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Demographic and familial predictors of early executive function development: Contribution of a person-centered perspective

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ABSTRACT

Executive function (EF) skills are integral components of young children's growing competence, but little is known about the role of early family context and experiences in their development. We examined how demographic and familial risks during infancy predicted EF competence at 36 months of age in a large, predominantly low-income sample of nonurban families from Pennsylvania and North Carolina in the United States. Using latent class analysis, six ecological risk profiles best captured the diverse experiences of these families. Profiles with various combinations of family structure, income, and psychosocial risks were differentially related to EF. Much of the influence of early risks on later EF appears to be transmitted through quality of parent–child interactions during infancy. Findings suggest that early family environments may prove to be especially fruitful contexts for the promotion of EF development.

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Introduction

Early childhood is characterized by dramatic brain growth and accompanying improvements in physical, social–emotional, and cognitive development (Diamond, 2002; Thompson, Easterbrooks, & Padilla-Walker, 2003). Young children's growing ability to regulate their behaviors, emotions, and thoughts in an intentional, goal-directed way provides one of the building blocks for future well-being

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(Shonkoff & Phillips, 2000). Recently, executive function (EF) skills, a set of interrelated abilities used in coordinated, goal-directed behavior, have been highlighted as integral components of young children's growing regulatory abilities and have been implicated in the development of both social-emotional and academic competence (Blair & Razza, 2007; Espy et al., 2004; Hughes, 1998; Rhoades, Greenberg, & Domitrovich, 2009; Riggs, Jahromi, Razza, Dillworth-Bart, & Muller, 2006).

Despite the acknowledged importance of children's early environments for learning and self-regulation (Shonkoff & Phillips, 2000), relatively little is known about specific relations between aspects of children's early family context and the emergence of EF skills (Carlson, 2003). As is evidenced by the prefrontal cortex's prolonged period of development and neural plasticity across the early childhood years (the prefrontal cortex is the brain area associated with EF development), ecological factors have the potential to play an important role in EF development (Huttenlocher, 2002; Nelson, Thomas, & de Haan, 2006). Parents not only provide children with the physical environment to facilitate development but also provide them with daily opportunities to develop their cognitive, linguistic, emotional, and self-regulatory skills (Gauvain, 2001). Given the central role of parenting and the dearth of research examining the influence of ecological factors on children's early EF development, this study explores how demographic and familial characteristics relate to the emergence of EF skills and the role of parent-child interactions and children's language skills.

EF during early childhood

EF is a multidimensional construct that encompasses a set of higher order, top-down cognitive processes that are elicited when flexible, coordinated, goal-directed behavior is needed to solve a problem (Hughes & Graham, 2002; Welsh, Pennington, & Groisser, 1991). Distinct from other more general cognitive abilities, EF is composed of three related but distinct components: working memory, inhibitory control, and attention flexibility or set shifting (Blair, 2006; Hughes, 1998; Pennington & Ozonoff, 1996; Welsh et al., 1991). What makes EF unique and especially relevant in emotion and behavior regulation in young children is its association with "context-specific action selection, especially in the face of strong competing but contextually inappropriate responses" (Pennington & Ozonoff, 1996, p. 56) (e.g., calming down when upset, using words instead of aggression to attain a goal). Overall, EF skills are regulated actions that are needed under circumstances (especially novel ones) that require planning and decision making, when there is a threat of danger, or when one must overcome a habitual response (Hughes & Graham, 2002).

EF skills emerge during the first year of life and develop in a gradual, stage-like fashion from reactive to more self-regulatory behaviors throughout early childhood (Diamond, 1991; Garon, Bryson, & Smith, 2008; Welsh & Pennington, 1988). EF development occurs in a stepwise fashion with key developmental periods occurring during early childhood (birth to 5 years), middle childhood (7–9 years), and early adolescence (11–13 years) (Anderson, 2002). Although some EF abilities emerge before 5 years of age, these skills remain quite immature and can often be applied only in a very simple and controlled testing context that reduces other aspects of cognitive and emotional load (Anderson, 2002; Best, Miller, & Jones, 2009; Willoughby, Blair, Wirth, & Greenberg, 2010). Zelazo, Muller, Frye, and Marcovitch's (2003) cognitive complexity and control (CCC) theory suggests that across early childhood, children are increasingly able to use more complex rules to guide their actions toward successful problem solving.

Although research consistently shows that young children have difficulty with various aspects of EF (Diamond, Kirkham, & Amso, 2002; Diamond & Taylor, 1996; Gerstadt, Hong, & Diamond, 1994; Zelazo et al., 2003), as children enter the preschool years, their ability to accomplish more complex affective and cognitive problems increases and becomes more consistent and flexible across different contexts (Garon et al., 2008). Therefore, examining EF at the beginning of the preschool period provides an opportunity to explore the emergence of individual differences in EF skills.

Ecological factors influencing early cognitive development

Although numerous studies have suggested that family structure and the quality of the home environment play important roles in the development of school readiness, cognitive development, and

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