates, it is possible that the predictive relationships may be partially driven by omitted variables or other unique qualities of the study sample (Vandell, 2004). Second, the effects associated with quality may be underestimated because refusal rates for ECE observations were higher among children attending informal care settings and children from low-income families (Vandell, 2004). To deal with this missing data, we utilized maximum likelihood estimation to reduce the threat of this bias in our results. Finally, the NICHD SECCYD data set is not nationally representative, cautioning generalization of results to other populations. With that said, this data set is one of the most comprehensive data sets available for understanding variability in quality of care for children attending a variety of ECE settings, ranging from center-based care to informal care settings (Lowe, Vandell, & Wolfe, 2000).

**Conclusions and Future Directions**

The studies in this dissertation examined why some children exhibited lower self-regulation skills than others, and what dimensions of prekindergarten ECE quality predicted children's subsequent self-regulation skills at the fall of kindergarten. Findings from both studies increased our understanding of how distinct combinations of early experiences and/or individual child characteristics relate to children's emerging self-regulation skills. Future work should also consider child-factors (such as temperament)

and larger social factors outside the family (neighborhood characteristics and community resources) in models of risk, to see how they contribute to self-regulation. Further, findings from both studies underscore the importance of responsive and accepting adult-child relationships for supporting children's early self-regulation. Future work should continue to investigate how dynamics between parents and children shape children's self-regulation. Finally, results of both studies point to the need for more research focused on understanding children who exhibit low early self-regulation. By better understanding how early family risk may impede self-regulation and how ECE quality can support these early skills, these dissertation studies can be used to help inform early childhood programs, policy initiatives, and professional development efforts that aim to support children and families at-risk for later school challenges.

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