UNDERSTANDING RURAL, AFRICAN AMERICAN FATHERS' PARENTING: CORRELATES AND CONSEQUENCES FOR EARLY DEVELOPMENT

by

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(Under the Direction of Geoffrey L. Brown)

ABSTRACT

Black men living in the rural southern United States are faced with a variety of contextual stressors, including disproportionate rates of poverty, racial discrimination, and residing in communities with few educational and employment opportunities. Nonetheless, emerging data suggests that many of these men are highly motivated to be involved in their children's lives and surmount these barriers to maintain positive engagement with infants and young children. However, the specific contextual circumstances that promote positive fathering among rural, Black men, as well as the unique impact of fathers' parenting for early child development in this cultural context are not well-understood. Thus, the proposed dissertation leverages two datasets to examine developmental pathways from fathers' parenting to early socio-emotional development among rural, Black children. In Study 1, we examined the longitudinal impact of prenatal readiness for parenting among expectant Black fathers on their children's socioemotional adjustment (18 months of age) through several dimensions of paternal engagement in an ongoing study of unmarried, Black fathers living in rural poverty. In study 2, we investigated the association between paternal sensitivity (6 months of age) and child executive functioning (35 months of age) through children's cortisol reactivity (24 months of age) among a sub-sample of rural, Black father-child dyads from the Family Life Project (FLP). These studies were

collectively intended to elucidate paternal contributions to early socio-emotional functioning among an overlooked and understudied population of parents. Implications for both research and practice with rural, Black children and families are discussed.

INDEX WORDS: Black fathers; Paternal engagement; Paternal sensitivity; Readiness for fatherhood; Cortisol reactivity; Executive functioning

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A Dissertation to be Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

ATHENS, GEORGIA

2023

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December 2023

DEDICATION

I would like to dedicate this dissertation to my parents – Nermin and Mevlut Aytuglu.

ACKNOWLEDGEMENTS

To my advisor, Dr. Geoffrey Brown, thank you for your endless support, guidance, patience, and our conversations. This endeavor would not have been possible without your generous and unwavering support. It's a privilege to work with you and learn from you. I look forward to our continued collaboration.

Thank you to my dissertation committee members, Dr. Kalsea Koss and Dr. Niyantri Ravindran, for their interest and insightful comments. I deeply appreciate the time you took out of your busy days to help me with this task.

Thanks to PACT project staff at the Center for Family Research as well as participating families in both projects. And thank you to each member of the Family Relationships and Early Development (FRED) Lab. This work was supported by a grant from the National Institute of Child Health and Human Development (NICHD), grant #R01094879, as well as awards from the Society for Research in Child Development (SRCD), the Price-Coker award from the Department of Human Development and Family Science at UGA, and the University of Georgia Graduate School.

Last but not least, to my family, thank you for your ongoing support over the course of my academic journey. One of the challenging parts of my graduate training was living on another continent across the world from you. Love you, "canim ailem", and thank you for always being there for me and supporting me. And mommy, annecigim, we finally end counting and celebrate my 25th-grade graduation. Mama's boy made it!

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INTRODUCTION AND OVERVIEW OF STUDIES

Introduction

Ample empirical evidence suggests that fathering matters for children (Cabrera et al., 2018). Whereas much early research on fathers was conducted from a "deficit perspective" that focused on the detrimental impact of paternal absence and inadequacy (e.g., Hawkins & Dollahite, 1997), more recent conceptualizations of fatherhood emphasize the positive contributions of fathers' parenting to child development (e.g., Bakermans-Kranenburg et al., 2019). Although fathers' parenting is multi-faceted, two dimensions—paternal engagement and sensitivity—have received substantial attention in the fathering literature focused on early childhood (e.g., Brown et al., 2012).

Paternal engagement generally refers to fathers' quantity or frequency of time spent directly involved with their children in either caregiving or play-related activities (e.g., Pleck 2012). Paternal sensitivity refers to qualitative aspects of proximal father-child interactions and describes the extent to which fathers are warm, prompt, and appropriately responsive to the needs of their young children (e.g., Lucassen et al., 2011). Emerging from distinct theoretical and empirical traditions, research that includes and integrates both aspects of fathering is necessary for a comprehensive understanding of the paternal role and paternal contributions to development in infancy and early childhood (Brown & Aytuglu, 2020). More recent conceptualizations of fatherhood have also incorporated aspects of fathers' stimulating parenting behavior (e.g., Paquette, 2004; Grossmann et al., 2002). Paternal stimulation can take many forms, but encompasses proximal interactions that may serve to activate children's emotions and/or

cognitive development (e.g., Olsavsky, 2020). Indeed, stimulating parenting may be a hallmark of early father-child interactions, which often challenge children physically, verbally, and emotionally as a means to promote growth and development (St. George et al., 2018).

Importantly, each aspect of fathering has been linked empirically to more adaptive child outcomes. For instance, paternal engagement is associated with positive, nurturing, and healthy father-child relationships (Sarkadi et al., 2008; Genesoni & Tallandini, 2009). Higher levels of paternal engagement are also associated directly with early language development and academic competencies (Baker, 2018; Jeynes, 2015; McBride et al., 2009), increases in prosocial behaviors (McWayne et al., 2013), improved socio-emotional skills and self-esteem (Fagan, 2000), higher levels of overall well-being (Wilson & Prior, 2010), fewer behavioral and mental health problems (Jackson, 1999; Sarkadi et al., 2007), and better civic engagement (Kelly, 2018). Likewise, fathers' sensitive interactions with their young children have been linked to secure father-child attachment relationships (Brown et al., 2012; Lucassen et al., 2011), greater language development and academic achievement (Coley et al., 2011; Downer & Mendez, 2005), better self-regulatory capacities (Kochanska et al., 2008), and improved executive functioning (EF) skills (Karreman et al., 2008; Towe-Goodman et al., 2014). Similarly, fathers' stimulating play has been associated with more optimal cognitive development (Jeong et al., 2016), larger vocabularies (Rowe et al., 2016), improved social competence (Dumont et al., 2013), and a greater likelihood of secure attachment (Olsavsky et al., 2020).

Despite the rapid proliferation of literature examining the determinants and consequences of fathering, conceptual models and empirical studies on parenting and child development have disproportionately focused on mothers' contributions and mother-child interactions, while largely overlooking the contributions of fathers (Cabrera et al., 2014; Volling & Cabrera, 2019; Palkovitz & Hull, 2018). In addition, most research on fathering has concentrated on homogeneous groups

of fathers (i.e., White American or European, married, co-residential, and middle to middle-upper SES) (Perez-Brena et al., 2022). As such, men's experience as fathers and in their transition to fatherhood is less well understood among minoritized groups of fathers in general, with those living in rural and resource-poor communities—such as Black fathers in the rural South—being particularly neglected (Brody, 2016).

Black men living in the rural southern United States encounter a variety of contextual stressors and challenges, including disproportionate rates of poverty, racial discrimination, and residing in communities with few educational and employment opportunities, which can negatively impact their ability to remain positively engaged with young children (Brown et al., 2018; Cross et al., 2022). These fathers are also less likely to be married to or cohabiting with their children's mothers, which leads to high rates of nonresidential status and less accessibility to children (Berger et al., 2008; Carlson & McLanahan, 2010; Hamilton et al., 2010). In addition to these contextual barriers, these men's role as parents have been highly stereotyped and stigmatized, and their identity as fathers has been largely overlooked (Coates & Phares, 2014; Cooper et al., 2021). These unique challenges and circumstances have the potential to limit their engagement with their children in the early years and adversely impact their parenting experiences, identities, resources, and interactions in their proximal relationships with both children and the mothers of their children (Cross et al., 2022; King et al., 2004).

Nonetheless, emerging data suggests that a significant portion of these men are highly motivated to be involved in their children's lives and to surmount these barriers to maintain positive engagement with infants and young children (Adamsons & Johnson, 2013; Carlson et al., 2008; Cooper et al., 2019). For example, some studies have documented that non-residential Black fathers spend more time with young children than non-residential fathers of other racial groups (e.g., Jones & Mosher, 2013), and that their interactions with young children are generally

warm and sensitive (Baker, 2017; Coley et al., 2011). Moreover, higher levels of paternal engagement and sensitivity in Black fathers could weaken or interrupt the adverse impact of contextual risks on healthy child development (Brown et al., 2018; Cabrera et al., 2017; Carlson et al., 2008; Downer & Mendez, 2005).

However, the contextual circumstances that promote positive fathering among rural, low SES, Black American men, as well as the unique impact of fathers' parenting on early cognitive, physiological, and social-emotional development in this cultural context are still not well understood. This dissertation aims to fill two gaps in our understanding of Black fathers' contributions to child development and the factors that promote positive fathering using two unique samples of Black fathers residing in resource-poor, rural communities. In particular, I examined: 1) the role of fathers' pre-birth readiness for parenting on postnatal father engagement and social-emotional development in the first two years, and 2) the impact of paternal sensitivity and stimulation on child physiological self-regulation and executive functioning. In the first study, we first examined potential pre-birth factors that impact fathers' readiness for parenting and how different readiness configurations promote early engaged fathering and social-emotional child development in the first 18 months. In the second study, I examined the mediating role of children's cortisol reactivity in the link between paternal caregiving (i.e., sensitivity and stimulation) and children's executive function (EF) among Black families.

Informed by extant research and developmental theories relevant to understanding the role of the father, this work collectively elucidated the strengths and developmental mechanisms underlying father-child relationships and paternal contributions to early child development. Both studies leveraged unique samples of Black fathers residing predominantly in low-resource communities in the rural southern United States. Findings from the proposed studies did not only advance our understanding of fathers' contributions to early development among this under-

represented population but also potentially informed the development of evidence-based programs and policies targeting father-child relationship quality, paternal engagement, and child outcomes in challenging contextual circumstances.

Theoretical Perspectives

To better understand the factors that contribute to men's prenatal readiness for fatherhood, father-child relationship quality, and the impact of fathering on a broad array of child outcomes among the Black American population, this dissertation has drawn from life course and biopsychosocial perspectives, as well as a more recent resource model of fathering (Palkovitz and Hull, 2018). The life course perspective and the resource theory center on the lived experiences of fathers and the developmental and contextual determinants of paternal identity—and their downstream consequences for father involvement and father-child interaction quality. The biopsychosocial perspective centers on child development and informs this work by addressing the interplay between family and social contexts and infants' physiological regulation (i.e., HPA-axis: hypothalamic-pituitary-adrenocortical and PNS: parasympathetic nervous systems) to predict subsequent cognitive and social-emotional development. Collectively, these theories inspired the present study's focus, informed the selection of variables of interests, and guided the research questions being tested in subsequent chapters.

Life Course Perspective

The life course perspective (Elder, 1998; Roy, 2014) addresses the critical impact of developmental turning-point events in the lives of individuals, their transitions between contexts, and the social interactions present at turning-point events. The transition to fatherhood is one of these critical turning points for an adult that is accompanied by a new parenting identity, interparental interactions, a sense of closure to the childless period of life, and alterations in social ties and work-life balance (Bakermans-Kranenburg et al., 2019; May, 1982). These

contemporaneous factors as well as those in men's earlier developmental histories (e.g., relationships in the family of origin, cumulative economic stress) contribute to prenatal readiness for parenthood—that is, their mental state of preparation for the fatherhood role and motivation to be involved in their children's development prior to birth (May, 1982; Walsh et al., 2021). The life course perspective underscores the importance of men's readiness and capacity for the parenting role during the prenatal period, and the potential consequences for children's developmental trajectories.

For Black men in low SES environments, the transition to parenthood often happens in emerging adulthood, a time when identity development is particularly salient (Arnett, 2000; Arnett & Brody, 2008). During this developmental period many Black men are beginning educational or career pursuits, often struggling to make ends meet financially, and experiencing instability in romantic relationships (Kurdek, 2008). They navigate these challenges within the context of a historical legacy of anti-Black racism in the United States. In this way the lived experiences of young, Black men intersect with the historical contexts in which they reside to collectively impact their readiness to become a parent and the emotions, cognitions, and parenting behaviors that accompany this transition. Informed by the life-course perspective, study models are intended to reflect both the early (i.e., family of origin caregiving history) and concurrent (i.e., desire for parenting) factors that affect both men's development and their preparation for fatherhood.

Resource Theory of Fathering

Relatedly, the resource model of fathering (Palkovitz & Hull, 2018) conceptualizes men's experience and caregiving behaviors as emerging from dynamic interactions among personal, interpersonal, and contextual resources to which they have access. According to this model fathers draw from personal, interpersonal, and contextual categories of resources. From this

perspective, father-child relationships are influenced not just by resource availability but the ways in which fathers utilize and manage resources across these domains. The focus of study one on constellations of pre-birth fathering resources is directly informed by this view, as this theory proposes a wide array of determinants that may be associated with positive fathering. Both the selection of prenatal predictor variables included as well as the approach of considering typologies of fathering that combine across these categories are consistent with the resource perspective on fathering, which emphasizes the holistic and combined contributions of available resources across economic, psychosocial, and relational domains. For Black men in low-resource environments in particular, the extent to which they accumulate and balance financial, psychological, and social resources prenatally is critical to understanding their engagement in early fathering in the postnatal period as well as contributions to child development across the first several years.

Biopsychosocial Perspective in Early Childhood

The biopsychosocial perspective additionally addresses the influence of early caregiving experience and contextual conditions on the biological underpinnings of developing systems of self-regulation in early childhood. One of the widely studied biological systems—HPA functioning—is critical for the development of self-regulation, is in part shaped by patterns of proximal social interactions (Feldman, 2007; Calkins, 2015). More specifically, parents' prompt, appropriate, and warm responses to infants' distress, and harmonious interactions in parent-child dyads aid very young children to regulate their immature biological systems and support the development of adaptive biological self-regulation, which in turn, contribute to positive child outcomes, including attention skills and inhibitory controls. (Blair et al., 2011; Feldman, 2007).

Although previous research has largely overlooked fathers' contribution to young children's biological regulation capacities, fathers' sensitive and stimulating interactions with

their children can assist their children in learning how to regulate their emotions during high arousal play activities (Calkins, 2011; Feldman 2007), which could also positively contribute to children's cognitive flexibility and stress response management. The biopsychosocial perspective also underscores the role of contextual challenges in the family environment, including economic hardship, poor housing quality, and growing up in communities with few resources, on young children's HPA functioning (Blair et al., 2011; Leerkes & Parade, 2015). Considering that many Black fathers living in rural poverty experience many of these contextual challenges, which have the potential to impede paternal sensitivity and stimulation, understanding this population of fathers' influence on children's biological regulatory capacities and its downstream effect on early child development is critically important. Thus, informed by a biopsychosocial perspective, we examined the impact of paternal sensitivity during father-child interaction on children's cortisol responses under stressful conditions and the development of executive functioning skills among low-income, rural Black children.

Overview of the Studies

The proposed dissertation has leveraged two datasets to examine developmental pathways from fathers' parenting to early socio-emotional development among rural, Black children. Study 1 examined the longitudinal impact of readiness for parenting among expectant Black fathers on their children's socioemotional adjustment (assessed in the second year of life) through paternal engagement (assessed in the first year of life). Study 2 investigated the association between two paternal caregiving dimensions (sensitivity and stimulation, assessed at 6 months of age) and child executive functioning (assessed at 35 months of age) through the child cortisol reactivity (assessed at 6-24 months) among a sub-sample of rural, Black father-child dyads from the Family Life Project (FLP). Using both variable-centered and person-centered approaches, these studies are intended to elucidate paternal contributions to early socio-emotional functioning among an

overlooked and understudied population of parents. Implications for both research and practice with rural, Black children and families is discussed.

Manuscript 1 Overview

Research has outlined various intra-individual characteristics (e.g., desire to become a father, fathering cognitions), interpersonal relationships (e.g., co-parenting, inter-parental relationship quality), and social-contextual factors (e.g., financial health) impacting fathers' readiness for parenthood (Cabrera et al., 2008) in the prenatal period. Men who display a higher level of readiness for parenthood during their partner's pregnancy are more likely to adapt to their new caregiving role and to meet the needs of infants in ways that promote early social-emotional success (Cabrera et al, 2008; May,1982; Roy, 2006). Although individual components of prenatal readiness for fatherhood have been considered, research to date has not considered a) configurations of fathering readiness based on the simultaneous examination of numerous prenatal factors, and b) readiness for fatherhood among ethnic minority populations in low SES contexts. Therefore, Study 1 employed latent profile analysis to identify distinct profiles of unmarried, low socioeconomic status expectant Black fathers based on factors contributing to their readiness for childrearing. Specifically, this study investigated 1) potential readiness for fatherhood profiles, 2) whether distinct profiles of prenatal readiness for fatherhood are linked to paternal engagement in early infancy and children's socioemotional competence at 12–18 months of age, and 3) whether these potential associations are mediated by paternal engagement in the first year of life.

Manuscript 2 Overview

Parental sensitivity and stimulation impacts children's physiological systems, such as cortisol response to emotion-eliciting conditions. Children's physiological regulation, in turn, is linked to various long-term child outcomes including emotion regulation and executive

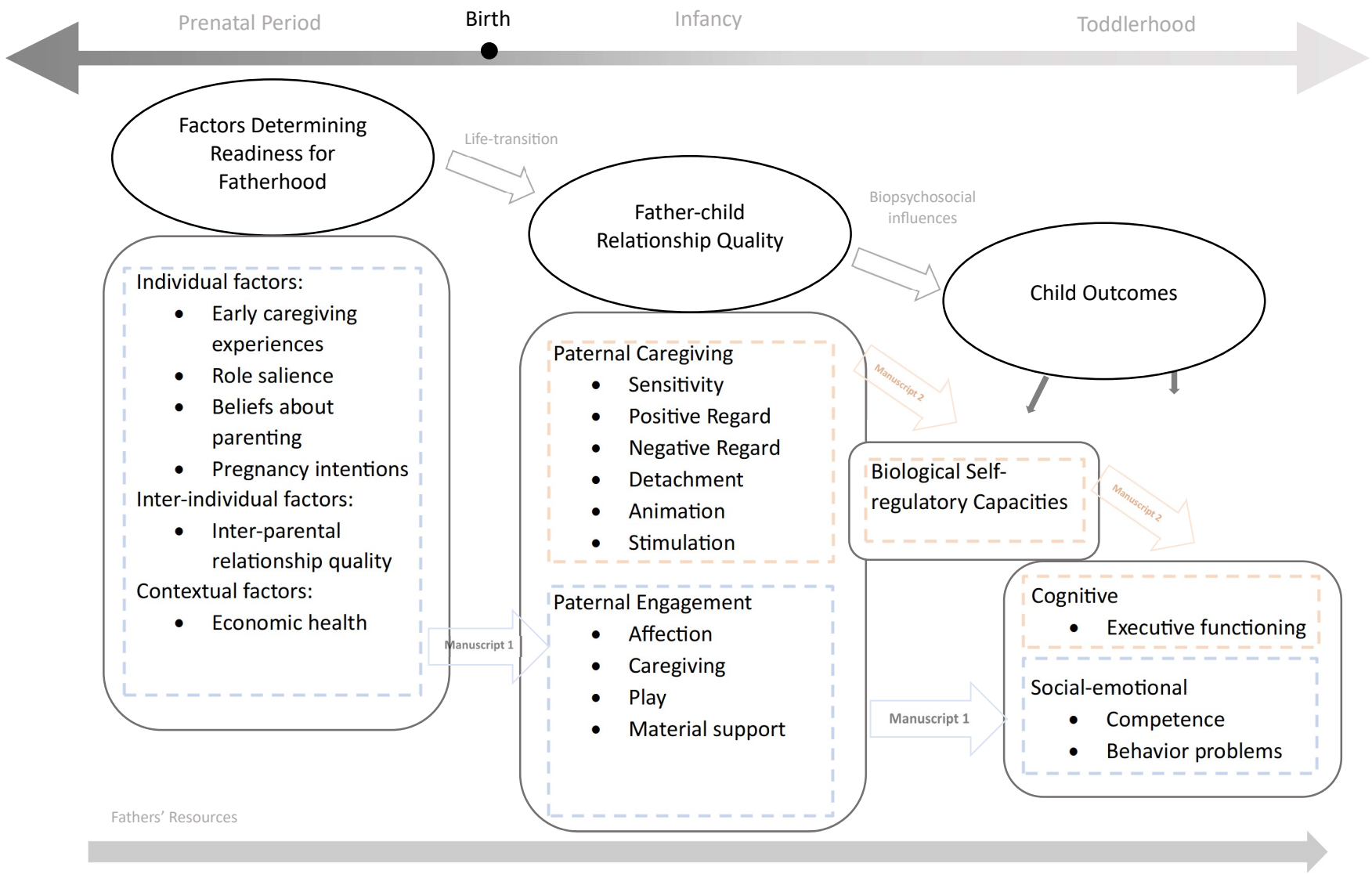
functioning (e.g., Blair et al., 2011; Porges, 1996; Towe-Goodman et al., 2014). The vast majority of relevant research in this area, however, has exclusively studied maternal caregiving behaviors (e.g., Moore & Calkins, 2004), whereas the impact of fathers' caregiving on children's physiological responses and attendant executive functioning skills has been largely overlooked. Furthermore, despite a limited number of studies suggesting a link between parent-child interactions and the development of executive functioning skills in early childhood, researchers are yet to examine Black fathers' contribution to their children's executive functioning. Given that Black fathers in low SES environments make important contributions to early social and emotional development, understanding the physiological mechanisms by which paternal sensitivity and stimulation impact developmental outcomes is critical for elucidating the role of fathers in early development, particularly in vulnerable contexts (e.g., Roy, 2006). Therefore, in Study 2, data from the Family Life Project (FLP) is utilized to examine structural models that test a) the link between paternal caregiving (sensitivity and stimulation) during father-child play and children's executive functioning, and b) whether this association is mediated by child cortisol reactivity.

Conclusion

Despite facing numerous contextual stressors, Black fathers in resource-poor rural communities engage with infants and toddlers in diverse ways (Coates & Phares, 2014). Nonetheless, their contributions to the early health and development of young children—and the developmental pathways by which those contributions occur—are not yet fully understood. Findings from this dissertation highlight potential risk and protective factors for Black fathers in rural environments and document the unique contributions of both quantity and quality of paternal caregiving to child socioemotional and socio-cognitive outcomes in the first three years of life. Collectively, results could be used to inform the development of evidence-based,

culturally competent programs and policies targeting the resilience and well-being of Black American fathers, paternal engagement, sensitivity, and stimulation, and early child development in challenging socio-ecological circumstances such as rural poverty.

Figure 1. Conceptual Framework



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CHAPTER 2

2. PRENATAL READINESS FOR FATHERHOOD, PATERNAL ENGAGEMENT, AND SOCIAL-EMOTIONAL WELL-BEING

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Abstract

The current study utilized a person-centered approach to identify constellations of prenatal readiness for parenthood among a sample of 126 unmarried Black fathers living in the rural southeastern United States. Further, prenatal readiness for fatherhood constellations were examined as predictors of distal outcomes of both paternal engagement in early infancy and socioemotional competence in toddlerhood. Expectant fathers reported on a series of variables prenatally and paternal engagement in infancy. Mothers reported on children's socioemotional competence when they were approximately 12-18 months old. A latent profile analyses revealed three distinct readiness for fatherhood profiles defined as High Readiness, Mixed Readiness, and Low Readiness based on expectant Black fathers' prenatal self-efficacy, desire for children, beliefs about the paternal role, inter-parental relationship quality, caregiving sensitivity in the family of origin, and economic distress. Results indicated that children of fathers in the High Readiness profile showed more optimal socioemotional competence compared to children whose fathers were in the Low and Mixed Readiness profiles. Indirect effects from profile membership to socio-emotional competence via paternal engagement were non-significant, but fathers in the Low Readiness profile did engage in less caregiving engagement relative to other fathers. Although mediating mechanisms remain unclear, findings suggest heterogeneity in unmarried Black fathers' patterns of readiness for parenting in the prenatal period, with implications for children's early socioemotional development.

Key words: Expectant fathers, Black fathers, rural poverty, paternal engagement, social-emotional development

Introduction

Extant research has documented multiple psychological and socio-contextual factors that contribute to fathers' readiness for fatherhood in early childhood. These factors include the desire to have a child, high-quality couple relationships, financial stability, and fathering cognitions that reflect commitment to the parenting role (Cabrera et al., 2008; May, 1982). Fathers who possess these characteristics after the birth of a child are shown to be more prepared for fatherhood and develop more realistic expectations about parenting (e.g., Feldman et al., 1983). This, in turn, impacts early childhood outcomes through multiple parenting dimensions and sustained parental engagement (e.g., Brown et al., 2012; Lang et al., 2014; Sarkadi et al., 2008). However, less attention has been given to the factors contributing to expectant fathers' *prenatal* readiness for parenting and the downstream consequences of prenatal parental readiness for children's socio-emotional growth.

This gap is particularly glaring among rural Black men, who often make the transition to parenthood in early emerging adulthood, which is a time when financial distress and competing role demands (i.e., vocational engagement, education, peer interactions) are often salient. Given that preparations for parenting begin before birth and readiness to be a parent is critical for early parent-child relationships (Zvara et al., 2013), this study aims to elucidate expectant fathers' preparation for the parenting role and its longitudinal impact on postnatal paternal engagement and socio-emotional development in toddlers. Specifically, the current study seeks to i) identify prenatal readiness for fatherhood typologies among unmarried, expectant Black American fathers ii) assess the impact of readiness for fatherhood on their paternal engagement and child's socio-emotional adjustment, and iii) test the indirect role of paternal engagement in the link between prenatal readiness for fatherhood and child socio-emotional adjustment.

Paternal Engagement in Infancy and Socio-Emotional Well-Being

Historical conceptualizations of the paternal role have attempted to capture the various ways in which men enact their parenting role (Pleck, 2007). One of the most influential conceptualizations comes from Lamb and colleagues' (1987) tripartite model composed of 1) engagement – interacting directly with one's child, 2) accessibility – being available to one's child without engaging directly, and 3) responsibility – planning and making arrangements for childcare-related tasks. Among these, engagement has received the most attention in the extant literature and generally shows the strongest associations with positive child outcomes among both residential and non-residential fathers (e.g., Adamsons & Johnson, 2013; Sarkadi et al., 2008). Paternal engagement is typically defined as fathers' time spent directly interacting with children, whether in caregiving (e.g., feeding, dressing, or putting children to sleep) or child-centered (e.g., singing, reading, playing with toys or games) activities. More recent operationalizations of paternal engagement are also likely to include affective dimensions that include the expression of warmth and positive emotion toward children (e.g., hugging, kissing, or telling children you love them) (Pleck & Masciadrelli, 2004).

Numerous studies suggest that the benefits of paternal engagement begin in *infancy*, with engagement in the first year linked to adaptive socio-emotional functioning including fewer internalizing and externalizing behavior problems, and better cognitive skills in the preschool years (e.g., Jia et al., 2012; Kotila et al., 2014; Lang et al., 2014; McMunn et al., 2017; Pancsofar et al., 2010; Rollè et al., 2019; Sethna et al., 2017; Wilson et al., 2011). Similarly, meta-analyses indicate that children who have engaged fathers tend to have better cognitive outcomes, greater social competence, and fewer socio-emotional difficulties compared to children with less involved fathers (e.g., McWayne et al. 2013, Sarkadi et al., 2008). For example, Torres and

colleagues (2014) found that higher paternal engagement in leisure activities was the strongest predictor of greater social competence and lower problem behaviors among preschool children, even after controlling for multiple maternal and contextual covariates. In another study with toddlers, father engagement was associated with fewer behavioral and emotional problems among boys (Keizer et al., 2014). Taken together, these findings suggest that paternal engagement during infancy and early childhood is a robust predictor of children's social-emotional outcomes.

In addition, the benefits of early paternal engagement for child outcomes appear to hold across socio-cultural contexts and family structures. Meta-analyses suggest, for example, that the benefits of paternal engagement extend to non-residential fathers, with non-residential father engagement being particularly beneficial for child outcomes in social and emotional domains (Adamsons & Johnson, 2013). Moreover, Black fathers' paternal engagement in infancy predicts preschool children's school readiness in the preschool years (Downer & Mendez, 2005). Further, declines in father involvement in cognitively stimulating activities across infancy is associated with poorer socioemotional functioning in middle childhood among predominantly Black and Latinx families (Fagan & Cabrera, 2023). Still, recent reviews of the father involvement literature have recognized that the extant literature on fathering and child outcomes has generally excluded unmarried, Black fathers (Diniz et al., 2021). Thus, a primary goal of the current study is to document the constellation of prenatal factors that are most likely to promote paternal engagement and socio-emotional well-being among this under-represented population of parents. Although existing research on this topic clearly suggests an association between postnatal parenting attitudes and both the quality of father-child interactions and child outcomes, relatively little is known about men's prenatal readiness for parenting, particularly among unmarried,

African American families in rural contexts. In the sections below I first discuss the contextual circumstances of parenting for unmarried, Black fathers followed by a discussion of key prenatal factors that may promote paternal engagement.

Contextual Stress and the Contributions of Unmarried, Black Fathers

For unmarried Black fathers living in rural poverty, understanding the factors that promote preparation for parenting is particularly important, as these men are disproportionately affected by inter-generational and socio-ecological challenges (Roy, 2006). These challenges have the potential to limit their engagement with children in infancy and early childhood, the quality of their interactions with their children, and subsequent child health and development (Brown et al., 2018; McHale et al., 2006). In particular, the majority of fathers in this population may not yet be in stable relationships with the child's mother (Dubowitz et al., 2004; Smock & Schwartz, 2020). Further, these men are likely to be experiencing economic distress or financial instability as they balance challenges associated with a new baby with the demands of employment and vocational obligations (Dubowitz et al., 2004; McLoyd, 1990). This lack of stability in relationships and financial situations could emerge as barriers impacting their readiness for parenting before the birth of a child (Carlson & McLanahan, 2010; Hamm et al., 2018). Additionally, Black men are more likely to become fathers as a result of unintended or unwanted pregnancy compared to other ethnic and racial groups in the US (Guzman et al., 2010; Hayford & Guzzo, 2013). Because unintended pregnancy may not allow sufficient preparation time for these fathers to adjust to their parenting role cognitively or emotionally, unwanted pregnancies could be detrimental to the process in various ways by catalyzing paternal disengagement and interparental conflict (Lindberg et al., 2017).

Although studies have documented the potential risk factors of non-marital birth on father engagement, most Black American fathers stayed highly motivated to be involved in their children's development regardless of their marital status during birth (Ellerbe et al., 2018). Indeed, despite challenges and contextual barriers that emerge as a result of anti-Black racism (e.g., generational poverty, discrimination and race-related stress; Coley, 2001; Tamis-Lemonda & McFadden, 2010) and in contrast to widely-held stereotypes (Jarrett et al., 2013) Black American fathers are generally highly engaged in their children's lives (Bright & Williams, 1996; Cooper et al., 2020; Jones & Mosher, 2013), and their paternal engagement plays a crucial role in their children's cognitive, physiological, and socio-emotional development (Coley, 2001). Among unmarried fathers, Black men spend more time with their children and engage in a wider variety of activities than fathers of other races (Jones & Mosher, 2013). Black fathers frequently engage in playful and nurturing activities with their children, such as reading books, singing songs, and participating in child-centered activities (Baker, 2014; Downer & Mendez, 2005; Fagan et al., 2016; Leavell et al., 2012). They also typically place a strong emphasis on communicating racial socialization messages (Cooper et al., 2015; Cooper et al., 2021) and promoting educational success in their children (Baker, 2014; Cooper, 2009; Martin et al., 2010). Furthermore, despite Black men's role as parents being highly stigmatized and their identity as fathers being overlooked, these fathers view their parenting role as a crucial part of their identity, which aids them in maintaining positive engagement with their children and interacting with them in more adaptive ways (Nelson et al., 1999).

Given the confluence of challenges unmarried, Black fathers face, their resourcefulness in enacting their parenting roles, and their documented positive impact on child well-being, it is critical to understand the prenatal factors that can potentially promote or inhibit unmarried, Black

American fathers' readiness for parenting during their transition to fatherhood. Despite their many contributions to early development, how and under what conditions these men feel prepared for fatherhood and how they develop confidence in their ability to contribute to their infants' lives remains largely unknown. Thus, the present study aims to understand the contributing factors to unmarried Black fathers' readiness for fatherhood and the impact of their readiness on paternal engagement and children's early socio-emotional development.

Proposed Components of Readiness for Fatherhood

The extent to which fathers are prepared for the challenges of parenting depends on various factors, including intra- and inter-personal characteristics, desire to be a parent, attitudes toward parenting roles, and characteristics of the socio-ecological environment (Donithen & Schoppe-Sullivan, 2022; Feldman et al., 1983; May, 1982). Although several categories of factors have been identified as potential predictors of early paternal engagement and subsequent child outcomes, these have largely been considered in isolation. Whereas individual studies provide some evidence for the correlates of early paternal caregiving, few studies have considered holistically what constellations of characteristics are most likely to facilitate adaptive fathering and early father-child relationship functioning. Recent conceptualizations of the determinants of fathering call for the simultaneous consideration of paternal influences across multiple levels of psychological functioning (i.e., cognitive, emotional), social and ecological contexts (i.e., inter-parental relationship quality, SES), and developmental timepoints (i.e., both concurrent and early life experiences) (e.g., Cabrera et al., 2014; Palkovitz & Hull, 2018). Motivated by these theoretical models of fathering and recent calls to incorporate person-centered analyses with fathers (e.g., Cooper et al., 2015; McBride et al., 2022) the present study examined configurations of readiness for fathers that incorporate numerous domains of potential

paternal influences and the extent to which these factors collectively impact both fathers' caregiving behaviors and socio-emotional developmental outcomes. Specifically, we conceptualized readiness for fatherhood as consisting of: i) parenting self-efficacy, ii) desire for parenthood, iii) early caregiving experience in the family of origin, vi) non-traditional beliefs about the paternal role, v) inter-parental relationship quality, and vi) economic distress. Evidence for the role of each in predicting both paternal engagement and early socio-emotional development is reviewed in the sections that follow.

Parenting Self-Efficacy. Several studies have considered the effects of parenting attitudes and beliefs among fathers as it relates to their paternal engagement in early development (Kwok & Li, 2015). Fathers who displayed more balanced expectations toward their new role, even before the birth of a child, are more likely to develop more nurturing relationships with their children as well as become more engaged in their children's development (Cabrera et al., 2008). For example, prior studies have documented the impact of prenatal paternal self-efficacy on parental engagement (Amin et al., 2018; Murdock, 2013; Tharan, 2018) and the quality of father-child interactions (Brown & Cox, 2020; Trahan, 2018). Pinto and colleagues found an increase in paternal self-efficacy from early pregnancy to 6 months postpartum when fathers experienced greater inter-parental support and displayed fewer depressive symptoms, which may contribute to positive paternal engagement during infancy. Similarly, Kwok and Li (2015) found that fathers of 2-to-6 years old children with higher self-efficacy and more positive beliefs about paternal roles showed greater father involvement in various aspects of childrearing activities. Although these studies emphasize the importance of paternal-self efficacy on paternal caregiving and early child development, research on the links between *prenatal* paternal self-efficacy and paternal engagement in infancy is needed.

Some empirical data does suggest that expectant fathers' pre-birth beliefs on fatherhood and thoughts about their unborn baby have implications for post-birth parenting (e.g., Connor et al., 2022; Hall et al., 2014). Although these studies do not directly address the role of prenatal self-efficacy and its downstream effects on parent-child relationship quality, they highlight the importance of prenatal paternal beliefs on postnatal caregiving quality. For example, Vreeswijk and colleagues (2014) found that first-time expectant fathers who reported dreaming about enjoying engagement with the baby and enjoyed learning about the developing baby displayed a more balanced internal representation of the child. Likewise, Lindstedt and colleagues (2021) demonstrated that expectant fathers with more balanced attitudes, thoughts, feelings, and perceptions of their unborn babies displayed more sensitivity and responsiveness during father-infant interactions at 4 months. Additionally, some extant literature suggests that expectant fathers' pre-birth and birth-related involvement has an effect on their post-birth caregiving behaviors (e.g., Fagan et al., 2023). Cabrera and colleagues (2008) showed that expectant fathers who reported high prenatal involvement during pregnancy (e.g., being involved in the pregnancy and willing to be present at birth) were more likely to be engaged in a range of childcare activities in the first 3 years, including showing physical affection to their children, playing with their child, reading and telling stories to their child, and visiting relatives together. Overall, these studies highlight the potential impact of fathers' cognitions (beliefs and thoughts) about unborn babies and their confidence in enacting their parenting role on postnatal engagement.

Desire for Parenting. For many men, the *desire to become a father* is an important life goal and is viewed as an essential aspect of their identity and a determinant of personal fulfillment (Sayler et al., 2022). Studies suggest that men who both wish for children and are intentional in family planning are more likely to contemplate responsibilities related to raising a

child and prepare for parenthood even before the announcement of a pregnancy (e.g., Fagan et al., 2023; Kranz et al., 2018). Fathers' desire to be a parent can also impact the quality of father-child interaction quality, which in turn, can contribute to various cognitive and social-emotional childhood outcomes (Junttila & Vauras, 2014). Similarly, in an ethnically and racially diverse sample of fathers, Combs and colleagues (2021) showed that fathers reporting an intended pregnancy had significantly higher levels of social and cognitive play with their child, compared to fathers reporting an unintended pregnancy. Having an unintentional pregnancy, particularly when coupled with other contextual difficulties common in Black families (Finer & Zolna, 2006), is associated with a greater likelihood of decreased paternal engagement and negative father-child interactions. For example, a recent study found that fathers displayed less paternal engagement with their children at age 5 when both father and mother did not want the pregnancy (Fagan et al., 2023). Having mistimed or unwanted pregnancy has also been linked to elevated paternal depression and co-parental conflict, which can contribute to father absenteeism and decreased father-child interactions (Bronte-Tinkew et al., 2008).

Research shows that Black families are more likely to experience unintended pregnancy, especially when they are unmarried parents (Finer & Zolna, 2006), which can hamper fathers' positive engagement with their children. Nonetheless, the ways in which the desire for parenthood impact Black men's postnatal paternal engagement and long-term child outcomes remain relatively untested. Therefore, considering the literature addressing the role of the desire to become a parent and pregnancy intentions, co-occurring with social-contextual factors, on later caregiving engagement, this study examined the effect of Black fathers' desire for parenting, in combination with other prenatal readiness factors, on postnatal paternal engagement in infancy and socio-emotional competence in toddlerhood.

Family of Origin Caregiving Experiences. Expectant fathers' early caregiving experience in the family of origin may also be a critical factor contributing to readiness for fatherhood before the birth of a child. Conceptual and empirical work in the fatherhood literature indicates that fathers who had positive caregiving experiences in the family of origin tend to have more positive beliefs about the paternal role and are more likely to be highly engaged in optimal parenting behaviors (Brown et al., 2018; Cooper et al., 2019). Conceptually, men whose own fathers were involved in their lives develop schemas of fatherhood that include positive engagement with young children and draw on models of fathering that promote intergenerational transmission of positive fathering (e.g., Belsky et al., 2005). In a recent study with first-time fathers, for instance, men with a secure working model of early attachment representations, measured prenatally based on experiences in the family of origin, took more pleasure in parenting six months postpartum and displayed more sensitive caregiving behaviors during father-child interactions at 12 months relative to those with insecure representations of parental relationships in the family of origin (Aytuglu & Brown, 2022).

Black fathers in low-resource communities are disproportionately likely to grow up in homes without a consistent father presence (Annie E. Casey Foundation, 2014; Barton et al., 2015). Given wide variability in paternal engagement in this population, fathers of young children may be particularly likely to draw on their experiences (or lack thereof) with their own fathers. For instance, low SES Black fathers whose fathers did not reside with them are less likely to live with their children after becoming parents (Furstenburg & Weiss, 2000), and report that their fathers "being there" for them was an important influence on their own parenting motivations and parenting behaviors with their own children (Shears et al., 2006). In another study examining the intergenerational transmission of fathering among unmarried, Black fathers,

Brown and colleagues (2018) found that retrospective reports of the quality of the relationship between young fathers and their fathers in the family origin were related to higher levels of paternal involvement with their own children. Given this emerging evidence, early caregiving experiences with one's own father are likely to be a key component of readiness for fatherhood before the birth of a child.

Beliefs about the Paternal Role. How men choose to enact their parenting roles is often embedded within broader beliefs about how one defines the paternal role (Lamb et al., 1987; Pleck, 2010). Some supporting data suggest that endorsement of stereotypically nontraditional parenting values (e.g., gender equality in caregiving) is linked to paternal engagement and more adaptive fathering (Freeman et al., 2008; Petts et al., 2018; Shafer et al., 2019). For example, Schoppe-Sullivan and colleagues (2014) found that fathers with nontraditional beliefs about their parenting roles were more engaged in teaching and caring for their children. However, the impact of expectant men's beliefs about the fathers' role on their parenting engagement and socioemotional child outcomes in the early years of development is relatively less studied, especially among low SES Black men living in rural areas.

For young Black men, establishing a coherent sense of what it means to be a man is a particularly important developmental task during late adolescence and early emerging adulthood, when many also make the transition to parenthood (e.g., Roberts-Douglass & Curtis-Boles, 2013). Moreover, some conceptions of men's roles as a father may be unique in this population compared to men from other sociodemographic groups. For instance, Curtis and colleagues (2021) found that some Black men possess "reputation-based" masculinity ideology emphasizing toughness and sexual prowess as a means of expressing manhood, which has the potential to elevate the risk of detachment from parental responsibilities. In contrast, other Black men's

"respect-based" masculine ideology, which values agency and resourcefulness, financial independence, having a stable romantic relationship, and providing for a family, is theoretically linked to adopting nontraditional beliefs about the father role and greater involvement in—and preparation for—one's paternal role (Cho & Kogan, 2017; Curtis et al., 2021). Given the importance of beliefs and attitudes toward fathers' roles in general, Black men's nontraditional gender roles (e.g., prioritizing respect, inter-personal relationship functioning, and warmth/care) as well as beliefs in fathers' positive influence on development could contribute to their prenatal readiness for fathering.

Economic Distress. Men who have less economic distress may feel more prepared for fatherhood as they feel more confident in their ability to provide for a child and family (Christiansen & Palkovitz, 2001). Financial stability can help men with accessing goods and services that can increase the quality of their family's living conditions (e.g., owning a house, health insurance, and child-care). Financially stable fathers are also less likely to experience work-related stress that hinders work-family balance (Conger et al., 2010). For example, existing research has documented a link between middle-to-high family income and various positive cognitive and emotional child outcomes (high cognitive test scores and fewer behavior problems) through parental well-being, positive parenting practices, and a cognitively stimulating home environment (e.g., Linver et al., 2002). In contrast, financial difficulties adversely impact family functioning, general well-being, and parenting practices (Hofferth, 2003). These findings are supported by existing theories (e.g., the family stress model; Conger & Elder, 1994) and extensive empirical data (e.g., Barajas-Gonzales & Brooks-Gunn, 2014; Conger et al., 2010). For example, in an ethnically and racially diverse sample of families with children between 5 and 16

years old, Barajas-Gonzales and Brooks-Gunn (2014) found an association between financial hardship and elevated family conflict, which also predicted more negative parenting behaviors.

Many unmarried, Black men experience financial hardship, poverty, and economic-related stress, which can cascade through families to disrupt early paternal engagement (e.g., McLoyd, 1990). When financial resources are limited, new fathers face psychosocial stressors associated with the challenges of making ends meet, as well as limitations on their time (i.e., working multiple jobs or non-traditional hours) that can restrict consistent engagement with young children (Nelson, 2004; Tamis-LeMonda & McFadden, 2010). For many young, Black fathers, providing for their children is also a particularly salient part of their identity and one way in which many men make meaning of from the paternal role (e.g., Randles, 2020). Thus, it seems likely that these fathers' experience of financial distress may be particularly likely to affect their motivation, willingness, and availability to engage with young children.

Typologies of Readiness for Fatherhood

Collectively, these studies highlight that readiness for fatherhood is a multifaceted concept that can be informed by numerous intrapersonal, relational, and contextual factors. Although these variables have been considered in isolation across individual studies, few investigations have examined the simultaneous predictive power of multiple prenatal variables on paternal engagement or child well-being. Further, as research in the domain of fatherhood has grown in recent years, so too has the need to understand typologies of fathering that characterize fathers across multiple variables.

In line with this approach, recent calls in the fatherhood literature have explicitly called for person-centered approaches that characterize profiles of fathers and their contributions to child well-being (e.g., Cooper et al., 2015; Goodman et al., 2011; Modecki et al., 2015). To our

knowledge, however, no studies to date have examined latent profiles of expectant fathers. The present study is intended to fill that gap by identifying a conceptually meaningful set of readiness for fatherhood clusters among expectant and unmarried Black fathers living in rural and resource-poor locations in the Southeastern US. Although profile-oriented approaches are inherently exploratory in nature, given the robust emerging body of literature on issues relevant to preparation for fatherhood (reviewed above), we hypothesized that distinct typologies of paternal readiness to emerge that may explain variance in paternal engagement during the early post-partum period and socio-emotional competence in toddlerhood. In particular, we examined the impact of individual differences in readiness for fatherhood typologies on socio-emotional child outcomes via early paternal engagement.

Current Study

The current study employs latent profile analysis to identify distinct profiles of unmarried, low socioeconomic status, expectant Black fathers based on prenatal factors hypothesized to contribute to their readiness and preparedness for childrearing. Specifically, the current study identified 1) prenatal readiness for fatherhood profiles among unmarried, expectant Black fathers, 2) examined whether distinct groups of prenatal readiness for fatherhood were linked to paternal engagement in infancy at 3-6 months and children's socioemotional competence when they are 12-18 months of age, and 3) tested whether the association between prenatal readiness for fatherhood and socioemotional competence is mediated by parental engagement in the first year of life.

Method

Participants

We tested our hypotheses using data from the Parents and Children Together Project (PACT) at the University of Georgia, which is an ongoing study investigating contextual factors affecting unmarried Black fathers residing in rural counties of Georgia. Eligibility criteria included self-identification as African American or Black, male gender, expecting a baby, being unmarried at baseline, and residence in nonurban counties of the sampling region. One hundred twenty-six expectant fathers who participated in the baseline data collection during the third trimester of pregnancy were included in the current study.

At baseline, the mean age of expectant fathers was 28 years old (SD = 6.85); and most of them (69%) were employed full-time (35 or more hours of work in a week), 9% being employed part-time (less than 35 hours a week) or working in a temporary job, 5% were self-employed, 17% were not employed, and one participant reporting other (i.e., disabled). The median income of participants at baseline was $1400 per month and the mean was $1690 per month ($SD$ = $1000). Twelve percent of fathers reported attending high school but did not earn a diploma, 57.4% had a high school education or equivalent (i.e., General Education Development [GED]), 10.6% had a vocational or technical school certification or an associate degree, 13.1% reported attending some college but did not earn a diploma, 5.7% had a bachelors' degree, and 1.6% had a graduate degree. The majority of expectant fathers (82%) reported being romantically involved with the expectant mothers at the baseline on a steady basis and spending every night (77.9%) or a few nights per week (9%) in the same home as expectant mothers.

Procedure

Three waves of data were collected from participants, which represent three critical time points for both parenting and early child development: prenatal (Wave 1; during 2nd or 3rd trimester of pregnancy, N = 126), early infancy (Wave 2; M_{age} = 4.78 months, SD = 2.30, N =

184), and toddlerhood (Wave 3; M_{age} = 16.38 months, *SD* = 3.27, *N* = 112). Eighty-three new father-infant dyads were recruited in Wave 2 in addition to retaining participants from Wave 1 (*N* = 101). All the participants in Wave 3 were recruited either in Wave 1 (*N* = 74) or Wave 2 (*N* = 38). African American field research staff assisted expectant fathers in completing computer-assisted surveys about parenting behaviors, family history, and close relationships at baseline. Due to the global pandemic, the data collection transitioned from in-person to an online platform after one-third of the baseline data were obtained. At the second and third waves, data collection was completed almost entirely online (Time 2 = 98%, Time 3 = 99%). During online data collection, the research staff assisted participants via phone call. Fathers received a $100 check at each visit and children received toys at Waves 2 and 3 for their participation. All study protocols were approved by the university institutional review board.

Measures

Readiness for Parenting

To assess factors contributing to expectant fathers' readiness for parenting, we utilized multiple indicators reported on prenatal surveys. This included fathers' pre-birth parenting self-efficacy, desire for children, early caregiving experience in the family of origin, non-traditional beliefs about fathers' role, relationship quality with the expectant mother, and economic distress to assess their readiness for parenthood typologies.

Parenting Self-Efficacy. Pre-birth parenting attitudes and beliefs were assessed using the 7-item Anticipated Parenting Efficacy Scale, which was adapted from the Parenting Sense of Competence Scale (see Appendix; Leerkes & Crockenberg, 2002; Teti & Gelfald, 1991). Expectant fathers reported on how effective they think they would be at parenting tasks after their baby is born. Each item was rated on a Likert-scale ranging from 1 (not good at all) to

4 (very good). Example items contain “when your baby is upset, fussy or crying, how good do you feel you will be at soothing your baby?” and “how good do you feel you will be at getting your baby to sleep?”. The Cronbach’s alpha coefficient was .91.

Desire for Parenting. Fathers’ desire for parenting was measured prenatally using three items from the Pleasure in Parenting scale (see Appendix; Brown & Cox, 2020), which was adapted from the parent development interview (Slade et al., 2004). Expectant fathers responded on their desire to have a child on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), including items “Becoming a parent will be one of the best things that ever happened to me”, with higher score indicated more positive desire to have a child. The Cronbach’s alpha coefficient was .73.

Relationship with Birth Father. Expectant fathers retrospectively self-reported on their early caregiving experiences with their biological fathers using a 4-item measure developed and validated for the African American Men’s Project, a longitudinal study of African American and Black men residing in rural and resource-poor counties of the southern United States (see Brown et al., 2018). Participants responded on a 4-point Likert-type scale ranging from 1=never to 4=often. Scale items were “Growing up, how often did you usually live with your birth father”; “Growing up I could depend on my birth father to always be there when I needed him”; “Growing up I knew that my birth father cared about me”; and “Growing up I spent a lot of time with my birth father.” The Cronbach’s alpha coefficient was .85.

Beliefs about the Role of the Father. Expectant fathers’ non-traditional beliefs about the parenting role were assessed using the fourteen-item adapted version of the Role of the Father Questionnaire (ROFQ) was used to measure parental attitudes toward the paternal role (Palkovitz, 1984). Sample items, which were rated on a Likert-scale ranging from 1 (strongly

disagree) to 5 (strongly disagree), included “A father should be as heavily involved in the care of a baby as the mother is” and “Fathers play a central role in child's development”, with higher scores represented more non-traditional beliefs and attitudes about parenting role. The Cronbach’s alpha coefficient was .81.

Inter-Parental Relationship Quality. Fathers' current relationships with the expectant mothers were assessed with the 5-item Relationship Quality Scale adapted from the Fragile Families and Child Well-Being Study (Carlson et al., 2004). Each item was rated on a Likert-type scale ranging from 1 (never) to 3 (often). Example items include, “how often is your child’s mother/father fair and willing to compromise?” and “how often does your child’s mother/father listen to you when you need someone to talk to?”. The Cronbach’s alpha coefficient of father-mother relationship quality was .90.

Economic Distress. Fathers’ economic distress was assessed using the 11-item Economic Distress Inventory (Dunst & Lee, 1987). Fathers responded on their economic well-being on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree), including items “I have enough money to pay my bills each month.” Higher scores indicate greater financial distress. The Cronbach’s alpha coefficient was .91.

Paternal Engagement

Paternal engagement was measured using the Fatherhood Research and Practice Network Father Engagement Scale (FRPN-FES, Dyer et al., 2015), a scale that originally included eleven items. One additional item was added to capture fathers’ virtual engagement using online technologies (“How often have you used video chat or FaceTime to see your child when you are not with them?”). Fathers responded about the frequency of caregiving activities in early infancy on a 5-point Likert scale ranging from 0 (never) to 5 (every day or almost every day). Items included

affection (How often have you told her you loved her?), daily caregiving tasks (How often have you fed or given a bottle to him?), and play or cognitive activities (How often have you told stories to her?). The Cronbach's alpha coefficient of father engagement was .90.

Children's Socio-Emotional Development

Children's socio-emotional competence was assessed using a 42-item modified version of the Brief Infant-Toddler Social and Emotional Assessment (BITSEA; Briggs-Gowan et al., 2013), including a sub-scale of competence (11 items), when the children were 18 to 24 months of age. Mothers responded on a 3-point Likert scale ranging from 1 (e.g., not true/rarely) to 3 (e.g., very true/often). Sample items included "Tries to help when someone is hurt (for example, gives a toy)" and "Is affectionate with loved ones.". Higher scores represent higher levels of competence in children. The Cronbach's alpha coefficient was .86.

Analysis Plan

Bivariate associations among all study variables were first examined. Next, data visualization techniques (i.e., parallel coordinates) were performed to understand variability within each readiness for fatherhood factor, and then latent profile analyses were conducted to identify the optimal number of classes of readiness for parenthood using all pre-birth factors in Mplus Version 8.3 (Muthén & Muthén, 1998–2019). Models with different numbers of profiles were compared based on entropy values and three model fit indices, including Akaike's Information Criteria (AIC), Bayesian Information Criteria (BIC), and Bootstrap Likelihood Ratio Test (BLRT). Lower values of AIC and BIC indicate a better fit for a model (Lo et al., 2010). For the BLRT, a significant *p*-value indicates that an estimated model with *k* number of profiles shows a better fit compared to a model with a smaller number (k-1) of profiles (e.g., a 3-profile solution fits better than a 2-profile solution). Higher entropy values, ranging between 0 to 1, indicate

better precision of profiles. The final number of profile solutions was determined based on theoretical frameworks, given fit indices, and parsimony (Geiser, 2012; Lo et al., 2010; Nylund et al., 2007).

After the determination of the best profile solution, we next performed a series of structural equation models to test for profile group memberships in distal outcomes of paternal engagement and socioemotional competence, as well as the indirect effects of paternal involvement from readiness for parenthood profile membership to socioemotional child adjustment in Mplus Version 8.3 (Muthén & Muthén, 1998–2019) using bootstrapping procedures. Model fit is evaluated by examining the chi-square ($\chi 2$), the Comparative Fit Index (CFI), and the Root Mean Square Error of Approximation (RMSEA). CFI value of .95 or higher, and RMSEA values of lower than .08 indicate good model fit. To test indirect effects, bias-corrected bootstrapping procedures were utilized to examine the mediating role of paternal engagement in the link between readiness for parenting and social-emotional child adjustment. Bootstrapping has advantages as an estimation procedure for indirect effects when the data has modest sample sizes. Indirect effects are considered significant if 95% confidence intervals do not include zero.

Results

Descriptive statistics and bivariate correlations among study variables are presented in Table 2. Among the prenatal readiness for fatherhood factors, paternal self-efficacy was significantly correlated with all other readiness factors in the expected direction. Inter-parental relationship quality was positively and significantly correlated with desire for parenting, and positively and marginally correlated with caregiver sensitivity in the family of origin. Men's non-traditional beliefs about the paternal role were positively and significantly correlated with desire

for parenting. Among paternal engagement sub-dimensions—i.e., affection, caregiving, and play—both caregiving and play showed a significant positive correlation with inter-parental relationship quality. Caregiving was also marginally positively correlated with desire for parenting. Unexpectedly, significant positive correlations with economic distress were found for all paternal engagement sub-dimensions. Two of the six readiness factors, parenting self-efficacy and non-traditional beliefs about the paternal role, were found to have significant positive correlations with children's socioemotional competence. Counter to expectations, none of the paternal engagement sub-dimensions were significantly related to socioemotional competence. Neither age nor fathers' level of education were correlated with any of the study variables.

Latent Profile Analyses

A series of latent profile analyses were conducted, including two- to five-profile solutions, to identify constellations of unmarried Black fathers' prenatal readiness for parenting based on parental self-efficacy, inter-parental relationship quality, family of origin paternal sensitivity, desire to be a parent, beliefs about the paternal role, and economic distress. Several criteria were considered in determining the best-fitting model. As illustrated in Table 2, relative to the two-profile solution the 3-profile solution showed higher entropy and substantially reduced AIC and BIC values, indicating improved fit. Although fit improved with subsequent classes (i.e., 4- and 5-classes), these solutions yielded profiles that contained very few participants (i.e., < 10% of the sample) and were not conceptually meaningful. Moreover, the significant p-value for the Bootstrapped Likelihood Ration Test (BLRT) also showed that the 3-profile solution was statistically better than 2-profile solution, the 4-class solution was statistically better than the 3-profile solution, and 5-profile solution was statistically better than the 4-profile solution. However, based on conceptual clarity, parsimony, and the overall fit indices, the 3-profile

solution was selected because it fit the data well and provided adequate group sizes for interpretability (see, Jung & Wickrama, 2008). Based on the characteristics of each readiness-for-fathering profile, presented in Figure 3, the three profiles were defined as High Readiness (n= 69, 55%), Low Readiness (n= 29, 23%;), and Mixed Readiness (n= 27, 22%). Fathers in the High Readiness profile scored relatively high on each of the readiness factors, but low on economic distress. Conversely, fathers in the Low Readiness profile scored low on all readiness factors but relatively higher on economic distress. Fathers in the Mixed Readiness Profile displayed relatively high scores on desire for fatherhood, caregiving sensitivity in the family of origin, and non-traditional beliefs about the paternal role. In contrast, these men were in the moderate range of parenting self-efficacy and relatively low on both interparental relationship quality and economic distress.

Latent Profile Analyses and Distal Outcomes

Next, the automated Bolck-Croon-Hagenaars (BCH) three-step procedure was utilized to estimate the mean paternal engagement sub-dimension values and socioemotional competence across the three readiness-for-fatherhood profiles. Results showed significant between-group differences in child socioemotional competence as a function of readiness profile membership, $\chi^2 = 7.02$, $p = .03$. Specifically, children whose fathers were in the High Readiness group ($M = 25.86$; $SE = 0.68$) scored significantly higher on socioemotional competence than did children of fathers in the Mixed Readiness group ($M = 21.74$, $SE = 1.68$), $\chi^2(1) = 5.11$, $p = .02$. Children of fathers in the High Readiness group also scored marginally higher on socioemotional competence compared to those whose fathers in the Low Readiness group ($M = 23.615$, $SE = 1.05$), $\chi^2(1) = 3.23$, $p = .07$. When considering sub-dimensions of paternal engagement as distal outcomes, results indicated a marginally significant overall between-group difference only for

paternal caregiving engagement, $\chi^2 = 4.90$, $p = .09$. Specifically, fathers in the Mixed Readiness group ($M = 13.47$, $SE = .43$) showed significantly higher caregiving engagement behaviors than did fathers in the Low Readiness group ($M = 11.66$, $SE = .68$), $\chi^2(1) = 4.88$, $p = .03$). Fathers in the High Readiness group also scored higher than fathers in the Low Readiness group ($M = 12.87$, $SE = .37$), but this difference was not statistically significant, $\chi^2(1) = 2.41$, $p = .12$).

Furthermore, manual implementation of the BCH procedure was used to test direct links between the study variables as well as the mediating role of paternal caregiving engagement in the link between prenatal readiness-for-fatherhood profiles and child socioemotional competence. First, the standard latent profile analysis was re-run without the distal outcomes but requiring Mplus to save profile weights for use in the later steps (e.g., the following command was added to the syntax: "savedata: save = bchweights"). Next, these weights were utilized to perform a regression on the effect of socioemotional competence on paternal readiness under the "%overall% section" to examine simultaneous associations among all study variables (Asparouhov & Muthen, 2014). Due to insignificant direct paths among study variables, an estimation of indirect effects was not conducted.

Discussion

By adopting a person-centered approach, the current study identified distinct profiles of prenatal readiness for fatherhood among an understudied population of expectant parents—unmarried Black men living in rural poverty. Findings speak to the heterogeneity in expectant Black fathers' readiness for parenting based on their prenatal parenting self-efficacy, interparental relationship quality, caregiving experiences in the family of origin, desire to be a father, beliefs about the paternal role, and economic distress. Although hypothesized mediational pathways were not supported, results did indicate direct effects of prenatal profile membership

on children's socioemotional competence in toddlerhood as well as some differences in fathers' caregiving engagement in early infancy as a function of readiness for fatherhood profiles.

Readiness for Fatherhood Profiles

Latent profile analyses identified a conceptually meaningful set of three prenatal readiness configurations. Just over half of the fathers in this sample were classified as being in the High Readiness group. These men scored high on all personal and socio-contextual readiness factors, indicating strong psychological readiness for parenting (i.e., desire to be a father, parenting self-efficacy), beliefs in the importance of the paternal role, contextual circumstances (i.e., economic well-being), and relationships (i.e., high-quality inter-parental relationships, sensitive fathers in the family of origin) that seemingly support a healthy transition to a new child. Notably, and in contrast to societal representations and some widely-held stereotypes of unmarried, Black fathers (Cooper et al. 2021), the majority of fathers fell into this High Readiness group. Although contextual barriers can pose a challenge to unmarried, Black men's engagement with their infants both before and after the birth of a child, these findings support the notion that many of these men report feeling prepared and highly motivated for parenthood during the prenatal period (e.g., Fagan et al., 2023; McHale et al., 2021).

In contrast to High Readiness fathers, fathers in the Low Readiness group — approximately a quarter of the sample—displayed low levels of prenatal parental self-efficacy, desire for parenting, and non-traditional beliefs about fathering roles. They also exhibited less inter-parental relationship quality and sensitive caregiving experience with their own fathers, whereas their economic distress levels were high. The third readiness profile that emerged—Mixed Readiness fathers, slightly less than a quarter of the sample—showed some similarities to High Readiness fathers with respect to the desire to have a child, valuing the fathering role, and

sensitive caregiving experiences with fathers in the family of origin. However, like fathers in the Low Readiness profile, these men also reported experiencing high economic distress and low inter-parental relationship quality, coupled with moderate levels of parenting self-efficacy. These fathers' strong desire for parenthood was coupled with their belief in the importance of their contribution to children's development as well as positive reported childhood experiences with their own fathers. Nevertheless, fathers in this group exhibited only moderate levels of parental self-efficacy (falling roughly halfway between the Low and High readiness profiles) as their interparental conflict and economic distress were high. This constellation could highlight the overarching effect of socio-contextual determinants of parenting (i.e., financial wellbeing and interparental relationship quality) on psychological preparedness (particularly parenting confidence and self-efficacy) among Black fathers, which has been documented in previous research involving Black families (e.g., Skinner, Sun, McHale, 2021).

Despite the scarcity of research on Black men's parenting and the exploratory nature of the current study, overall profile clustering was consistent with the premise that expectant men's readiness for fathering may differ based on their parenting cognitions, desires, beliefs in the importance of the father's role, the quality of their close relationships, and contextual determinants (Cooper et al., 2015; Junttila & Vauras, 2014; McBride et al., 2023). Previous studies have frequently shown the critical role of interparental relationships as well as fathers' caregiving experience in the family of origin in shaping men's cognitions about parenting roles and aiding them in their caregiving capabilities (Altenburger & Schoppe-Sullivan, 2020; Aytuglu & Brown, 2022; Pinto et al., 2016; Roy, 2006). Studies have also documented that holding negative expectations about parenting roles and poor interparental relationships can have negative consequences for fathers' overall parenting experiences during pregnancy (Ramsdell &

Brock, 2020; Zvara et al., 2013). Results from the current study provide some limited support for the view that the determinants of prenatal readiness for parenting are highly connected to one another and may emerge concurrently during pregnancy. It remains to be seen whether the profile constellation documented here is replicable and to what extent it may be unique to this specific population of fathers or generalize to other groups with differing socio-demographic characteristics.

Socio-Emotional Competence Across Prenatal Readiness for Fatherhood Profiles

Hypothesized direct effects from prenatal readiness to children's outcomes were supported, such that study findings indicated differences in toddlers' social-emotional competence across prenatal readiness for fatherhood typologies. More specifically, toddlers of High Readiness fathers showed more socioemotional competence in comparison to toddlers whose fathers were in the Mixed or Low Readiness profiles. It may be that unmarried Black men who are prenatally ready for their parenting role (e.g., holding positive beliefs about fathering, desire to have a baby, positive interparental relationships, and financial security) can positively impact the socio-emotional development of their children approximately two years later. This finding is consistent with previous research examining the link between typologies of parenting beliefs and children's overall social competence (Ardelt & Eccles, 2001). For example, Junttila and Vauras (2014) found that children of fathers in a high parenting self-efficacy latent profile group exhibited more prosocial behaviors and less antisocial behaviors compared to those in lower self-efficacy profiles.

Similarly, previous research has shown a positive impact of fathers' experience of supportive interparental and familial relationships, especially when coupled with financial security, on their children's social-emotional well-being among Black families (McBride et al.,

2022; Skinner et al., 2020). Our findings build upon this work and extend it to the prenatal period by documenting associations between constellations of both psychological and contextual factors prior to the birth of a child and downstream socio-emotional adjustment in early childhood. Collectively, results speak to the "long reach" of fathers during the prenatal period for health and well-being in the post-natal period (e.g., Cabrera et al., 2008; Fagan et al., 2023).

Paternal Engagement Across Prenatal Readiness for Fatherhood Profiles

One goal of the current study was to examine different patterns of paternal engagement sub-dimensions—affection, caregiving, and play—across the typologies of expectant Black fathers' readiness for parenting. In general, most hypothesized associations between prenatal readiness profiles and paternal engagement in early infancy were not supported. In particular, neither the affection nor play sub-dimensions of engagement significantly differed across groups. Considering that the majority of parents take high pleasure in fathering and report displaying affection toward children (Rohner & Veneziano, 2001), it is plausible that paternal affection may not exhibit much variability across groups. Likewise, considering that the current study focuses on paternal engagement in the first several months, play interactions between father-infant dyads was likely somewhat limited, with caregiving activities more salient during this developmental period (Amodia-Bidakowska et al., 2020).

In contrast to play and affection, the overall effect for paternal caregiving trended toward significance, with fathers in the Low Readiness profile lower on paternal engagement than fathers in other profiles. Somewhat counterintuitively, fathers in the Mixed Readiness (rather than High Readiness) group showed the highest levels of caregiving engagement in infancy, and these fathers' caregiving engagement was significantly higher than those in the Low Readiness group. These findings indicate that expectant fathers who have a high desire to have children and

positive beliefs about fathers' importance in child development may be more likely to contribute caregiving behaviors in infancy in spite of relatively poor interparental relationship quality and some economic distress. For some fathers with robust psychological resources, it may be that negative social-contextual circumstances could potentially motivate them to develop positive attitudes toward caregiving that facilitate more optimal engagement with their infants (e.g., Thomas et al., 2023). More research examining associations between prenatal factors and fathers' parenting in early infancy is needed in this population.

Limitations and Future Directions

Despite its multiple strengths, the current study has also several limitations that could be addressed in future research. First, although results of the latent profile analysis suggest that expectant fathers' readiness for parenting can be characterized by a three-class constellation, the current analyses were exploratory in nature and limited to a sample of unmarried Black fathers living in rural regions of the southeastern US. Future research is needed to determine whether these constellations of prenatal readiness for fatherhood can be replicated and extended to more diverse samples. Second, although the current study aimed to elucidate expectant fathers' personal experiences in their readiness for parenthood, data were comprised entirely of fathers' self-report data on prenatal factors and paternal engagement. Future research could more fully integrate data from multiple informants as well as more objective assessments of both prenatal readiness (e.g., neuroendocrine functioning associated with an adaptive transition to parenthood) and parenting (e.g., observational assessments of father-infant interactions). Relatedly, the assessments of parenting used in the current study were relatively limited. This may in part explain the lack of associations between parenting behaviors and both prenatal readiness profile membership as well as socioemotional competence. Subsequent studies should continue to

examine other possible mediating mechanisms within the family environment (e.g., qualitative aspects of parent-infant interactions, attachment quality, coparenting dynamics) that may explain the link between paternal prenatal factors and infant socioemotional development. Finally, despite the focus on a unique sample of hard-to-reach, this study had a modest sample size that yielded relatively small profile sizes. Additional studies with larger samples and more statistical power are warranted.

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Figure 2. Conceptual Diagram of the Study 1

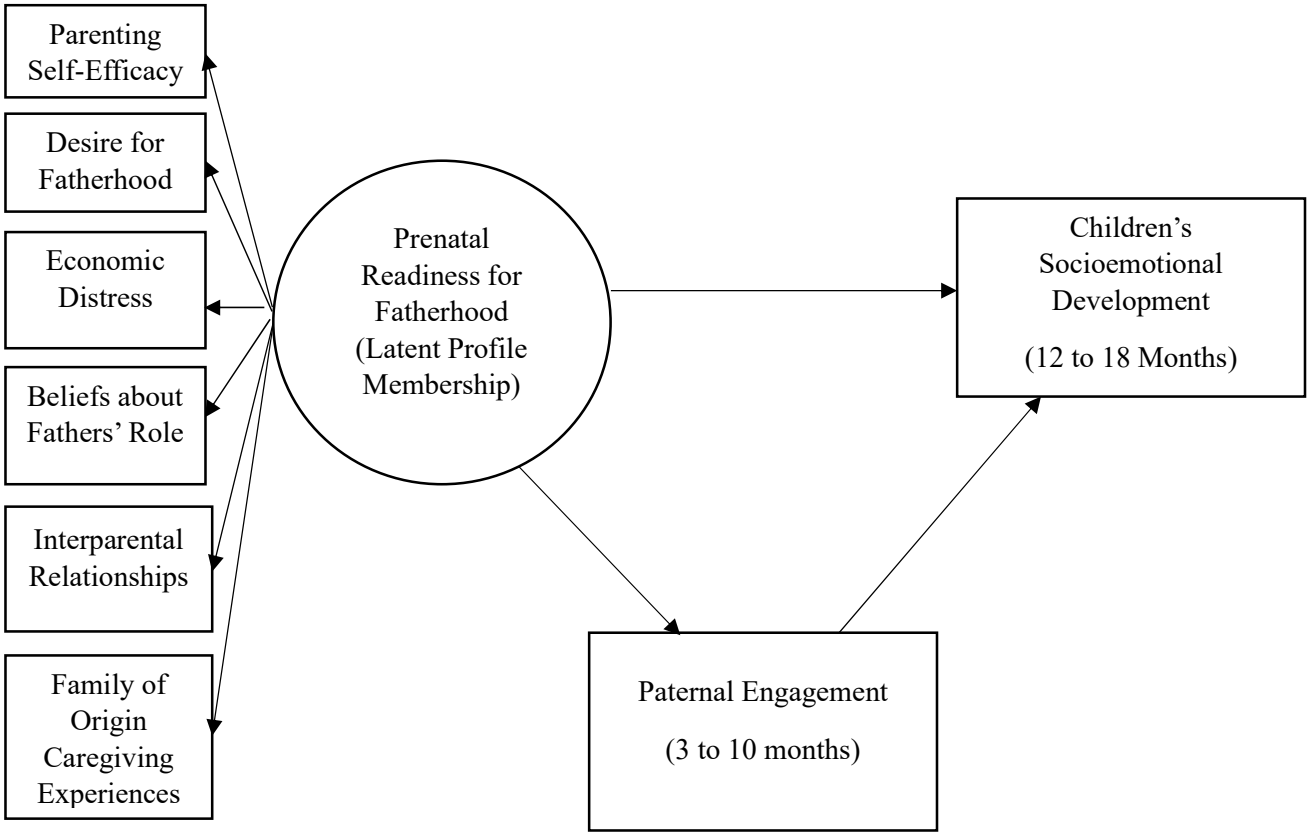


Table 1. Zero Order Correlations among Continuous Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	-											
2. Edu	.09	-										
IV: Readiness for Fatherhood Factors												
3. Paternal Self-efficacy	-.11	.02	-									
4. Interparental Relationships	-.15	-.02	.33***	-								
5. Desire for Fatherhood	-.07	-.01	.54***	.22*	-							
6. Family Origin Caregiving	.16†	.07	.25**	.15†	.09	-						
7. Economic Distress	-.01	-.15	-.21*	-.10	-.05	-.12	-					
8. Role of Fathers	-.09	-.02	.38**	.13	.47**	.13	.01	-				
Mediators: Paternal Engagement												
9. Affection	-.16	-.07	.01	.19	.13	-.08	.24*	-.06	-			
10. Caregiving	-.10	-.13	.12	.33**	.17	-.04	.21*	-.06	.83**	-		
11. Play	-.03	-.05	.09	.23*	.06	.01	.21*	-.16	.65***	.73***	-	
DV: Socioemotional Child Outcome												
12. BITSEA Competence	-.17	.11	.24*	.05	.07	-.08	-.04	.33**	.05	.05	.04	-
Mean	27.99	3.37	25.69	13.14	13.94	9.34	15.64	36.70	17.99	12.49	19.16	25.19
SD	6.85	1.73	2.82	2.37	1.47	4.35	4.42	5.15	3.17	3.10	5.69	4.92
Range (min - max)	18-64	1-8	21-28	6-15	6-15	4-16	7-28	18-45	5-20	2-15	2-25	11-33
N	126	126	125	124	125	125	125	124	181	180	181	120

Note. SD = standard deviations. *IV* = Independent variable. *DV* = Dependent variable

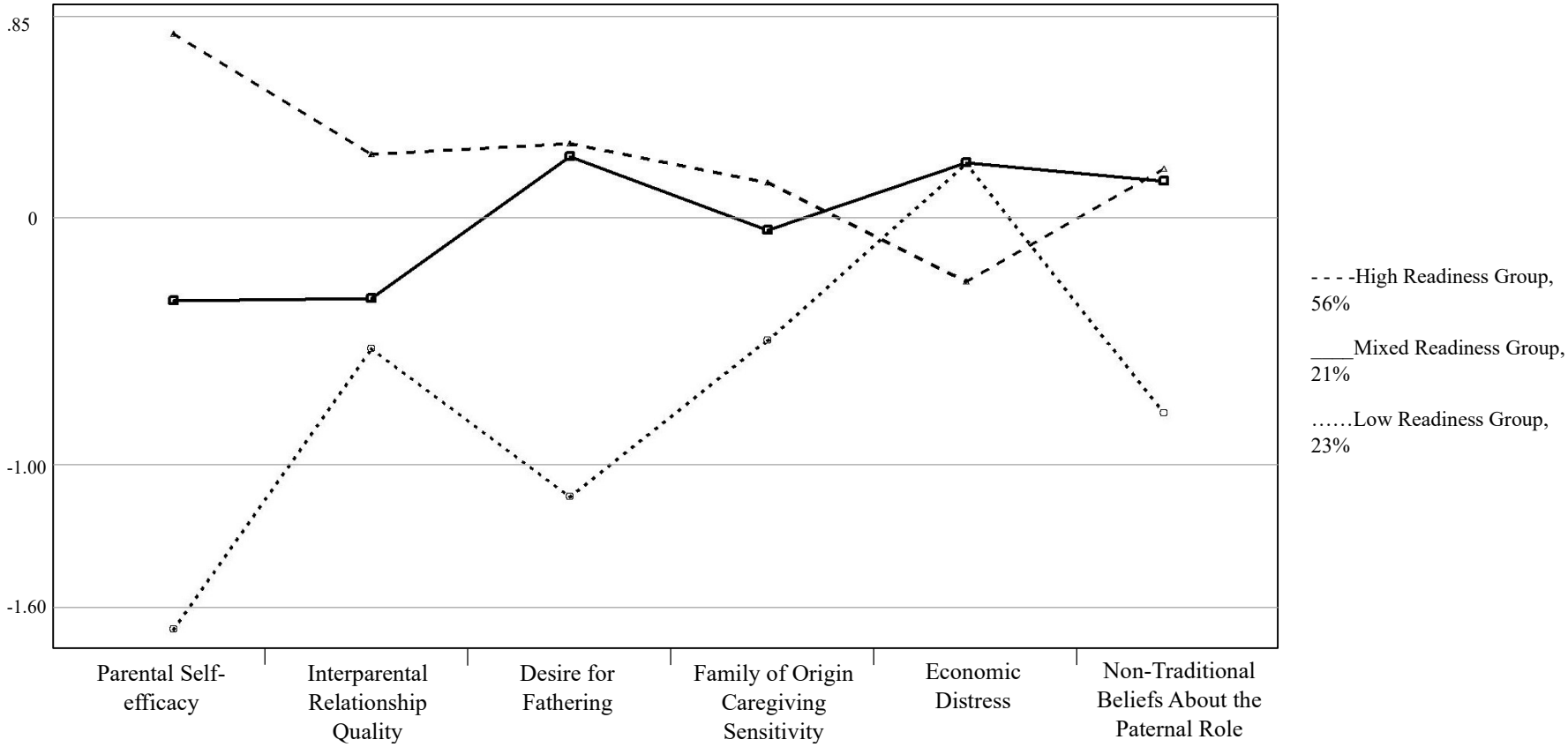
†p<.08, *p< .05, **p< .001.

Table 2. Goodness of Fit for Models Based on Different Numbers of Readiness Profiles

Number of profile solutions, % of group sizes	AIC	BIC	SSA-BIC	Entropy	BLRT *p*-Value
2 Profiles: C1=29%; C2=71%	1982.9	2036.6	1976.6	.964	--
3 Profiles: **C1=24%; C2=56%; C3=21%**	1907.7	1981.3	1899.0	.972	.00
4 Profiles: C1=22%; C2=55%; C3=14%; C4=09%	1846.4	1939.7	1835.4	.999	.00
5 Profiles: C1=01%; C2=22%; C3=08%; C4= 14%; C5=55%	1826.1	1939.2	1812.8	.999	.00

Note. C(2-5) = Profiles; *AIC* = Akaike's information criteria; *BIC* = Bayesian information criteria; *SSA-BIC* = Sample-size adjusted Bayesian information criteria. BLRT p-Value = Bootstrapped Likelihood Ration Test

Figure 3. Prenatal Readiness for Fatherhood Profiles



CHAPTER 3

3. PATERNAL CAREGIVING AND EXECUTIVE FUNCTION: THE MEDIATING ROLE OF CORTISOL REACTIVITY

Aytuglu, A., Koss, K., Ravindran, N., & Brown, G.L. To be submitted to *Developmental Psychobiology.*

Abstract

This study examined longitudinal associations among paternal caregiving behaviors (i.e., sensitivity and stimulation), cortisol reactivity, and executive functioning (attention shifting, inhibitory control, and working memory) among 202 Black father-child dyads living in rural parts of the southern United States. Paternal sensitivity and stimulation were coded from father-infant play interactions at 6 months. Children's cortisol reactivity was assessed three times when the children were 6-, 15-, and 24-months, and executive functioning was assessed at 35 months using multiple tasks administered in a flipbook format. Results indicated that higher levels of paternal stimulation, but not paternal sensitivity, predicted more cortisol reactivity in children at 24 months. In turn, elevated cortisol reactivity at 24 months was linked to greater inhibitory control approximately one year later. Despite the non-significant link between paternal stimulation and inhibitory control, the indirect effect from paternal stimulation to inhibitory control was significant via cortisol reactivity at 24 months. The significant indirect effect held even after controlling for maternal caregiving (sensitivity and stimulation), child negative reactivity, and fathers' education level. Results support the impact of early paternal caregiving on EF through children's stress biology among Black families living in rural poverty. Implications for research with rural, low SES Black fathers are discussed.

Key words: Black fathers, rural poverty, paternal sensitivity, executive functioning skills, cortisol reactivity.

Introduction

Extant research on early childhood suggests that executive functioning— including cognitive flexibility, inhibitory control, and working memory—in the first several years of life has important consequences for multiple aspects of development in socio-emotional and academic domains (Brock, 2009; Devine & Hughes, 2014). The contextual stress associated with rural poverty places children growing up in this environment at risk for maladaptive development in self-regulation and executive functioning (Lawson et al., 2017; Vernon-Feagans et al., 2016). For Black children, the effects of discrimination, racial trauma, and race-related stress can exacerbate challenges to healthy executive functioning (e.g., Keating et al., 2022). Therefore, understanding the determinants of executive functioning in this population is essential for promoting adaptive development.

Positive parenting (i.e., sensitivity and cognitive stimulation) is one protective factor that has been linked to the development of executive function skills in young children (Bernier et al., 2012; Blair et al., 2011; Rodrigues et al., 2021) through physiological self-regulatory capacities (Carlson, 2009). Past research has focused almost exclusively on the impact of maternal caregiving in predicting executive function skills in young children, whereas paternal caregiving has not been thoroughly studied as a potential contributor. Thus, the current study aims to extend previous literature on the development of child executive function skills by investigating the longitudinal impact of paternal sensitivity and stimulation in early childhood (6 months) on executive function skills in preschoolers (36 months) among Black families living in rural poverty.

A growing body of research also suggests that sensitive and stimulating caregiving affects a wide array of children's physiological self-regulatory capacities, including the limbic

hypothalamus-pituitary-adrenal (HPA) axis (Blair & Raver, 2012). This aspect of physiological regulation is in turn associated with numerous long-term outcomes in children, including emotion regulation and executive functioning (e.g., Blair et al., 2014; Porges, 1996; Towe-Goodman et al., 2014). Similarly, most studies linking caregiving to physiological indices of self-regulation have exclusively considered maternal caregiving behaviors (e.g., Moore & Calkins, 2004) whereas the impact of fathers' caregiving on children's neuroregulatory systems has been studied far less frequently. Given that fathers make important contributions to early socio-emotional and cognitive development (Brown & Aytuglu, 2020; Rodrigues et al., 2021; Tamis-LeMonda et al., 2004), and considering the critical role that Black fathers in resource-poor rural communities can play (e.g., Tamis-LeMonda & McFadden, 2010; Towe-Goodman et al., 2014), understanding a) the impact of paternal sensitivity and stimulation on the development of executive functioning and b) biological mechanisms that may mediate those associations is critical to elucidating the role of fathers in early development. The current study aims to extend previous literature by investigating the mediating role of child cortisol reactivity in the link between paternal caregiving (i.e., sensitivity and stimulation) and child executive function among low-income Black father-child dyads residing in rural regions in the southern US.

The Context of Rural Poverty for Black Families

For children living in rural environments, the impact of economic distress is amplified. Indeed, rural children face heightened health disparities relative to their urban counterparts (The National Survey of Children's Health, 2020). Among Black children in rural environments these stressors are exacerbated, with rural Black children showing particularly stark racial disparities in health and development (e.g., Grace et al., 2006). The negative impact of economic hardship on fathers' caregiving quality may also be further amplified by other contextual stressors. Many

of these stressors are due to a history of anti-Black racism, and may include experiences with structural racism, racial discrimination, and race-related stress, which are disproportionately likely to affect young Black men in the rural South (Brody, 2016; Coley, 2003; Threlfall et al., 2013). These race-related factors have the potential to disrupt men's regulatory systems and their abilities to maintain positive engagement and meet the needs of young children (Black et al., 1999).

Despite these challenges, many low SES Black fathers are highly involved in their children's lives and their positive engagement with their children (regardless of residential status) can buffer negative impacts of poverty on various domains of child development, including cognitive outcomes (Black et al., 1999; Downer & Mendez, 2005). Still, few investigations have considered individual variability among Black fathers in low-resource rural communities, and the extent to which this variability promotes executive functioning in early childhood as well as biological processes of stress physiology that may underlie executive functioning. The present study is designed to meet this need by examining mechanisms by which Black fathers' caregiving behaviors influence children's executive function development.

Parenting and Executive Functions in the Early Years

Executive functions (EFs) refer to higher-order cognitive processes that are used to control and coordinate cognitive abilities and behaviors. EFs are essential for numerous learning, memory, attention, and self-regulatory processes, including attention-shifting, inhibitory control, and working memory. Significant growth of EFs in early childhood (2–4 years of age) enables children to perform problem-solving skills and master everyday tasks (Mills-Koonce et al., 2015). Moreover, optimal development of EFs in early development is critical for processing and retaining new information, paying attention to relevant details, developing a theory of mind and

empathy, success in social and academic settings, cooperative interactions with others, and positive peer relationships (Blair & Razza, 2007; Carlson et al., 2003; Devine & Hughes, 2014). EFs also enable children to navigate socio-emotional challenges and assist them in developing resilience against stressors, such as negative parenting, poverty, and home environments providing low levels of stimulation (Masten & Tellegen, 2012). Given early EFs' meaningful benefits for subsequent growth, understanding their determinants in early childhood is critical to understanding the full extent of early caregiving contributions to cognitive and socio-emotional development.

Parenting plays a crucial role in the development of EF in young children, as neural plasticity in early development depends heavily on caregiving experiences. High-quality caregiving experiences and stimulating proximal environments while growing up have meaningful effects in shaping the neural systems associated with the cognitive aspects of self-regulation (i.e., executive functions) (e.g., Blair et al., 2011). Numerous parenting domains are thought to play a role in the development of EF across the first several years, including scaffolding, stimulation, behavioral control, and sensitivity (Fay-Stammbach et al., 2014). Among these, parental sensitivity, or derivatives thereof (e.g., warmth, responsiveness, positive affect), is considered a particularly critical caregiving dimension in the first two years. Sensitivity refers to a caregiver's ability to respond to children's cues in a warm, prompt, and appropriate manner (Ainsworth, 1979). Sensitive maternal parenting in infancy has been linked to a host of beneficial socio-emotional and cognitive outcomes in young children (e.g., Deans, 2020; Page et al., 2010). For instance, maternal sensitivity at 4.5 years predicted steeper growth trajectories of EF skills from grades 1 through 5 (Ku & Feng, 2021). Sensitive and responsive

parenting is also related to executive functions such as self-control and working memory among preschool-aged children (Vrantsidis et al., 2022).

Stimulation refers to parents engaging with children in cognitively stimulating ways—using objects, making sounds, or physical activities—to foster child development. Similar to parental sensitivity, stimulating parent-child interactions have also been associated with more optimal child outcomes, including secure parent-child attachment relationships, cognitive flexibility, and academic abilities (Blair et al., 2011; Fagan & Lee, 2012). An emerging body of empirical literature shows that high levels of both maternal sensitive responsiveness and cognitive stimulation are predictive of greater performance on measures of EFs in children of all ages (e.g., Bernier, 2010; Blair et al., 2014). Indeed, meta-analytic evidence indicates a significant association between maternal positive parenting (consisting of both sensitivity and stimulation of cognitive development) and performance on executive function tasks, with particularly strong effects observed in early childhood (Valcan et al., 2018).

Paternal Caregiving and Executive Functioning

However, existing research has exclusively been based on *maternal* caregiving and the quality of the mother–child relationship despite evidence that fathers contribute significantly to children's cognitive development (Ryan et al., 2006). Although mothers tend to be slightly more sensitive than fathers across many studies (Deneault et al., 2022), most fathers do engage in sensitive caregiving interactions with their young children. Fathers are also more likely than mothers to exhibit stimulating caregiving behaviors that include challenging children's physical abilities and capacities through play, pushing children to take risks, and using more complicated language (e.g., Grossmann et al., 2002; Paquette & Bigras, 2014; Rowe et al., 2013). In turn, stimulating father-child interactions positively contribute to longer attention focus, higher quality

peer interactions, and better academic performance (Cook et al., 2011; Robinson et al., 2021). Further, whereas paternal sensitivity and cognitive stimulation has been linked to some developmental outcomes for children, the role of these paternal caregiving behaviors in the development of EF has been considered only infrequently (Rodrigues et al., 2021; Yoon et al., 2021). The failure to include fathers in research on parenting and EF runs the risk of missing a potentially important caregiving influence on EF development. To fully capture the effect of parenting on EF it is necessary to consider caregiving systems that include both mothers and fathers, and the unique contributions of each.

Although few studies have sought to examine the link between fathering and child EF skills a limited number of studies have found that the quality of father–child interactions (e.g., cognitively stimulating interactions with rule-setting and sensitive responsiveness) are predictive of child self-regulation capacities and some aspects of executive functioning (Bernier et al., 2012; Meuwissen & Carlson, 2015; Roby et al., 2021; Shannon et al., 2002; StGeorge & Freeman, 2017). For example, high levels of positive parenting (sensitivity, responsiveness, and warmth) and stimulating parenting (autonomy support, scaffolding, and cognitive stimulation) were associated with high levels of executive function skills during early childhood (Rodrigues et al., 2021). Relatedly, fathers' controlling caregiving behaviors negatively predicted EF development among 3-year-old children, whereas fathers' autonomy support was marginally associated with better EF skills (Mauwissen & Carlson, 2015). In another study, fathers' simultaneous frightening and sensitive behaviors in infancy were predictors of children's better emotion regulation at 24 months and fewer attention problems at age 7 compared to fathers who were frightening and insensitive (Hazen et al., 2010). Further, in a study of ethnically and racially diverse families living in rural low-wealth areas, Towe-Goodman and colleagues (2014)

found that children of fathers who are more sensitive and responsive to their needs at 24 months tend to perform better on measures of EF skills one year later. Taken together, these studies underscore the potential impact of early father-child interactions on EF development.

Stress Response Physiology as a Mediating Mechanism

Children's physiological self-regulation capacity (i.e., stress response) may be one mechanism mediating the link between sensitive caregiving and EF. A growing understanding of the biological underpinnings of self-regulation suggests that high-quality caregiving and a favorable family environment in early childhood may have a positive impact on both the function and structure of brain regions responsible for stress response and EF skills (see Hackman et al. 2018, for review). Specifically, early caregiving is linked to the development of self-regulation in children, which encompasses neural circuitries (including the frontal cortex, striatum, and limbic system) associated with the physiological stress response systems (i.e., HPA-axis). This enacts the capacity to manage emotional arousal and cognitive control, and subsequently, to perform goal-directed behaviors (Belsky & de Haan, 2011). Such biopsychosocial interplay in early development highlights a) the direct influence of early caregiving experiences on young children's self-regulatory capacity at the biological level as well as EF skills, b) the effect of children's self-regulatory capacity on the development of EF, and c) self-regulatory capacity as a potential mechanism in linking early caregiving experience to child behaviors (see Calkins, 2011, for review). As such, the development of self-regulatory capacity (i.e., stress response physiology) in the first two years of life may play a mediating role in linking paternal sensitivity to EF development in young children.

The development of stress response physiology, which is open to early caregiving experience, has been a well-established determinant of EF in young children, as it alters neural

activity in brain regions that control cognitive flexibility and attention regulation (Champagne et al., 2008). Stress physiology includes the HPA-axis, which secretes stress hormones in a cascaded order (corticotropin → adrenocorticotropic → cortisol), to aid in organizing attentional, behavioral, and emotional responses to stimuli (Gunnar & Donzella, 2002; Lupien et al., 2007). The optimal function of stress physiology (e.g., HPS-axis) in early development is to maintain homeostasis, demonstrating moderate levels of resting cortisol response during low-to-mild levels of stress as an important indicator of effective self-regulation responses during emotion and stress arousals in young children (Blair et al., 2012). In turn, the development of effective self-regulation capacities in early childhood fosters key elements of EF.

Substantial evidence also suggests that children who grow up in a supportive and stimulating family environment (which often includes parental sensitivity and cognitive stimulation) are more likely to develop well-regulated HPA-axis functioning linked to elevated activity in the prefrontal cortex, which plays an important role in EFs (Blair et al., 2012; Fay-Stammbach et al., 2014; Mills-Koonce et al., 2011). In contrast, those who grow up in adverse family environments are more likely to display hypo- or hyperactivity of the HPA axis which is linked to decreased levels of neural activity in the PFC or elevated levels of activity in subcortical areas. This insufficiently regulated HPA-axis functioning may lead to cognitive inflexibility, impulsiveness, or early-onset risk for psychopathology (Martin et al., 2017; Wagner et al., 2019).

In a longitudinal study of ethnically diverse families living in poverty, Blair and colleagues (2011) documented an association between positive parenting (measured by a composite score of maternal sensitivity, positive regard, animation, and stimulation) and EF skills at 36 months. Positive parenting was also inversely related to resting levels of cortisol in

the child over the first two years of development, which, in turn, predicted more EF skills at 36 months. Within the same sample, father negativity contributed to higher cortisol reactivity after an emotional-eliciting task at 7 months (Mills-Koonce et al., 2011). In addition, they also found a greater return to baseline level after the task when fathers' parenting was less negative at 7 months, while the same association was not significant at 24 months. In another longitudinal study involving slightly older children, Martin and colleagues (2018) showed that greater emotional insecurity (i.e., high levels of family conflict) in children (kindergarten to second grade) was linked to greater cortisol reactivity in response to interparental conflict in second grade, which then predicted less effective EF skills in adolescence. These findings collectively address the impact of caregiving experience and family environment on both cortisol reactivity and subsequent EF skills. However, most of the findings to date have been exclusively focused on the maternal contribution to child cortisol response and EF development, whereas associations between fathering, child cortisol response, and the development of EF are still largely unknown.

Current Study

The proposed study builds on existing research linking caregiving, children's stress physiology, and emotion regulation in mother–child dyads by examining pathways from fathers' early caregiving behaviors to a critical form of physiological regulation (cortisol reactivity) and executive functioning in early childhood. Specifically, we utilized data from the Family Life Project (FLP), to examine latent growth models that a) test the link between fathers' caregiving sensitivity and stimulation (6 months) and children's EF development (35 months), and b) whether these associations are mediated by children's initial levels and growth trajectories of cortisol reactivity in response to mild stress (6 to 24 months) among Black father-child dyads.

Consistent with previous findings addressing similar associations in mother–child dyads, we hypothesized that higher levels of paternal sensitivity and stimulation would predict better executive function skills in early childhood. Given that cognitive child outcomes are linked to child stress physiology among mother–child dyads and—more tentatively—to paternal caregiving, we predicted that children's cortisol reactivity would serve as a mediating mechanism in linking paternal sensitivity to their executive function development.

Method

Participants

The sample was drawn from the Family Life Project (FLP, $N = 1293$ families) where families were recruited from local hospitals in three rural counties of eastern North Carolina and three rural counties of Pennsylvania. FLP adopted a developmental epidemiological design to recruit a representative sample of rural families, which involved oversampling low-income families in both states and African American or Black families in North Carolina. Participants in the current study were a subsample of Black father-child dyads recruited immediately following the child's birth to measure critical developmental domains—the father's sensitivity and stimulation during dyadic interaction, the child's executive function, and behavioral regulation of children—in the home setting. The subsample selection depended on the primary/secondary respondents' relationship to the target child (i.e., biological, adoptive, foster parent), the gender of the primary/secondary respondent (i.e., male), and self-identified as Black. Among 1293 families, 202 Black father-child days participated in father-child interaction at 6 months. Across the time points, the majority of respondents (98.8% – 99.6%) were biological fathers living in the same household with the child (48.8% – 49.4% female). Just over half of the fathers had a high school diploma or less (58.4%). Mean level father income was $2326 per month and median was

$2020 (*SD* = $1257). At 15 months, a hundred and forty fathers (19.4%) were aged between 15-25 years, four hundred and twenty-three (58.5%) were aged between 26-35 years, a hundred and forty (19.4%) were aged between 36-45 years, eighteen (2.5%) aged were between 46-55 years, and two (.3%) aged were between 56-65 years.

Procedure

Multiple home visits were conducted over three years when the children were approximately 6, 15, 24, and 35 months old. Fathers completed questionnaires about demographics, income, and child temperament during the home visits. They also participated in a free-play interaction with their child at 6 months which was video recorded for 10 minutes. For the free-play interaction tasks, fathers were given a set of age-appropriate toys and instructed to play with their children as they would typically do when they had free time. Children completed a series of executive function tests in a standard order during a fourth home visit when they were approximately 36 months of age. At each visit, children's saliva samples were collected three times during the data collection to assess their cortisol response to challenging and emotion-eliciting tasks (i.e., arm-restraint task, the barrier task, and the mask task). Multiple factors that could influence salivary cortisol were taken into consideration, including the time of day of saliva collection, children's temperature, time since eating, time since sleeping, time since sleeping, and use of medication. The time of the saliva collection varied due to the families' availability on a sampling day and the length of the interview procedure in each visit (2–4 hours). During these emotion-eliciting tasks, children's emotion reactivity was also observed and coded for negative reactivity.

Measures

Paternal Caregiving

Father-child interactions were coded during 10 min free-play and puzzle completion interactions. Fathers' behaviors were scored by trained coders using a series of 5-point scales for free play interactions (1 = 'not at all characteristic,' 5 = 'highly characteristic'), which were designed for the FLP study to assess dimensions of fathers' overall positive parenting. Scales included sensitive responsiveness (observing, and warmly and promptly responding to child cues), detachment (being uninvolved and unaware of the child's needs), intrusiveness (acting insensitively and in adult-centered ways during parent-child interaction), positive and negative regard (amount of positive affect or hostility displayed during the interaction), stimulation (engaging in cognitively stimulating ways to foster child development), and animation (how animated they were). For the current study, we utilized paternal sensitivity and stimulation scores. Approximately 30% of these scales were coded by two coders for interrater reliability which was determined by intraclass correlation (ICC) and repeated in case of disagreement to reconcile differences in the final codes. The inter-rater reliability for paternal sensitivity and stimulation composite was .65 and .74, respectively.

Children's Executive Functioning

A series of EF tasks, created and adapted for the FLP Study, were administered in flipbook format to assess three dimensions of executive function: attention shifting, and inhibitory control, working memory. Before starting each EF task, children had to pass training trials where research assistants assessed children's understanding of the task.

Attention Shifting: The *Something's the Same Task* was used to assess attention shifting (or cognitive flexibility), where children were first presented with a page on which two line-drawn figures share a similar aspect (e.g., color, shape, or size). The examiner talked about the shared attribute to draw the child's attention to it (e.g., "Look! They are both *blue* drawings, a

large blue circle, and a small blue square!"). Then, the examiner flipped the page on which three figures were presented—the same two figures from the previous page and a new one. The new figure had a shared attribute with one of the two figures from the previous page (e.g., a medium-sized green circle). Children were then asked to name the shared attribute between the new figure and one of the previous two. This task requires children to shift their attention to a new attribute (i.e., from color to shape). The percentage of correct responses across 15 trials was recorded.

Inhibitory control: *The Spatial Conflict* task to assess children's inhibitory control from a prepotent response. In this task, children were given a response card with line drawings of a car on the left and a boat on the right. Then, the children were asked to touch the car on the response card when the examiner showed a car or touch the boat when the examiner showed a boat. In the first eight trials, the examiner showed cards on which each figure was depicted in the center of the picture. In the following 14 trials (i.e., trials 9–22), cars were always on the left and boats on the right on the experimenter's cards, the same as on the child's response card. In the last 13 trials (i.e., trials 23–25), cars or boats usually (but not always) were depicted on the opposite side as the response card. These last trials require inhibitory control from the prepotent response. The percentage of correct responses on the last trials was used.

Working Memory: A span-like *Operation Span Task* was utilized in which children were presented with two pieces of information simultaneously and were required to store and memorize one piece of information without the interference of another. Children were first presented with a line-animal drawing with a colored dot positioned above it, both located within an outline of a house. After confirming that the children knew the required information in the pre-test (i.e., names of the animals and colors), the examiner flipped a page on which only the outline of the house from the previous page was presented. The examiner then asked the

children, “Which animal was/lived in the house?” thereby asking the children to recall only one piece of information (the animal) without the interference of the other piece of information (the color). Examiners repeated the task for one 1-house trial, two 2-house trials, and two 3-house trials. The percentage of correct responses across the three trials was analyzed.

Stress Response Physiology

Cortisol. Child saliva samples were collected at baseline before administering the emotion-eliciting task, at 20 min peak emotional arousal, and 40 min after peak emotional arousal following the task. For the current study, the cortisol reactivity scores, calculated by subtracting baseline cortisol from 20 min peak level, were used to assess children’s response to emotion-eliciting tasks at 6, 15, and 25 months. All samples were collected using either cotton or hydrocellulose absorbent material and expressing the sample into 2 ml cryogenic storage vials. These were assayed for salivary cortisol using a highly sensitive enzyme immunoassay US FDA 510k cleared for use as an in vitro diagnostic measure of adrenal function (Salimetrics, State College, PA). The test used 25 µl of saliva for singlet determinations. It had a sensitivity range from 0.007 to 1.8 µg/dl and average intra- and inter-assay coefficients of variation of less than 10% and 15%, respectively. All samples were assayed in duplicate; the criterion for repeat testing was variation between duplicates of more than 20%. The average of the duplicates was used in all analyses. The cortisol distributions were subject to log transformation to correct for positive skew.

Covariates

Given that previous work has documented the impact of fathers’ education levels on children’s cognitive development among low-SES families, fathers’ years of education (predicting children’s inhibitory control at 35 months) was included as a covariate in the final model.

Moreover, considering the impact of maternal sensitivity and stimulation on the development of children's EF skills as well as the concordance between paternal and maternal caregiving behaviors (Deschenes et al., 2014; Perry et al., 2004), we included maternal sensitivity and stimulation as covariates in the final statistical model predicting cortisol reactivity and child EF. Maternal sensitivity and stimulation at 6 months were also measured in home visits using identical procedures. Lastly, previous work documented the impact of children's negative reactivity on their patterns of biological response to stress. Therefore, children's weighted sum score of negative reactivity at 24 months was added as a control variable in the model (predicting both cortisol reactivity and EFs) in which children's response to mild stress (arm restrain, barrier, mask tasks) was coded second-by-second (0=no negative, 3=high negative).

Analysis Plan

Analyses focused on families for whom caregiving data on fathers who self-identified as Black is available. We first examined the descriptive statistics and bivariate correlations among continuous study variables. Next we tested measurement models to examine the fit of observed indicators for latent variables of unconditional growth models, attending to variability in intercepts and growth trajectories of child cortisol reactivity. Subsequently, to test the indirect effects of the growth factors (intercept and slope) of children's cortisol reactivity in the associations between paternal parenting (sensitivity and stimulation) and executive function sub-dimensions, we performed structural equation models using Mplus version 8.3 (Muthén & Muthén, 1998–2019). Model fit was considered a good fit if the chi-square ($\chi 2$) test is not significant, the Comparative Fit Index (CFI) value is .95 or higher, and the Root Mean Square Error of Approximation (RMSEA) values is .08 or lower (Hu & Bentler, 1999). To test the indirect effect, we utilized the bias-corrected bootstrapping technique as it provides a distinct

advantage with small-to-moderate sample sizes and does not require a significant association between predictor and distal outcome (MacKinnon et al., 2004). Indirect effects are considered significant if 95% confidence intervals do not contain zero.

Results

Means, standard deviations, and bivariate correlations for all continuous study variables are presented in Table 3. In terms of SES covariates, father education was positively related to children's inhibitory control and marginally related to paternal stimulation and child cortisol reactivity at six and fifteen months. In terms of bivariate associations among primary observed variables, paternal sensitivity and stimulation at six months were both moderately correlated with children's cortisol reactivity at 24 months and with inhibitory control at 35 months. All the executive functioning sub-dimensions were significantly correlated with one another, whereas, surprisingly, the cortisol reactivity variables were not significantly related to one another across study waves. Among mother and child covariates, children's negative reactivity was not significantly correlated with study variables, whereas maternal stimulation was positively related to paternal stimulation and children's working memory.

Latent Growth and Measurement Models

Unconditional growth curve models were first examined to test sample mean level change in children's cortisol reactivity across three different time points, and variability in the intercept and slope of cortisol reactivity. The fit indices showed good model fit ($\chi 2$ (1) = .819, p =.37, CFI = 1, RMSEA = 0). However, the specified unconditional growth model of cortisol reactivity failed to show significant variability in either the intercept (β= .031, p= .84) or slope (β= .002, p= .99) of cortisol reactivity across time. Due to lack of sufficient variability in starting points or growth trajectories of cortisol reactivity, we next conducted confirmatory factor

analyses to estimate a measurement model that included the three cortisol reactivity timepoints as observed indicators of an overall cortisol reactivity latent variable. Results indicated that factor loadings were generally low, and the data fit the model poorly. Indeed, bivariate correlations supported these findings, with the magnitude of correlations for cortisol reactivity across timepoints not exceeding .07 (see Table 3). Collectively, these results supported a modeling approach that considered single-timepoint observed cortisol reactivity scores as mediating variables. Therefore, path analyses were conducted using single-time cortisol reactivity scores as a potential mediator linking paternal caregiving behaviors (i.e., sensitivity and stimulation) to each executive function sub-dimension separately. Cortisol reactivity at 24 months was tested as a mediating variable for subsequent analyses, given that it was measured temporally between parenting (6 months) and inhibitory control (35 months) and that it was significantly related to paternal sensitivity and stimulation in bivariate correlations.

Structural Model

A mediational path model was tested that examined associations between both paternal parenting independent variables at 6 months (sensitivity and stimulation) and inhibitory control at 35 months, via cortisol reactivity at 24 months. The pattern of non-significant bivariate correlations did not support testing mediational models for the other two executive function outcomes. Nonetheless, for full transparency results of mediational models predicting working memory and attention focus, as well as 6 month or 15 month cortisol reactivity timepoints (in place of the 24 month cortisol reactivity assessment), are also presented in full. Complete results are presented in Tables 4 and 5.

In the primary mediation model, maternal caregiving (i.e., both sensitivity and stimulation), child observed negative emotional reactivity, and paternal education level were all

included as covariates on both the mediator and outcome variables. Direct effects of paternal stimulation (path-c') and cortisol reactivity (path-b) on inhibitory control were specified, as well as a relationship between paternal stimulation and cortisol reactivity (path-a). Indirect effects were examined using bias-corrected bootstrapped confidence intervals, which is generally the preferred method due to the power benefits relative to other tests of mediation. This method also does not require a significant link between the independent and dependent variable (i.e., path-c') to interpret indirect effects (e.g., Fritz & MacKinnon, 2007). Overall results for this structural model are presented numerically in Table 6 and graphically in Figure 5, with significant paths bolded.

The mediational model fit the data well ($\chi^2(5) = 1.920$; CFI = 1; RMSEA = 0). Although the direct link between paternal stimulation and children's inhibitory control was not significant (β= -.061, p=.57), fathers' stimulating behaviors were a significant predictor of cortisol reactivity (β= .227, p= .002), such that a greater degree of paternal stimulation at six months was linked to higher levels of cortisol reactivity among children approximately eighteen months later. Cortisol reactivity also significantly predicted higher levels of child inhibitory control approximately one year later (β=.151, p=.008). Further, the indirect effect from paternal stimulation to inhibitory control via cortisol reactivity was significant (95% CI [.006, .074]), thus supporting the mediational hypothesis. Notably, stimulation was related to higher cortisol reactivity and cortisol reactivity to greater inhibitory control over and above the contributions of children's observed negative reactivity, paternal sensitivity, and maternal parenting (both sensitivity and stimulation). Among other covariates, paternal education level was related to higher levels of inhibitory control (β=.461, p<.001), while maternal stimulation was negatively (β= -.235, p =.001) and maternal sensitivity was positively (β= .181, p =.03) related to cortisol reactivity.

Discussion

Findings demonstrated some support for a mediational pathway from paternal caregiving in infancy to inhibitory control in early childhood. Specifically, when Black fathers exhibited more stimulating caregiving behaviors during father-child interactions at 6 months then children showed elevated cortisol reactivity under emotion-eliciting conditions at 24 months. In turn, cortisol reactivity was associated with higher levels of inhibitory control skills at 35 months. Results held even after controlling for the contributions of paternal sensitivity, as well as various child (i.e., negative reactivity), contextual (i.e., paternal education), and maternal caregiving factors (i.e., sensitivity and stimulation).

Fathering Behaviors and Cortisol Reactivity

Results showed that Black fathers' stimulating behaviors during father-infant interactions at 6 months were associated with elevated child cortisol reactivity—the increase in cortisol level from baseline to peak arousal—under mild emotion-eliciting conditions. Likewise, the association between paternal sensitivity and child cortisol reactivity also showed a positive trend, although this association was no longer significant with the inclusion of paternal stimulation in the final model. Although the lack of association with sensitivity in the final model is broadly consistent with findings from the overall FLP sample (Mills-Koonce et al., 2011), associations between paternal sensitivity and cortisol reactivity at 24 months (but not 6 or 15 months) were somewhat stronger in this analysis of the Black sub-sample.

Nonetheless, paternal sensitivity was in general a less robust predictor of cortisol reactivity than was paternal stimulation. It is plausible that when fathers stimulate their children's arousal through their caregiving interactions, these children may be more prone to showing stronger physiological responses in the context of mild to moderate stress. A limited amount of

prior research has linked parental tactile (e.g., Mammen et al., 2016) and language (e.g., Borelli et al., 2017) stimulation to early childhood patterns of emotional reactivity (e.g., Mammen et al., 2016). Study findings extend this work to document associations between parental stimulation and HPA axis activity in young children. The notion that stimulating paternal behaviors— often characterized by engaged and animated proximal interactions with infants—may somehow prime children to be physiologically responsive to stressful or threatening circumstances is an intriguing possibility to be tested in future research.

Although most prior studies have considered parental stimulation of cognitive development as a sub-component of a broader sensitivity or positive parenting composite variable (Blair et al., 2014; Cox et al., 1999; Towe-Goodman et al., 2014), study findings speak to the utility of considering stimulation as a distinct dimension of parenting behavior. Likewise, these results add to an emerging literature on the unique importance of *fathers'* stimulating behavior. For instance, prior theoretical work has suggested that fathers engage in more physically stimulating behaviors with their children compared to mothers, and that fathers' uniquely stimulating caregiving styles may facilitate emotion regulation capacities by encouraging their children to take risks (Paquette, 2004). As such, fathers' unique ways of interacting with their young children (i.e., high stimulation) could be a particularly salient predictor of physiological self-regulation, where children learn how to approach stress-inducing situations (Dumont & Paquette, 2013). Indeed, some emerging empirical data have shown links between paternal stimulation and both early cognitive development (Jeong et al., 2016) and attachment security (Olsavsky et al., 2020). Although the present study does little to clarify the magnitude and direction of effects between early parenting and cortisol reactivity, it is one of very few to examine fathers' parenting and is to our knowledge the first to consider the unique

role of parental stimulation (see Rattaz et al., 2022 for a review). Future research should continue to consider the possibly unique role of paternal stimulation in children's development more generally and biological reactivity in particular (e.g., St. George et al., 2018).

Cortisol Reactivity and Inhibitory Control

There was partial support for study hypotheses linking cortisol reactivity and children's effortful control, such that higher levels of cortisol reactivity under mild stress predicted inhibitory control in children one year later. Similar associations between cortisol reactivity and both attention shifting and working memory were not significant. More specifically, this finding suggests that children who had an increase in cortisol from the pre-test to the peak of a stress test at 24 months exhibited better inhibitory control one year later. Although heightened cortisol reactivity has been linked in some cases to higher levels of negative emotional reactivity (e.g., Bader et al., 2021; Wu & Feng, 2020), some prior studies do suggest that cortisol reactivity is positively related to self-regulatory behaviors in infancy and early childhood (e.g., Muller et al., 2015).

Moreover, results are broadly consistent with those from Blair and colleagues (2005), who documented the positive impact of change in cortisol (an increase from baseline to peak, followed by a slow decline after peak) on preschool children's cognitive flexibility and overall self-regulation among preschool children from low-income families with predominantly Caucasian backgrounds. Some other studies focused on baseline levels of cortisol have shown associations between high basal cortisol and poor executive function skills among young children (Quas, Bauer, Boyce, 2004; Wagner et al., 2016). However, the ability to mount a cortisol response in the context of a stressful event may well reflect an adaptation that allows young children to inhibit impulses and down-regulate emotions when appropriate. Importantly,

this appeared to be unique to inhibitory control and not attention shifting or working memory skills, suggesting the possibility of underlying processes tied to emotion. Future research should continue to examine the mechanisms that might underlie a somewhat paradoxical link between more reactive cortisol responses and executive function capacities characterized by emotion regulation and response inhibition.

Mediational Role of Cortisol Reactivity

Although previous research has documented a) some associations between early caregiving and young children's physiological responses to stress and EF skills, and b) some associations between physiological responses to stress and EF, indirect pathways from early parenting to EF via child physiology have rarely been tested (e.g., Wagner et al., 2016). Moreover, existing research almost exclusively examined the impact of *maternal* parenting on later child physiology and EF development, with very few exceptions (i.e., Kolak & Dean, 2022; Towe-Goodman et al., 2014). Thus, one innovative contribution of the current study was considering simultaneous associations among these constructs using a mediational approach among an underserved sample of father-child dyads (i.e., Black families) living in rural poverty.

The inclusion of cortisol reactivity as a mediating mechanism did reveal an indirect pathway via child cortisol reactivity. This highlights the critical role of child physiological reactivity as a mechanism by which fathers' stimulating caregiving behaviors carried forward may contribute to inhibitory control skills in children. In line with previous findings using the same data, the *direct* link between any form of paternal caregiving behaviors in infancy and EF at 35 months was not significant among Black father-child dyads (Wills-Koonce et al., 2011; Towe-Goodman et al 2014). Findings highlight the need to continue considering mediating mechanisms at all levels (e.g., biological, psychosocial, relational) that may help to further

elucidate paternal contributions to early development. Moreover, the current study highlights another way in which Black fathers' diverse range of caregiving practices (sensitivity, stimulation, positive regard, responsiveness) may contribute to the healthy development of cognitive, emotional, and neurobiological systems in early childhood.

Limitations and Future Directions

Despite numerous strengths, a number of study limitations could be improved upon in future research. First, the current study specifically focuses on a subsample of underrepresented Black father-child dyads in rural areas. As such, results are likely not generalizable to all families living in rural poverty and certainly not representative of the broader population. The extent to which study findings generalize across race, SES, and/or geographic location remains to be seen. Second, the primary study findings are reliant upon a single assessment of cortisol reactivity. That cortisol reactivity assessments were unrelated to one another across timepoints calls into question whether results including 24-month cortisol reactivity are replicable and to what extent they might hold across other developmental timepoints. Future research may benefit from more repeated assessments to better elucidate the role of within- and between-person variation in cortisol reactivity. Finally, directionality of effects and proposed mechanisms linking study variables are largely speculative. Indeed, associations between cortisol reactivity and both parenting and EF are likely bi-directional. Efforts to disentangle directions more fully among key variables would improve causal validity. Despite these limitations, findings of the current study provide valuable insight that can inform developmentally-focused and family-centered programming and policies targeting the contributions of Black fathers in infancy.

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Figure 4. Conceptual Diagram of Study 2

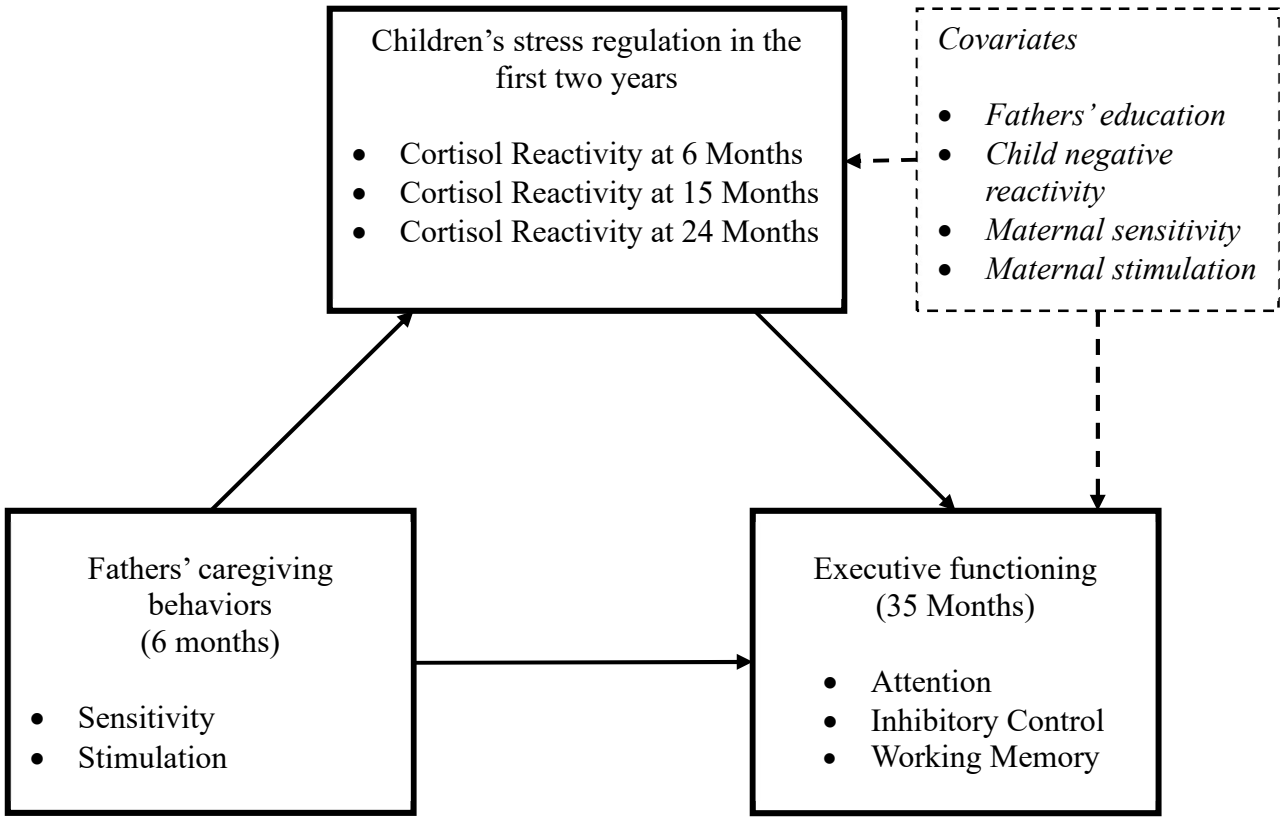


Table 3. *Zero Order Correlations among Continuous Study Variables*

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
IVs: Fathers' Caregiving													
1. Paternal Sensitivity	-												
2. Paternal Stimulation	.41**	-											
Mediations: Cortisol Reactivity													
3. Cortisol Reactivity 6M	.08	.03	-										
4. Cortisol Reactivity 15M	.06	-.06	.06	-									
5. Cortisol Reactivity 24M	.25*	.30**	-.07	.04	-								
DVs: Executive Function													
6. Attention	.12	.13	.03	.11	.02	-							
7. Inhibitory Control	.05	.12	.15†	.16†	.17†	.29**	-						
8. Working Memory	-.14	.04	.01	.02	-.03	.20*	.33***	-					
Covariates (6 Months)													
9. Fathers' Education Levels	.10	.17†	.14†	.16†	.03	.12	.41***	.12	-				
10. Fathers' Income	.14	.03	.07	-.04	-.04	.09	.17	.07	.36***	-			
11. Child Negative Reactivity	.05	.11	.11	.08	.06	.19†	.14	.23*	-.10	.06	-		
12. Maternal Sensitivity	.19*	.30**	.04	-.02	.10	.22**	.16†	.16†	.16*	.06	.09	-	
13. Maternal Stimulation	.09	.21*	.01	-.15†	-.07	.14	.09	.23**	.19**	.14	.05	.49***	-
Mean	2.43	2.02	.007	-.016	.009	.454	.626	.181	13.6	2386	-.608	2.50	2.55
SD	.72	.79	.21	.27	.24	.22	.26	.20	2.30	1289	1.53	.73	.94
Range (min – max)	1-4	1-4	-1.4-1	-2.3-1	-.7-2	0-.9	0-1	0-.9	7-20	348-6740	-2-5.4	1-4	1-5
N	113	113	163	142	157	139	152	130	202	99	144	193	193

Note. †p<.08, *p< .05, **p< .001. *SD* = standard deviations.

Table 4. Parameter Estimates for Paternal Sensitivity, Cortisol Reactivity, and EFs

Variable	Unstandardized Coefficients		Standardized Coefficients		*P*-value
	β	S.E.	*β*	S.E.	
Sensitivity – Cortisol Reactivity – Attention Focus					
Sensitivity → Cortisol 6	.020	.027	.083	.109	.45
Sensitivity → Cortisol 15	.031	.049	.070	.111	.52
Sensitivity → Cortisol 24	.079	.032	.237	.093	.01
Cortisol 6 → Attention Focus	.028	.168	.023	.138	.86
Cortisol 15 → Attention Focus	.074	.073	.110	.108	.31
Cortisol 24 → Attention Focus	.010	.097	.011	.108	.92
Sensitivity – Cortisol Reactivity – Inhibitory Control					
Sensitivity → Cortisol 6	.012	.027	.049	.108	.65
Sensitivity → Cortisol 15	.032	.049	.072	.111	.52
Sensitivity → Cortisol 24	.079	.032	.237	.093	.01
Cortisol 6 → Inhibitory Control	.459	.179	.316	.116	.01
Cortisol 15 → Inhibitory Control	.090	.080	.113	.101	.26
Cortisol 24 → Inhibitory Control	.229	.107	.214	.097	.03
Sensitivity – Cortisol Reactivity – Working Memory					
Sensitivity → Cortisol 6	.021	.029	.086	.116	.46
Sensitivity → Cortisol 15	.031	.049	.069	.111	.53
Sensitivity → Cortisol 24	.079	.032	.236	.093	.01
Cortisol 6 → Working Memory	-.030	.299	-.025	.250	.92
Cortisol 15 → Working Memory	.083	.125	.125	.187	.50
Cortisol 24 → Working Memory	-.050	.095	-.057	.108	.60

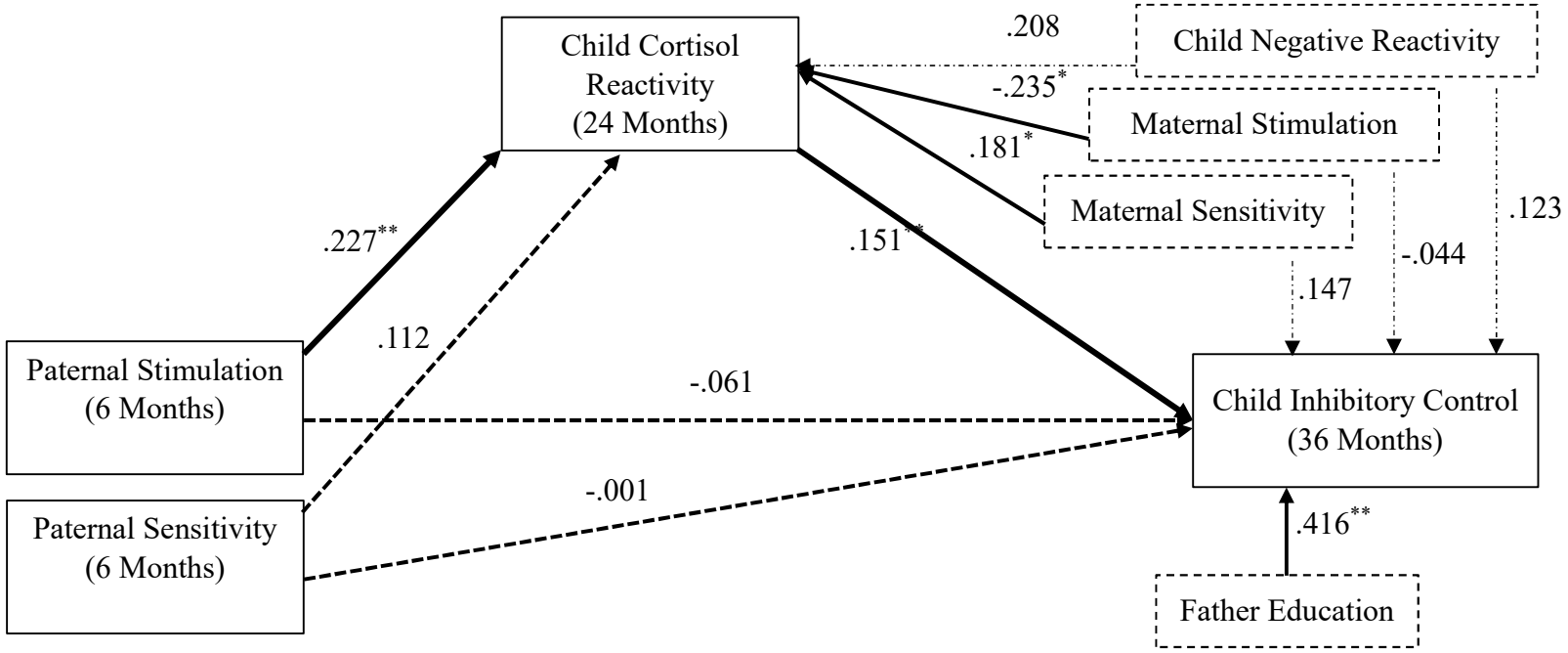
Note. *$p < .05$; ** $p < .01$.

Table 5. Parameter Estimates for Paternal Stimulation, Cortisol Reactivity, and EFs

Variable	Standardized Coefficients		Unstandardized Coefficients		*P*-value
	β	S.E.	*β*	S.E.	
Stimulation – Cortisol Reactivity – Attention Focus					
Stimulation → Cortisol 6	.007	.025	.030	.112	.79
Stimulation → Cortisol 15	-.024	.045	-.060	.112	.59
Stimulation → Cortisol 24	.089	.029	.295	.090	.001
Cortisol 6 → Attention Focus	.025	.169	.020	.139	.88
Cortisol 15 → Attention Focus	.069	.073	.103	.108	.34
Cortisol 24 → Attention Focus	.022	.096	.025	.107	.82
Stimulation – Cortisol Reactivity – Inhibitory Control					
Stimulation → Cortisol 6	.002	.010	.010	.110	.93
Stimulation → Cortisol 15	-.023	-.056	-.056	.112	.62
Stimulation → Cortisol 24	.088	.293	.293	.090	.001
Cortisol 6 → Inhibitory Control	.467	.177	.322	.115	.01
Cortisol 15 → Inhibitory Control	.083	.081	.104	.102	.30
Cortisol 24 → Inhibitory Control	.230	.107	.215	.097	.03
Stimulation – Cortisol Reactivity – Working Memory					
Stimulation → Cortisol 6	.007	.025	.030	.112	.79
Stimulation → Cortisol 15	-.027	.045	-.066	.112	.56
Stimulation → Cortisol 24	.089	.029	.294	.090	.001
Cortisol 6 → Working Memory	.046	.282	.038	.235	.87
Cortisol 15 → Working Memory	.075	.124	.114	.187	.54
Cortisol 24 → Working Memory	-.045	.095	.051	.108	.64

Note. *$p < .05$; ** $p < .01$.

Figure 5. *Path Analysis Mediational Model*



Note. Standardized coefficients are presented; *$p < .05$; ** $p < .01$. Indirect Effect from Paternal Stimulation to Child Inhibitory Control: 95% CI [.006, .074].

Table 6. Parameter Estimates for all Paths in Full Mediational Path Model

	Unstandardized Coefficients		Standardized Coefficients		
	β	*S.E.*	*β*	*S.E.*	*P-Value*
Predicting Cortisol Reactivity					
Primary Study Variables					
Paternal Sensitivity	.038	.026	.112	.076	.14
Paternal Stimulation	.069	.028	.227	.073	<.01**
Covariates					
Maternal Sensitivity	.058	.030	.181	.084	<.05*
Maternal Stimulation	-.059	.018	-.235	.069	<.01**
Negative Reactivity	.037	.028	.208	.126	.10
Predicting Inhibitory Control					
Primary Study Variables					
Paternal Sensitivity	.000	.037	-.001	.105	.99
Paternal Stimulation	-.019	.034	-.062	.106	.57
Cortisol Reactivity	.160	.058	.151	.057	<.01**
Covariates					
Maternal Sensitivity	.050	.039	.147	.108	.17
Maternal Stimulation	-.012	.033	-.044	.119	.71
Negative Reactivity	.023	.021	.123	.108	.25
Father Education	.048	.011	.416	.089	<.01**

Note. *$p < .05$, **$p < .001$.

CHAPTER 4

4. DISCUSSION AND CONCLUSION

Conclusion

This work examined paternal contributions to early cognitive and socioemotional development among an overlooked and understudied population—Black fathers living in the rural southeastern United States. More specifically, it explored (1) the longitudinal impact of prenatal readiness for parenting typologies on paternal engagement and children's socioemotional adjustment, and (2) mediating mechanisms linking paternal caregiving (i.e., sensitivity and stimulation) to EF skills through children's cortisol reactivity. These studies documented the wide influence of rural, Black fathers' parenting cognitions and behaviors on their children's socioemotional and cognitive development in the first three years of life.

Black men living in the rural southern United States face various contextual stressors, including disproportionate rates of poverty, racial discrimination, and residing in communities with few educational and employment opportunities. Nonetheless, emerging data suggests that many of these men are highly motivated to be involved in their children's lives and surmount these barriers to maintain positive engagement with infants and young children (Brown et al., 2018). However, the specific contextual circumstances that promote positive fathering among this group, as well as the unique impact of fathers' parenting on early child development in this cultural context have been generally neglected in the developmental and family science literature and are still not yet well-understood (Cabrera et a., 2007; Brody, 2016). This dissertation

contributes to knowledge and theory-building on both the determinants and early child outcomes of parenting among rural, Black fathers.

Findings from this dissertation highlight potential risk and protective factors for Black fathers in rural environments and the developmental contributions of Black fathers that begin even before the birth of their child (Study 1). Further, they document the unique effects of Black fathers' caregiving (particularly stimulating parenting behaviors) on children's physiological and sociocognitive development in the first three years of life (Study 2). Collectively, these results could be used to inform the development of evidence-based, culturally competent programs and policies targeting the resilience and well-being of Black American fathers, paternal engagement and caregiving quality, and early child development in challenging socioecological circumstances such as rural poverty (Tamis-LeMonda & McFadden, 2010). This work highlights the challenges and strengths of rural, Black fathers. In doing so, we hope to draw attention to the important role of these men in their children's early development, and better elucidate the developmental mechanisms underlying father-child relationships as well as paternal contributions to various aspects of early development among Black fathers living in resource-poor, rural communities.

Manuscript 1

Findings from Study 1 revealed heterogeneity in unmarried, expectant Black fathers' readiness for parenting. Specifically, latent profile analyses identified three prenatal readiness typologies—High Readiness, Mixed Readiness, and Low Readiness—based on Black fathers' prenatal parenting self-efficacy, interparental relationship quality, caregiving experiences in the family of origin, desire to be a father, beliefs about the paternal role, and economic distress. Furthermore, results showed direct effects of prenatal profile membership on children's

socioemotional competence at approximately in toddlerhood, and some differences in fathers' caregiving engagement in early infancy as a function of readiness for fatherhood profiles. Specifically, children of High Readiness fathers showed enhanced socioemotional competence in comparison to children whose fathers were in the Mixed or Low Readiness profiles. Moreover, expectant Black fathers in the Low Readiness profile displayed lower levels of paternal engagement than fathers in other profiles. Findings provide additional support for the notion that unmarried Black men who are prenatally ready for their parenting role can positively impact the socioemotional development of their children approximately two years later.

Manuscript 2

The findings from Study 2 highlighted the influence of Black fathers' early caregiving behaviors on their children's cognitive development approximately two and a half years later via children's cortisol reactivity under mild stress. More specifically, Black fathers' stimulating caregiving (i.e., engaging in cognitively stimulating ways to foster child development) in infancy predicted elevated child cortisol reactivity in response to stress-inducing tasks at 24 months, which predicted inhibitory control skills approximately one year later. Despite some similar trends, direct and indirect associations for paternal sensitivity were not significant. Furthermore, the significant mediating effect from paternal stimulation to inhibitory control held after controlling for mothers' stimulating caregiving behaviors, paternal and maternal sensitivity, child negative reactivity, and fathers' education levels. These findings speak to the possibility that Black fathers' stimulating parenting behaviors may serve to elevate their children's emotions and heighten their stress response, potentially aiding in the development of self-regulation and inhibitory control.

Scientific Contributions, Future Direction, and Implications

Study 1 is to our knowledge the first study to investigate the factors contributing to prenatal readiness for fatherhood among unmarried Black fathers living in rural poverty. This study progresses earlier findings on the heterogeneity in Black fathers' parenting, extending this work to the prenatal period and documenting a link between typologies of psychological and contextual factors prior to the birth of a child and later socioemotional competence in early childhood. Findings suggest that rural, Black men's parenting can begin even before pregnancy, with pre-birth preparations for parenthood having implications for the well-being of children in the first 2 years. The concept and components of prenatal readiness for fatherhood should be widely studied, using diverse samples of families and guided by ecological and developmental theories and prior work (Bakermans-Kranenburg et al., 2019; Cabrera et al., 2007; Cardenas et al., 2022; Palkovitz & Hull, 2018).

To our knowledge, Study 2 is one of the first studies to have focused on a physiological stress mechanism in the link between Black fathers' parenting and child EF skills in the first three years of development. Notably, Black fathers' level of stimulating caregiving behaviors was the strongest predictor of inhibitory control after approximately two years, over and beyond paternal sensitivity and maternal caregiving behaviors (sensitivity and stimulation). Although paternal stimulation has been suggested as a particularly robust paternal contribution to child development and father-child relationship quality, the impact of this specific dimension of parenting behavior on children's physiological reactivity or EF skills has remained largely untested. Findings from this study contribute to research and theory-building in the fatherhood literature, by suggesting that fathers' unique ways of interacting with their infants could be particularly salient for adaptive biological regulation in children and high-order cognitive skills (Leekers & Parade, 2015). Future research should consider examining both fathers' and mothers'

unique and independent caregiving effects on biological aspects of children's self-regulatory processes and EF development.

Given the evidence that rural, Black fathers' parenting matters, these men should be considered in parenting prevention and interventions targeting Black families. Such interventions should a) take the heterogeneity in Black fathering into account so that various resources can be offered to these fathers to meet their diverse needs, b) identify targeted protective factors and sources of resilience uniquely tailored to their contextual circumstances, and c) adopt strengths-based perspectives that recognize and capitalize upon the strong motivation and many competencies that rural, Black fathers possess. Finally, based on the findings of both studies, parenting interventions should target the prenatal period and early postnatal period to capitalize on paternal contributions that appear to be present before the birth of a child (Study 1) and shortly after (Study 2), with important implications for subsequent socioemotional and cognitive development in young children.

Summary

The studies reported in this dissertation documented the strengths and developmental mechanisms underlying father-child relationships and paternal contributions to various aspects of early development among Black fathers living in resource-poor, rural communities in the United States. Not only do these findings advance our understanding of fathers' contributions to early development among this under-represented population, but they also broaden the existing scientific literature and point to the importance of considering multiple levels of influence on fathering and early socioemotional development in diverse sociocultural contexts.

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APPENDICES

APPENDIX A

ANTICIPATED PARENTING EFFICACY SCALE

We would like for you to think about some situations that all parents encounter with a baby. Then, please indicate the response that best describes how good you think you will be at each of these things after your baby is born.

Response set: 1=Not good at all; 2 = Not good enough, 3 = Good enough, 4 = Very good

Items:

1. When your baby is upset, fussy or crying, how good do you feel you will be at soothing your baby?
2. How good do you feel you will be at understanding what your baby wants or needs; for example, when your baby needs to be changed or wants to be fed?
3. How good do you feel you will be at feeding your baby?
4. How good do you feel you will be at knowing what your baby will enjoy; for example, what toys and games your baby will like?
5. How good do you feel you will be at getting your baby to sleep?
6. How good do you feel you will be at getting your baby to smile or laugh?
7. In general, how good a parent do you feel you will be?

Scales: Sum of items 1 to 7 for total of parenting self-efficacy score.

APPENDIX B

DESIRE FOR PARENTING SCALE

Being a parent can come with many joys and many challenges. Please think about how you think that things will be after your new baby is born and indicate whether you agree or disagree with the following statements.

Response set: 1=Strongly disagree; 2 = Disagree, 3 = Not sure, 4 = Agree, 5 = Strongly agree

Items:

1. I will take a lot of pleasure in being a parent
2. Nothing will make me happier than spending time with my child
3. Becoming a parent will be one of the best things that ever happened to me

Scales: Sum of items 1 to 3 for total of parenting self-efficacy score.