INFLUENCES OF PARENTING, EMOTION SOCIALIZATION, AND BIOBEHAVIORAL FUNCTIONING IN INFANCY ON THE DEVELOPMENT OF CHILDREN'S CONDUCT PROBLEMS AND CALLOUS-UNEMOTIONAL BEHAVIORS

Nicholas James Wagner

A dissertation submitted to the faculty at the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Psychology and Neuroscience.

Chapel Hill
2016

Approved by:

Martha J. Cox

Roger Mills-Koonce

Daniel Bauer

Lilly Shanahan

Eric Youngstrom

ABSTRACT

Nicholas James Wagner: Influences of parenting, emotion socialization, and biobehavioral functioning in infancy on the development of children's conduct problems and callous-unemotional behaviors
(Under the direction of Martha J. Cox)

Etiological models of externalizing psychopathology emphasize the importance of incorporating multiple levels of influence and accounting for interactions between and within both biological and environmental factors. Informed by these views, this dissertation examines how caregiving experiences in infancy contribute to the development of conduct problems (CP) and callous-unemotional (CU) behaviors, as well as the extent to which children's physiological functioning and behavioral reactivity moderate and/or mediate these associations. Despite many commonalities, youth exhibiting antisocial behavior comprise heterogeneous groups that show great variability in etiology and behavioral manifestation. CP encapsulates both oppositional defiant and conduct disordered behaviors, whereas CU behaviors describe affective, emotional, and interpersonal deficits. Findings suggest that a diversity of parenting experiences, including emotion socialization practices, in the first six months of life play an important role in the development of CP and CU behaviors. Further, both baseline cortisol and cortisol reactivity were found to moderate the associations between multiple indices of maternal caregiving in infancy and later CP and CU behaviors, contributing to literature which identifies heightened psychobiological stress response as a potential susceptibility factor. This dissertation integrates multiple levels of influence including biology and the environment, considers both direct and interactive associations between early risk factors, and provides preliminary evidence that there exists multiple pathways to disordered behavior.

ACKNOWLEDGEMENTS

My successful completion of the doctoral program at UNC would not have been possible without the encouragement, support, and guidance of many people. First, I want to thank my advisor, Martha Cox, and my secondary advisor, Roger Mills-Koonce, for introducing me to the field of Developmental Psychology, and to empirical research. My experiences working with them as an undergraduate student solidified my interest in developmental science and motivated me to return to UNC to earn my Ph.D. I want to express my deepest appreciation for their continued support and guidance throughout my training. In addition to being a brilliant researcher, Martha is a dedicated, thoughtful, and caring advisor, always pushing me improve and excel in all things. Roger fosters an intellectual excitement that has helped to shape my career trajectory and the ways in which I approach new challenges and ideas. My advisors exemplify the qualities of the ideal mentor, scientist and colleague, and I will be forever grateful for everything they have done for me.

Second, I would like to thank Cathi Propper and the other research scientists at the Center for Developmental Science (CDS). The CDS and affiliated researchers have played a fundamental role in my development, and I look forward to my continued work with Cathi and the Center. Third, I want to thank my committee, Drs. Dan Bauer, Eric Youngstrom, and Lilly Shanahan, for their support throughout the dissertation process. Each member of my committee dedicated countless hours to providing clear and valuable feedback, and I am honored to have had the opportunity to work with each of these esteemed scholars. I also would like to offer my sincerest gratitude to my fellow lab mates, peers, colleagues, and friends. I've learned so much from the postdoctoral and graduate students with whom I've had the pleasure of working. In addition to lively and substantive conversations, I am indebted to my peers for creating a fun and encouraging work environment. I am very much looking forward to our continued collaboration in the future.

Most importantly, I want to thank my family. Specifically, I want to thank my parents for their unquestioned and unwavering support. Unconditional love is a powerful thing, and I would not be where I am today had my parents not filled our family with it. I want to thank my brother for his humor and perspective. Finally, last in sequence but first in my heart and mind, I want to thank my wife, Ariel Tichnor-Wagner. To my wife, you are my shining light, and an inspiration to me every single day. You challenge and motivate me to strive for excellence, and to not lose sight of the truly important things in life. I am eternally grateful for being able to share this journey with you, and I can’t wait for us to embrace our future, together.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter One: Introduction: Early Experiential and Biobehavioral Influences on the Development of Conduct Problems and Callous-unemotional Behaviors

Introduction

Persistent conduct problems in childhood are a common precursor to major adult psychiatric disorders (Erskine et al., 2014; Kim-Cohen et al., 2005) and the human and financial costs of youth exhibiting antisocial behavior are great (Romeo, Knapp, & Scott, 2006). These facts have motivated a long history of research focused on describing and understanding the unique etiological pathways associated with these maladaptive outcomes (Frick, Ray, Thornton, & Kahn, 2014a; Frick & Viding, 2009; Hawes, Brennan, & Dadds, 2009), an endeavor that is crucial for informing future research, policy, and intervention strategies (Petersen, Bates, Dodge, Lansford, & Pettit, 2015). Despite many commonalities, youth antisocial behavior is heterogeneous, showing great variability in developmental pathways and behavioral manifestation (Dandreaux & Frick, 2009). Research attempting to explain heterogeneity within externalizing behavior problems has led to a revision of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013) to include a specifier for children who meet criteria for conduct disorder (CD) and also exhibit "limited prosocial emotions", commonly referred to as callous-unemotional (CU) behaviors.

Conduct problems (CP), a broad term encapsulating both oppositional defiant and CD qualities, are characterized by aggressive, deceitful, and norm-violating behaviors (Lorber, 2004), and are often associated with deficits in emotional and behavioral regulation (Frick, Cornell, Barry, Bodin, & Dane, 2003). CU behaviors describe an affective and interpersonal style that reflects qualities of adult psychopathy and are characterized by a lack of guilt and empathy, fearlessness, insensitivity to punishment, and a callous use of others (Dadds, Fraser, Frost, & Hawes, 2005; Frick & White, 2008). Elucidating the etiological processes that underlie and contribute to the formation of CP and CU behaviors is important because it is estimated that up to 30% of youth will demonstrate CU behaviors in community samples (Frick, Ray, Thornton, & Kahn, 2013) and as many as half of youth high on CP will also demonstrate CU behaviors in clinical samples (Kahn, Frick, Youngstrom, Findling, & Youngstrom, 2012). Exhibiting these behaviors early in life is associated with severe and stable patterns of offending as well as a risk of developing adult antisocial personality disorder and psychopathy (Fontaine, McCrory, Boivin, Moffitt, & Viding, 2011; Frick & White, 2008; Lynam, Caspi, Moffitt, Loeber, & Stouthamer-Loeber, 2007).

This dissertation is guided by a developmental psychopathology approach to studying human development (Cicchetti, 2014; Davies & Cicchetti, 2004; Rutter & Sroufe, 2000; Rutter, 2013) which suggests that there are multiple contributors to maladaptive and adaptive outcomes, and that development is characterized by the interplay among these contributors across the lifespan (Cicchetti & Toth, 2009). The developmental psychopathology perspective considers development to be a dynamic and ongoing process where multiple factors, or levels of a factor, are considered in context rather than in isolation (Cicchetti & Dawson, 2002; Rutter & Sroufe, 2000). This perspective is an appropriate framework for the study of CP and CU behaviors because there is evidence that both individual (e.g., biological, cognitive, emotional) and environmental (e.g., familial, societal, peer) risk factors play an important role in the development of CP and CU behaviors (Frick & Viding, 2009; Moffitt, 1993; Shaw, Gilliom, Ingoldsby, & Nagin, 2003). As such, research that advances our understanding of the phenomena of CP and CU behaviors must (1) integrate multiple levels of influence, including biological and the environmental factors; (2) consider both direct and interactive associations between early and ongoing risk factors; (3) and account for the possibility of multiple pathways to disorder (Calkins et al., 2013; Frick, Ray, Thornton, & Kahn, 2013; Sameroff, 2000), a concept known as 'equifinality' (Cicchetti & Rogosch, 1996). Additionally, research that focuses on processes occurring in infancy is important because there is ample reason to believe that CP and CU behaviors have their foundations in this early developmental period (Frick & Morris, 2004; Frick & Viding, 2009; Mills-Koonce et al., 2015; Willoughby, Waschbusch, Moore, & Propper, 2011), although currently there is a paucity of longitudinal research that examine these processes in infancy.

The first goal of this dissertation is to investigate the associations of caregiving and emotion socialization practices in infancy with later conduct problems and callous-unemotional behaviors. We know little about how caregiving experiences in infancy are associated with the development of CP and CU behaviors. As such, study one use a structural equation modeling approach to examine the associations between caregiving and emotion socialization experiences at 6 months and children's later CP and CU behaviors. Study two will investigate the extent to which infants' cortisol functioning and behavioral fear reactivity at 15 months moderate and/or mediate the influences of early caregiving experiences on later CP and CU behaviors. Accomplishing the research goals of this dissertation will contribute to the literature by 1) extending downward the study of the influences of parenting on CP and CU behaviors from childhood to infancy, 2) examining the importance of parents' emotion socialization practices for understanding the development of CP and CU behaviors, and 3) elucidating the influences of infants' cortisol functioning and behavioral fear reactivity on the development of CP and CU behaviors.

Conduct Problems and Callous-Unemotional Behaviors in Young Children

Children who exhibit conduct problems constitute a heterogeneous group and much work has been done to better understand the developmental pathways that lead to this behavioral phenotype (Frick, 2012). A diagnosis of ODD or CD may be given when children demonstrate a persistent and repetitive pattern of behaviors that violate the rights of others or in which major age-appropriate societal norms or rules are violated. Specifically, symptoms of CP, which is commonly used to refer to both oppositional and conduct disordered behavior, include aggressive behaviors directed toward people and animals, destruction of property, deceitful behaviors, and serious violations of the rules; and these behaviors are often accompanied by anger and irritability (American Psychiatric Association, 2013; Stringaris & Goodman, 2009).

Historically, attempts have been made to classify subgroups of patterns of offending based on differing types of aggression (Barker, Tremblay, Nagin, Vitaro, & Lacourse, 2006), the presence of comorbid disorder like ADHD (Lynam, 1996), or age of onset of offending (Moffitt, 1993). Identifying homogenous subgroups of offending within violent and aggressive conduct problems is useful because it supports analytic and theoretical specificity, the formation of accurate etiological models, and, ultimately, the creation of targeted interventions. To this end, researchers have identified a constellation of affective/emotional deficits and callous behaviors that often accompany early-onset CP behaviors and may provide additional insight into the etiological processes which underlie behavioral offending and later psychopathic traits (Viding, Blair, Moffitt, & Plomin, 2005).

Research on psychopathy in adults has been accumulating since the 1970s (see Hare & Neumann, 2008 for review) and, because adults with high levels of psychopathic traits often demonstrate CP early in life (Neumann, Kosson, Forth, & Hare, 2006), there have been efforts to identify the affective (e.g., lack of empathy; lack of guilt; shallow emotions) and interpersonal (e.g., callous use of others for own gain) deficits associated with adult psychopathy in childhood (Dadds et al., 2005; Frick et al., 2013). For example, the 3rd edition of the *Diagnostic and Statistical Manual of mental Disorders* (DSM-III; American Psychiatric Association, 1980) distinguished between "socialized" and "undersocialized" subtypes of conduct disorder. The "undersocialized" subtype, which shares features with contemporary views of CU behaviors, was used to describe youth who began offending early and demonstrated a number of affective and empathic deficits. However, there was considerable confusion surrounding the use of the "undersocialized" classifier because it required the clinician to make further distinctions regarding the type of aggression most commonly used by the child and whether or not the child's offending typically occurred in a group setting. Further, the DSM-III only included one symptom specific to the affective and interpersonal deficits associated with later psychopathy. As such, the "undersocialized" classifier fell out of favor and was replaced by Moffitt's age-of-onset distinction in the DSM-IV, a distinction with much clinical utility (Frick et al., 2013).

Contemporary research on developmental pathways of early antisocial behavior has resulted in the addition of a "limited prosocial emotions" classifier to the criteria for disruptive behavior disorders in the latest version of the DSM (DSM-5; American Psychiatric Association, 2013). Colloquially known as callous-unemotional behaviors, the CU specifier provides a framework for assessing a broad constellation of behaviors that represent a downward extension of the psychopathic phenotype from adolescence and adulthood into childhood. Characteristics assessed by the specifier include a lack of remorse or guilt, fearless temperament, callous-lack of empathy, unconcern about performance or the well-being of others, and shallow or deficient affect. Recent reports of clinical samples suggest that anywhere from 12 to 51% of youth diagnosed with CD will also meet the criteria for CU behaviors (Kahn et al., 2012) which highlights the potential of the specifier to inform etiology, current and future impairment, and intervention development. Although it is clear that CU behaviors have clinical relevance and are associated with severe patterns of offending and adult psychopathy (Frick & White, 2008; Viding & McCrory, 2012), CU behaviors overlap considerably with deficits in normative characteristics such as empathic responding, guilt, and conscience, and likely pose a risk for child development in community-based samples, as is thought to also be the case with CP (Lahey, 2015). This dissertation places the behavioral and emotional construct of CU behaviors in a developmental context and, as such, intentionally refers to them as 'behaviors' rather than 'traits' or 'symptoms'.

Caregiving and Emotion Socialization

Developmental research shows that the socialization of a child occurs in multiple arenas (i.e., within the family system, in out-of-family contexts such as childcare, within peer groups) and the parent-child relationship has rightfully been identified as playing a fundamental role in facilitating healthy child development (Berry et al., 2014; M. J. Cox & Paley, 1997; Curran, Stice, & Chassin, 1997). The importance of the caregiver-infant relationship begins at birth as children's self-regulatory abilities emerge from a history of interactions with their caregivers (Sameroff, 2010; Sroufe, 1996). This early relationship, which functions in the larger context of the family system, directly influences the child's understanding of emotions, internalization of societal norms, and expectations for interpersonal relationships (Cox & Paley, 1997; Wagner et al., 2015; Zvara et al., 2014). Although the importance of this relationship persists throughout development as parents adjust their strategies to fit the child's age and characteristics, the parent-infant relationship plays a vital role in providing a foundation and setting a course for subsequent development (Cassidy, 2008).

There is a large research literature examining associations between early caregiving experiences and the development and persistence of conduct problems (Loeber & Hay, 1997; Shaffer, Lindhiem, Kolko, & Trentacosta, 2013), and a growing literature on early experiences and the development of CU behaviors (see Waller et al., 2013 for review). However, there is a lack of research on the influences of caregiving practices in infancy on CP and CU behaviors; a gap that should be addressed given that many constructs fundamental to our conceptualizations of CP and CU behaviors, such as guilt, empathy, conscience, and attachment quality, are developmentally rooted in infancy (Bowlby, 1977; Kochanska & Kim, 2012; Pasalich, Dadds, Hawes, & Brennan, 2012).

Given the complexities of this early parent-child dynamic, researchers enlist a number of methodologies and strategies for its study. Although the approaches to studying parenting are many, the majority of the work investigating the associations between parenting and CP and CU behaviors, in particular, has relied on self-reports or brief observable measures of parenting, most commonly including monitoring, praise, or discipline (Waller et al., 2013; Waller, Gardner, Shaw, et al., 2014). Research shows us that many qualities of parenting behaviors, such as engagement, sensitivity, and language and affect, play a fundamental role in the development of a child (Eisenberg, Cumberland, & Spinrad, 1998; Hoeve et al., 2009; Kochanska, 1997), and it is a limitation that studies of parenting and CU behaviors do not typically incorporate diverse measurement, although the use of observational measurement is becoming more common. As such, study one will contribute to the literature by investigating the associations between diverse and validated observational measures of caregiving in infancy and later CP and CU behaviors.

Family interactions also provide opportunities for children to experience and learn about emotions (Herba, Landau, Russell, Ecker, & Phillips, 2006; Lunkenheimer, Shields, & Cortina, 2007; McMahon & Meins, 2012), and variability in emotion processing in families is linked with children's emotional traits and behaviors (Eisenberg et al., 1998). Very few studies have investigated the associations between parents' emotion socialization practices and children's later CP and CU behaviors (see Pasalich, Waschbusch, Dadds, & Hawes, 2014; Pasalich, Dadds, Vincent, et al., 2012), which is surprising given the emotional deficits that are associated with these behavioral phenotypes (Frick et al., 2013). Study one of this dissertation will address this gap in the literature by investigating the associations between mothers' emotion language use and mental state talk use in infancy and later CP and CU behaviors.

Caregiving and CP and CU behaviors

Early antisocial behavior is influenced by a history of maladaptive parenting experiences which are often characterized by low warmth, low support, harshness, intrusion, aggression, and, sometimes, violence (Dodge & Pettit, 2003). Given the importance of the parent-child relationship, most etiological models of aggressive and antisocial behavior include or start with this early relationship. Research in the 1950s identified harsh parenting behaviors as being a major risk factor for later offending (Glueck & Glueck, 1950) and this hypothesis quickly gained empirical support (Hirschi, 1969; Parke & Deur, 1972). Early work by Hirschi (1969) contributed to the formation of Control Theory which posits that harsh parental discipline and low supervision contribute to poor parent-child bonding which, in turn, inhibits the identification with parental and societal values. Clear connections can be made between this early work and more recent social control (Laub & Sampson, 2006) and social development (Catalano & Hawkins, 1996) models of antisocial behaviors which posit that positive social bonds between children and members of their family inhibit deviant behavior and promote prosocial norms and values. Although the early work by Hirschi and others had a number of limitations, it provides a foundation for later research on parenting and antisocial behavior by highlighting the importance of the parent-child relationship and the importance of this relationship in socioemotional development.

Gerald Patterson and his colleagues compiled a significant body of research findings that have contributed to our understanding of how coercive family processes influence the development of antisocial behavior. Emphasizing the importance of observing interactions between parents and their children in context, Patterson and colleagues found that children's aggressive and conduct disordered behaviors likely grow from coercive interactions with caregivers whereby conflictual behaviors on the part of the child and the parent are reciprocally and mutually exacerbated (Patterson, Debaryshe, & Ramsey, 1983; Patterson, 2002). This work is important because it highlights the utility of observational measurement and contributes to current models of antisocial behavior which view environmental influences on CP as operating largely through mechanisms embedded in parent-child interactions (Hawes et al., 2014; Pardini, Waller, & Hawes, 2015). Finally, substantial intervention work has supported the link between parenting practices and the development of conduct problems. Capitalizing on this robust relationship, parent management training has been shown to reduce children's externalizing disorders which affirms contemporary views that sensitive, warm, and responsive parenting, as well as the structured use of appropriate disciplining strategies, is adaptive for children (Kazdin, 1987).

Given the demonstrated associations between maladaptive parenting experiences and later conduct problems (Shaw, 2013), the field is currently evaluating the relevance of parenting experiences for the development of CU behaviors. Until recently, a common notion in the literature was that the CP of youth high on CU behaviors developed independent of the influences of parenting. A handful of studies have found that ineffective parenting (Wootton, Prick, Shelton, & Silverthorn, 1997), negative parental discipline (Viding, Fontaine, Oliver, & Plomin, 2009), and environmental adversity (Oxford, Cavell, & Hughes, 2003) are associated with conduct problems, but only for children not demonstrating CU behaviors. For example, a highly cited paper (over 400 citations as of 2015) written by Wootton and colleagues suggests that ineffective parenting is predictive of CP at low levels of CU behaviors but is not related to CP at high levels of CU behaviors. These early findings lead many to conclude that CU behaviors are primarily of a genetic origin and develop mostly independently of environmental influence (Frick & White, 2008; Oxford et al., 2003; Wootton et al., 1997).

It's important to note that the majority of studies that report no association between parenting experiences and CU behaviors typically adopt moderation designs (i.e., parenting X CU behaviors) which inform us of the influences of parenting on CP in the presence of CU behaviors, but do little to inform us of how parenting influences the development of CU behaviors directly. Additionally, many previous cross-sectional studies relied on older samples of aggressive boys which limits the ability to generalize findings to normative or community settings. Finally, there is an overwhelming reliance on self-report measures of parenting among the studies that reported no association, a measurement approach that does well to inform researchers about parents' perceptions of parenting, but does little to provide an objective measure of parenting behaviors (Morsbach & Prinz, 2006).

Contrary to this early work, there are a growing number of findings that support associations between caregiving and the onset and maintenance of both CP and CU behaviors (Bohlin, Eninger, Brocki, & Thorell, 2012; Fearon, Bakermans-Kranenburg, van Ijzendoorn, Lapsley, & Roisman, 2010; Pasalich, Dadds, Vincent, et al., 2012; Vando, Rhule-Louie, McMahon, & Spieker, 2007; Waller et al., 2013). A recent review of the literature by Waller and colleagues (2013) shows that positive and negative aspects of parenting are prospectively associated with later CU behaviors (Waller et al., 2013). Measures of harsh parenting (Pardini et al., 2007; Waller, Gardner, Hyde, et al., 2012) and corporal punishment (Pardini et al., 2007; Viding et al., 2009) predict higher levels of later CU behaviors, even after controlling for earlier CU behaviors (Waller, Gardner, Viding, et al., 2014). Additionally, findings suggest that higher levels of positive reinforcement, sensitivity, and warmth predict lower levels of CU traits (Frick, Cornell, Bodin, et al., 2003; Hawes, Dadds, Frost, & Hasking, 2011; Wagner et al., 2015). In a mixed-sex community cohort, Hawes and colleagues (2011) found that higher warm and sensitive parenting predicted decreases in CU behaviors one year later in both boys and girls (Hawes et al., 2011). This is not surprising given the role of sensitive parenting in the development of guilt, empathy and, more generally, the development of conscience (Kochanska, 1997; Swain, Lorberbaum, Kose, & Strathearn, 2007) which are associated with later CP and CU behaviors (Frick & White, 2008).

Many aspects of parenting experiences from birth to early adulthood influence the development and maintenance of CP and CU behaviors (Hoeve et al., 2009; Waller et al., 2013). However, there is reason to believe that the *early* parent-child relationship is particularly important for understanding the etiology of behavioral disorders and successfully intervening in pathways of risk (Belsky & Fearon, 2002; Bowlby, 1977; Fearon et al., 2010; Pardini et al., 2015). For example, caregiving behaviors in infancy play a key role in supporting the development of effortful control, executive functioning, and behavioral regulation abilities later in life (Garon, Bryson, & Smith, 2008; Posner & Rothbart, 2000). The caregiver's ability to appropriately interpret and sensitively respond to the infant's signals contributes to the emergence of adaptive self-regulatory skills (Calkins, Graziano, Berdan, Keane, & Degnan, 2008; Swingler, Perry, & Calkins, 2015). Further, a child's mental health is closely tied to the extent to which they successfully or unsuccessfully derive emotional and physical security from early relationships with caregivers (Bowlby, 1969; Bretherton & Munholland, 1999; Wagner et al., 2015). Mental representations of the self and others are formed through repeated interactions with caregivers and are particularly important because healthy representations serve as a foundation for successful socialization efforts in later childhood (Kochanska et al., 2010). Taken together with the growing body of research demonstrating links between parenting behaviors and children's CP and CU behaviors in childhood and adolescence (Frick, Ray, Thornton, & Kahn, 2014b; Waller et al., 2013), findings which highlight the importance of the parent-infant relationship provide motivation for additional research investigating the associations between observational measures of caregiving in infancy and the development of CP and CU behaviors.

Emotion Socialization Practices

Although biological factors contribute to children's ability to regulate, identify, understand, and display emotions, there is evidence that parents play a vital role in the socialization of children's emotions (Baker, Fenning, & Crnic, 2011; Eisenberg et al., 1998). Eisenberg and colleagues (1998) identified three primary ways that parents directly socialize their children's emotional development: reactions to children's emotional expressions, parents' emotional expressiveness, and parent-child discussion of emotion (Eisenberg et al., 1998). Of these socialization processes, it is parents' socialization of children's emotions through verbal communication that is considered in this dissertation. The frequency with which parents communicate about emotions is predictive of children's emotional awareness and their ability to understand others' emotions (Denham, Zoller, & Couchoud, 1994; Malatesta & Haviland, 1982), and parents' engagement in emotion-focused verbalizations supports children's processing of emotions and other affective qualities of social interaction (Dunn, Brown, & Beardsall, 1991). Emotion socialization practices contribute to emotional understanding, facilitate early regulation, contribute to conscience development, and influence the formation of attachment relationships (Laible & Thompson, 2000; Laranjo, Bernier, & Meins, 2008; Meins et al., 2012), all of which have implications for the development of CP and CU behaviors (Chronis et al., 2007; Kochanska, Barry, Stellern, & O'Bleness, 2009; Kochanska & Kim, 2012; Meins et al., 2002). In order to gain a more comprehensive understanding of the early caregiving environment and its associations with later psychopathology, this dissertation will examine the influence of parents' emotion socialization practices in infancy on the development of children's CP and CU behaviors.

Children's abilities to understand their emotions, recognize others' emotions, and attribute individual thoughts, feelings, and emotional desires to others are all important components of healthy emotional and behavioral development (Denham et al., 1994; Dunn et al., 1991). Although the ability to make complex inferences about others' internal states fully emerges in toddlerhood (Lagattuta, Wellman, & Flavell, 1997; Lagattuta, 2005), there is much evidence that caregivers' emotion language use in infancy has important developmental implications. Language provides the developing child with an expanding set of tools from which to draw when participating in and reflecting on interactions with others. Daily experiences with language from parents and other adults often include salient emotional messages (Dunn, Bretherton, & Munn, 1987) which support cognitive and socioemotional development. For example, Meins and colleagues (2002) found that mothers' emotion language use with 6 month olds was positively associated cognitive development at age four (Meins et al., 2002) and emotion language use at 15 months is positively associated with emotion understanding in toddlerhood (Taumoepeau & Ruffman, 2006).

In addition to facilitating emotional understanding, early language may play an important role in the development of emotion regulation. Parents' use of emotional discourse is thought to scaffold children's ability to reflect on their own feelings, thoughts, and experiences (Saarni, 1999), and as children grow they develop the ability to use self-verbalization as a strategy for regulating attention and behavior in context (Vygotsky, 1962). Because parents' emotion language use in infancy appears to at least partially influence children's later self-regulation, disruptions in these socialization behaviors may have implications for maladaptive behavioral and emotional outcomes. Along these lines, Petersen and colleagues (2015) found that poorer early language ability predicted later higher inattentive behavior problems and that this relationship was partially mediated by children's poorer self-regulation (Petersen, Bates, & Staples, 2015). Similarly, Roben and colleagues found that more emotion language socialization with toddlers predicted less anger in early childhood and that better child regulatory strategies explained a portion of the variance in this association (Roben, Cole, & Laura, 2012).

Parents' emotion socialization practices may also have important implications for the development of CP and CU behaviors. For example, mothers' mental state talk in infancy has been shown to predict lower scores on concurrent measures of aggression at age 2 years (Garner, Dunsmore, & Southam-Gerrow, 2008) and was negatively associated with externalizing problems at 44 months (Meins, Centifanti, Fernyhough, & Fishburn, 2013). Additionally, a number of emotion-related deficits are associated with CU behaviors including lower levels of fear (Jones et al., 2009; Marsh et al., 2008), decreased responsiveness to negative emotional stimuli including others' distress (De Wied, van Boxtel, Matthys, & Meeus, 2012; Loney, Frick, Clements, Ellis, & Kerlin, 2003), poor recognition of others' emotional expressions (Dadds et al., 2008), and deficits in sharing and understanding others' feelings (i.e., affective and cognitive empathy; Dadds et al., 2009). To date, only three studies have examined direct associations between mothers' emotion socialization practices and children's CU behaviors, and all three provide evidence for such links (Centifanti, Meins, & Fernyhough, 2015; Pasalich et al., 2014; Pasalich, Dadds, Vincent, et al., 2012). It is surprising that parental emotion socialization practices have not garnered more attention in the literature given the interpersonal deficits in emotional functioning associated with CU behaviors and the fundamental role parents play in socializing the ways in which children understand, experience, express, and regulate emotions (Eisenberg et al., 1998).

Despite the large body of work on parents' socialization practices, there remain a number of gaps in the literature. First, there is a paucity of research examining maternal emotion language use during infancy despite the fact that mothers regularly use affective language with infants (Garrett-Peters, Mills-Koonce, Adkins, Vernon-Feagans, & Cox, 2008; Garrett-Peters, Mills-Koonce, Zerwas, Cox, & Vernon-Feagans, 2011; Malatesta & Haviland, 1982). Importantly, two of the three studies that investigated the associations between emotion socialization practices and CP and CU behaviors used clinic-referred children and adolescents. This dissertation is one of the first studies to examine the association between emotion socialization practices in infancy and later CP and CU behaviors using a community sample.

Additionally, no work has examined multiple qualities of caregiving and emotion language use simultaneously in the same study, an important next step to building a comprehensive understanding of the associations between the early caregiving environment and later CP and CU behaviors.

Biobehavioral Functioning and the Environment

Parent-child interactions are embedded within a complex network of biological, interpersonal, and contextual influences and a developmental psychopathology approach suggests that individual biological susceptibilities may potentiate or attenuate environmental risk (Hawes et al., 2014). Generally speaking, extant literature shows that biological and social factors additively and interactively contribute to antisocial and violent behavior (Raine, 2002), and many researchers have called for a multi-operational and multi-system measurement of biological, environmental, and interactional processes in investigating the development of disordered behavior (Bauer, Quas, & Boyce, 2002; D'Onofrio & Lahey, 2010; Nigg, 2006). Although there is important existing research investigating the biological and environmental correlates of CP and CU behaviors, there is little research on how infant biobehavioral functioning and caregiving environments in infancy interactively and probabilistically contribute to children's later CP and CU behavior. Research with older children and adolescents suggests that CU behaviors are associated with temperamental fearlessness, deficits in response to cues of punishment and biobehavioral profiles characterized by reduced baseline cortisol and heart rate functioning and blunted physiological responses to stressors (Frick & Morris, 2004; Frick et al., 2013; Frick & Viding, 2009). However, work with infants suggests that youth high on CP and CU behaviors exhibit biobehavioral profiles characterized by elevated cortisol and heart rate activity and behavioral reactivity in early life which suggests that there may be multiple pathways to childhood CP and CU behaviors (Mills-Koonce et al., 2015; Wagner et al., 2015; Willoughby et al., 2011). Study two of this dissertation will examine the extent to which children's biobehavioral functioning moderates and/or mediates the associations between early caregiving experiences and later CP and CU behaviors.

There are a number of prominent theoretical frameworks that support the study of how biological processes potentially moderate the influences of early experience on later psychopathological outcomes. For example, the diathesis-stress (DS) model posits that individuals who possess a "vulnerability" factor are disproportionately or exclusively at risk for maladaptive outcomes in presence of negative environmental input or stressor. Potential diatheses identified in the literature include temperamental, physiological, or genetic characteristics. Also referred to as dual-risk models by Sameroff (1983) and others, these models suggest that vulnerable individuals will fare no worse or better than individuals who do not possess the diathesis in neutral or positive environments, but that they are at greater risk for negative outcomes in the presence of environmental risk. An analytically isomorphic and theoretically similar compensatory model could also be hypothesized in which individuals possess a biological or temperamental risk disposition and are buffered from negative outcomes by positive and protective environmental influences (i.e. vantage sensitivity; see (Pluess & Belsky, 2012).

The biological sensitivity to context model (BSC; Boyce & Ellis, 2005) also suggests that individuals vary in their developmental susceptibility to the environment but, unlike the DS model, posits that the presence of plasticity factors may influence outcomes for better or for worse. Drawing from evolutionary theory, the BSC model suggests that, because what is adaptive varies as a function of the changing environmental context, it is advantageous for individuals to vary in their developmental plasticity to the environment. As such, an optimal survival strategy is one of developmental plasticity or susceptibility. Typically characterized as psychobiological or behavioral hyper-activity or reactivity (Obradović & Boyce, 2009), individuals demonstrating a susceptibility factor may garner increased benefit from supportive and enriching environments or be buffered from negative, harsh, or dangerous environments due to increased vigilance, for example. However, the BSC model also suggests that susceptible individuals are more dependent on the quality of the environment than non-susceptible individuals and, as such, may be at risk for worse outcomes, particularly in the context of chronically unsupportive or harsh environments (Doom & Gunnar, 2013; Ellis & Boyce, 2011; Gunnar & Quevedo, 2007; McEwen & Wingfield, 2003).

These theoretical models have proven useful in supporting research endeavors focused on understanding how psychobiological functioning and early experience interactively contribute to the development of behavior problems. For example, there is work which suggests that irritable and moody infants demonstrate more emotional and behavioral dysfunction in the face of coercive parenting experiences than individuals not exhibiting this temperamental profile (Morrell & Murray, 2003), and highly reactive children who experience harsh disciplining strategies in kindergarten are more likely to later demonstrate conduct problems than children who were not highly reactive (Deater-Deckard & Dodge, 1997). Related to CU outcomes, Kochanska and colleagues found that variations in power-assertive parenting predicted a failure to internalize adult values and callous-unemotional behaviors for children who demonstrated temperamental and genetic risk, with suboptimal parenting combining with high biobehavioral risk to produce the poorest outcomes (Kochanska, Boldt, Kim, Yoon, & Philibert, 2014).

In addition to developmental models that posit moderation, there is growing evidence that early family experiences shape children's psychobiological activity and reactivity. Although patterns of hypothalamus-pituitary-adrenal (HPA) axis functioning become consolidated early, the effects of experience on future HPA axis functioning are also well established, stressing the role of plasticity in development (Alink et al., 2008; Calkins et al., 2013; Gunnar & Quevedo, 2007; Meaney, 2010; Miller, Chen, & Zhou, 2007; Ruttle et al., 2011). Experimental work with animals shows that caregiving experiences directly influence the development of the HPA axis (Champagne et al., 2008; Liu et al., 1997; Meaney & Szyf, 2005), and there is longitudinal work with human samples that suggests that the quality of the early caregiving environment likely influences HPA functioning from infancy onward (Blair et al., 2011; Calkins & Fox, 2002; Calkins et al., 2008; Mills-Koonce et al., 2011). Conradt and colleagues found that greater exposure to early adversity influenced trajectories of physiological functioning ultimately contributing to behavioral dysregulation in late childhood (Conradt et al., 2014). With regard to HPA functioning, cortisol activity and reactivity are correlated with caregiving behaviors in early life (Blair et al., 2008; Mills-Koonce et al., 2011), maternal engagement in infancy predicts reduced overall cortisol activity across baseline and challenge tasks in toddlerhood (Blair et al., 2008), and HPA functioning mediates the associations between multiple dimensions of parenting and household risk on later cognitive abilities (Blair et al., 2011).

Taken together, this research suggests that individual differences in psychobiological and behavioral functioning can both mediate and moderate the influences of early experience on later developmental outcomes. Further, these processes need not operate in exclusivity given that multiple starting points and developmental pathways can lead to the same behavioral phenotype (i.e., equifinality; Cicchetti & Rogosch, 1996). Study two of this dissertation will examine the extent to which HPA axis functioning and behavioral fear reactivity moderate and/or mediate the associations between early caregiving experiences and later CP and CU behaviors.

Cortisol Functioning and Behavioral Reactivity

Behavioral genetic research suggests that CU behaviors are at least moderately heritable with estimates ranging from 40% - 60% (Viding et al., 2005), and relatively high stability estimates (ranging from .3 to .8) suggest some level of biological influence (Frick et al., 2013) on their development. The influences of genes on children's development are actualized through numerous biobehavioral mechanisms implicated in behavioral adaptation. Much of the work investigating how experience and biological mechanisms interact to influence later development has focused on specific peripheral systems associated with psychophysiological activity and reactivity, such as the HPA axis, as well as behavioral reactivity (Calkins et al., 2013). Research has shown that HPA axis functioning and behavioral reactivity are regulated by the social environment (Dickerson & Kemeny, 2004; Gunnar & Donzella, 2002), provide insight into cognitive and social competence (Blair, Granger, & Razza, 2005), and can be associated with emotional and behavioral problems when chronically high or low (Gunnar & Vazquez, 2001). Given this, and given the accuracy with which they characterize biological responsiveness to environmental stress, behavioral reactivity and the activity and reactivity of the HPA system in response to stress of challenge are of primary interest to this dissertation.

When confronted with arousing environmental stimuli, the stress system works to mount a physiological response and also supports the maintenance of physiological homeostasis. The first component of the stress network is the sympathetic-adrenomedullary system which is a part of the autonomic nervous system and is responsible for immediately mobilizing resources in response to threatening stimuli. The HPA system, on the other hand, responds a short time after stress-inducing and arousing experiences (approximately 20 minutes to peak levels) and works to maintain balance by reversing acute responses to stress (Alink et al., 2008; Gunnar & Quevedo, 2007; Sapolsky, 2000). When confronted by a stressor, the HPA axis operates through a cascade of hormones starting with the hypothalamus which triggers the release of corticotropin-releasing hormone (CRH). CRH activates the production of adrenocorticotrophic hormone (ACTH) by the pituitary which travels to the adrenal gland causing the release of cortisol, a primary stress hormone (Alink et al., 2008; Alink, Cicchetti, Kim, & Rogosch, 2012; Chrousos & Gold, 1992). Following stressful experiences, excess cortisol binds to glucocorticoid receptors which inhibit the production of CRH, ACTH, and cortisol which, in turn, facilitates the stress system's return to homeostasis. Cortisol is also produced in daily non-stress situations and follows a diurnal rhythm characterized by a peak shortly after waking and subsequent decline throughout the day. Diurnal rhythms of cortisol are established by 3 months of age (Mantagos, Moustogiannis, & Vagenakis, 1998) and continue to develop over infancy as rhythmicity solidifies (Gunnar & Quevedo, 2007).

Emotional responses become increasingly differentiated in early life with infants exhibiting general distress reactions at birth. General distress reactions develop into specific frustration responses around 3 months of age, and fear and frustrating stimuli can be used to yield measures of both behavioral and cortisol reactivity by 6 months (Mills-Koonce et al., 2015; Ursache, Blair, Granger, Stifter, & Voegtline, 2014). Furthermore, measures of cortisol and behavioral reactivity seem to be related in infancy. For example, negative affect averaged across laboratory frustration tasks is positively associated to both pre-task and post-task cortisol levels at 24 months (Fortunato, Dribin, Granger, & Buss, 2008) and Mills-Koonce and colleagues (2014) found concordance between measures of behavioral fear reactivity and cortisol reactivity at 15 months (also see C. Blair et al., 2008). Additionally, behavioral manifestations of fear including crying and gesturing for parental contact were positively associated with cortisol reactivity in a sample of 15-month olds (Van Bakel & Riksen-Walraven, 2004).

Assessments of children's cortisol functioning and behavioral responses during fear and frustration tasks provide accurate assessments of children's biobehavioral functioning (Gunnar, Talge, & Herrera, 2009) and are useful when examining the extent to which individual and contextual influences interactively predict psychopathological outcomes. Additionally, children's cortisol functioning and behavioral reactivity also may be useful in providing insight into the extent to which the associations between early caregiving experiences and later CP and CU behaviors are mediated by children's biobehavioral functioning. Although cortisol release in response to stressful experiences serves an important biological function, prolonged activation of the HPA system can have negative implications for healthy development. This is because, unlike byproducts of the autonomic system which do not significantly impact brain functioning, the primary influences of cortisol occur in the brain. Prolonged activation of glucocorticoid receptors can impair neural plasticity and inhibit glucose utilization. Allostasis is a concept used to describe the processes through which the stability and homeostasis of the stress system are maintained through ongoing adaptation to challenges and activation of response processes (McEwen & Seeman, 1999). Frequent and prolonged activation of the HPA axis, referred to as allostatic load, may disrupt the balance of the system and can result in psychological and physiological pathology (Alink et al., 2008; Miller et al., 2007).

Infants' biobehavioral functioning has been shown to moderate the influences of social experiences in early life and frequent activation of psychobiological and behavioral stress responses in early life can instigate long lasting changes in neurobiological functioning and increase the risk of physical and mental disorder. As such, study two of this dissertation will first examine the extent to which cortisol functioning and behavioral fear reactivity at 15 months mediate the influences of caregiving and emotion socialization behaviors at 6 months on children's CP and CU behaviors in first grade. Next, this study will investigate whether cortisol functioning and behavioral fear reactivity moderate the associations between caregiving and emotion socialization behaviors in infancy and children's CP and CU behaviors in first grade.

Current Studies

The overall goal of this dissertation is to examine the influences of caregiving behaviors and emotion socialization practices in infancy on the development of children's CP and CU behaviors. Further, this dissertation will investigate the extent to which the associations between experiences with early caregivers and later CP and CU behaviors are moderated and/or mediated by infants' behavioral fear reactivity and cortisol activity and reactivity. This dissertation is poised to make a number of unique contributions to the field. First, we stand to gain insight into CP and CU behaviors by studying their development in a representative sample. It is likely that elevated, but subclinical, levels of CU behavior, as well as CP, pose a risk for child development (Lahey, 2015). As such, we will acquire important information about the etiology of CP and CU behaviors by studying their development in a large prospective sample. Second, despite the contributions of dedicated researchers on this topic, there remains a lack of research examining the interplay of biological and environmental predictors of CP and CU behaviors in infancy. Our understanding of the etiology of these behaviors requires that we extend downward the study of psychobiological and environmental correlates of CP and CU behaviors in a developmental psychopathology model relevant to their emergence in early childhood.

Chapter Two: Associations between Early Parenting and Emotion Socialization and Later Conduct Problems and Callous-Unemotional Behaviors

Introduction

Conduct problems (CP), a broad term capturing both oppositional defiant and conduct disordered qualities, are characterized by aggressive, deceitful, and norm-violating behaviors (Lorber, 2004), and are often associated with deficits in emotional and behavioral regulation (Frick, Cornell, Barry, et al., 2003). Characterized by a lack of guilt and empathy, fearlessness, insensitivity to punishment, and a callous use of others, callous-unemotional (CU) behaviors describe an affective and interpersonal style that is associated with later psychopathy (Dadds et al., 2005; Frick & White, 2008). CU behaviors refer to a number of emotional and affective deficits including a lack of guilt, empathy, and fear as well as an over-focus on reward and insensitivity to punishment (Blair, 2008; Dadds et al., 2005; Frick & White, 2008; McMahon, Witkiewitz, & Kotler, 2010), and have been useful in characterizing heterogeneity in offending among children with elevated conduct problems (Lynam, Loeber, & Stouthamer-Loeber, 2008; Rowe, Costello, Angold, Copeland, & Maughan, 2010).

There is a large research literature examining associations between early familial experiences and the development and persistence of externalizing behavior problems (Deater-Deckard & Dodge, 1997; R Loeber & Hay, 1997), and a growing literature on early experiences and the development of CU behaviors (Waller et al., 2015b), including evidence suggesting that multiple aspects of the parent-child relationship are important for the development of these outcomes (Frick et al., 2014a; Pasalich, Dadds, Vincent, et al., 2012; N. J. Wagner, Mills-koonce, et al., 2015; Waller et al., 2013). Although a recent increase in research in early childhood has contributed to our understanding of the influences of parenting on later CP and CU behaviors (e.g., Waller, Gardner, Dishion, et al., 2014; Waller, Gardner, Viding, et al., 2014), very few studies have investigated the associations between caregiving in the first year of life and these outcomes. This is despite the fact that the parent-infant relationship plays a fundamental role in the development of core attentional, executive functioning, and self-regulatory systems in early life (Calkins et al., 2013; Posner, Rothbart, Sheese, & Voelker, 2014; Posner & Rothbart, 2000; Swingler et al., 2015).

Additionally, a diversity of measurement of caregiving behaviors is lacking, with many studies of CP and CU behaviors including measures of sensitivity and harsh-intrusion, emotion language use, or mental state talk, but rarely measurement of more than one of these constructs and never measurement of all four of these constructs. The need for additional research on the topic is substantiated by developmental research highlighting associations between various components of the parent-child relationship and behavioral and emotional hallmarks of CP and CU behaviors, including links between harsh-intrusion and aggressive behaviors (Hinnant, Erath, & El-sheikh, 2015; Smith et al., 2014), sensitivity and empathic responding (Kiang, Moreno, & Robinson, 2004), guilt (Kochanska, Forman, Aksan, & Dunbar, 2005), prosocial behaviors (Newton, Laible, Carlo, Steele, & McGinley, 2014), and emotion socialization and children's emotional understanding (Centifanti et al., 2015; S. A Denham, Bassett, & Wyatt, 2008). Incorporating diverse measurement of parenting behaviors is important because doing so may provide insight into the differential influences of early caregiving as well as elucidate potential variability in pathways to CP and CU behaviors. As such, formulating a comprehensive understanding of the associations between early caregiving experiences and later CP and CU behaviors necessitates the use of multiple parenting constructs which incorporate a diverse set of observational measures including multiple components of sensitivity (i.e., positive regard, sensitivity, engagement) and negativity (i.e., negative regard, intrusion) as well as emotion socialization practices. The current study will address these gaps in the literature by examining the associations between multiple dimensions of caregiving in the six months of life and children's later CP and CU behaviors using a prospective longitudinal design and diverse observational measurement techniques.

Parenting and the Development of CP and CU Behaviors

The past five years have seen an increase in studies that utilize prospective longitudinal designs and observational measurement to assess the direct influences of various caregiving experiences on later CU behaviors (Wagner, Mills-koonce, et al., 2015; Waller et al., 2013; Waller, Gardner, Viding, et al., 2014; Willoughby et al., 2011), which is promising given the methodological concerns that surround self-report techniques (Gardner, 2000) including well-known threats to validity such as social desirability effects or difficulties interpreting items related to parenting constructs (Morsbach & Prinz, 2006) . Recent work has demonstrated links between observational measures of parental sensitivity (Wagner, Mills-koonce, et al., 2015; Waller, Gardner, Viding, et al., 2014), harsh-intrusion (Waller et al., 2012; Willoughby et al., 2011), and emotion socialization practices (Pasalich et al., 2014; Pasalich, Dadds, Vincent, et al., 2012) in middle and late childhood and later CP and CU outcomes. A recent review of the literature by Waller and colleagues (2013) suggests that both positive and negative aspects of parenting are prospectively associated with later CU behaviors. Parental warmth has been shown to be negatively correlated with CP and CU behaviors for boys in middle childhood (Pasalich, Dadds, Hawes, & Brennan, 2011), and more parental negativity has been shown to be associated with increases in CU behaviors over time (Pardini et al., 2007).

Despite the fact that links between parenting and CP are well established (Maccoby, 1992; G R Patterson et al., 1983), and links between parenting and CU behaviors are becoming more established (Waller et al., 2013), there are a number of gaps that should be addressed. First, this body of work is characterized by varying approaches to measuring parenting behaviors. For example, measures of parental warmth have ranged from global scores assessed over a 2-3 hour home visit and mothers' structuring of the environment to parental speech samples and affective responses during short conversations. Second, much of this research has not simultaneously incorporated multiple qualities of parenting in analytic models which makes it difficult to draw conclusions about the specific aspects of the parent-child relationship that are most relevant for the development of CP and CU behaviors (see Waller et al., 2013b for review). The current study will address these gaps by examining the extent to which children's CP and CU behaviors at first grade are predicted by both positive and negative parenting behaviors using a large community sample. Measures of parenting include multiple aspects of observed maternal caregiving (i.e., sensitivity, positive regard, animation, stimulation of development, detachment, intrusion, negative regard) in infancy.

Parenting in Infancy

Constructs like sensitive responding in infancy are being increasingly considered in the etiology of CP and CU behaviors because the literature shows that the emergence of adaptive behavioral and emotional functioning is based on a history of early dyadic interactions which, when characterized by contingent, synchronous, and sensitive responding on the part of the caregiver, support the gradual transition of regulatory functions to the child (Sameroff, 2010;

Sroufe, 1996). These early interactions with caregivers contribute to the emergence and maturation of behavioral and neurocognitive systems that underlie later adjustment or maladjustment (Cicchetti & Dawson, 2002) and have important significance given their influence on the child's subsequent interactions with the environment (Sroufe, Carlson, Levy, & Egeland, 1999). CU behaviors have been reliably measured in samples as young as two years old (Waller et al., 2012), and there is now evidence that externalizing behaviors may develop into a psychologically meaningful construct before age 12 months (Lorber, Del Vecchio, & Slep, 2014; Van Zeijl et al., 2006). Additionally, longitudinal evidence indicates that trajectories of early onset behavior problems may be in place by 17 months (Tremblay et al., 2005), suggesting that researchers must examine parent-child relationships before age two in order to understand their influence on CP and CU behaviors. Although many researchers have called for the associations between CP and CU behaviors and parenting to be assessed as early as possible in order to inform early intervention on the child's early socioemotional development (Boivin et al., 2005; Centifanti et al., 2015), this work has been largely neglected.

In one of only a few studies to investigate parenting during infancy and later CU behaviors, Willoughby and colleagues (2013) found that harsh parenting in infancy but not toddlerhood predicted CU behaviors whereas harsh parenting in infancy and toddlerhood predicted later oppositional defiant behaviors (Willoughby, Mills-Koonce, Propper, & Waschbusch, 2013). Using a multi-ethnic, high-risk sample, Waller and colleagues found that dimensions of harsh parenting, but not positive parenting, at ages two and three contributed to the development of deceitful-callous behavior measured between ages two and four (Waller et al., 2012). Finally, a recent study showed that maternal sensitivity measured at 29 weeks has been shown to predict later CU behaviors at 2.5 years (Bedford, Pickles, Sharp, Wright, & Hill, 2014). Informed by these innovative studies and a long history of work which highlights the importance of the parent-infant relationship (Maccoby, 1992; Patterson et al., 1983), the current study will investigate the associations between multiple dimensions of observed parenting behaviors at 6 months and children's CP and CU behaviors at first grade.

Emotion Socialization Practices

Parents' socialization of children's emotion through language and conversation is also of interest to this study because there is evidence that parents who do not express their feelings clearly, or otherwise demonstrate unemotional, abrasive, or hostile communication, may contribute to children's inability to regulate emotions or understand the perspectives and emotional demonstrations of others (Daversa, 2010; Waller, Gardner, Shaw, et al., 2014), which are important correlates of CP and CU behaviors (Frick & White, 2008). Emotions facilitate the appraisal of environmental circumstances and support one's ability to take action to maintain or regain well-being (Arnold, 1960; Campos, Campos, & Barrett, 1989; Frijda, Ekman, & Scherer, 1986; Lazarus, 1991). Infants' emotions play functional and adaptive roles by motivating action, promoting regulation, and helping to alert caregivers of problems and elicit reparation of those problems (Cole, Hall, & Radzioch, 2009; Tronick et al., 1998).

Research suggests that parents play a vital role in the socialization of children's emotions (Baker et al., 2011; Eisenberg et al., 1998) primarily through reactions to children's emotional expressions, emotional expressiveness, and discussion of emotion (Eisenberg et al., 1998). More generally, there is considerable evidence that emotion socialization practices influence cognitive and regulatory emotional processes which contribute to CP (Garner et al., 2008; Hill, Degnan, Calkins, & Keane, 2006; Olson et al., 2013) and CU behaviors (Ciucci, Baroncelli, Golmaryami, & Frick, 2014; Pasalich et al., 2014; Pasalich, Dadds, Vincent, et al., 2012; Woodworth &

Waschbusch, 2008). Further, while CU behaviors are not associated with deficits in Theory of Mind, or an ability to understand others' mental states (O'Nions et al., 2014), they are associated with problems understanding and processing emotion (Frick & White, 2008; Sharp, Vanwoerden, Baardewijk, Tackett, & Stegge, 2014), suggesting that parents' emotion socialization in infancy might be an important target for research and intervention.

Researchers have identified two distinct types of verbalizations that socialize children's awareness of emotional states and promote children's emotion-related conceptual system. First, there is systematic variation in the extent to which caregivers explicitly discuss emotions, emphasize certain emotions, explain the causes and consequences of emotions, and help children understand emotions. Referred to as *emotion language use*, mothers use emotion-focused language with very young infants and continue to talk about emotions as their children grow (Beeghly, 1986; Dunn et al., 1991; Malatesta & Haviland, 1982). The second type of verbalization, referred to as *mental state talk*, is a construct that refers to caregivers' verbalizations that recognize the internal states of the child, the caregiver themselves, or others and typically results in the use of words such as "think", "want", and "feel" (Taumoepeau & Ruffman, 2006). Mothers' use of language that demonstrates an attunement to their infants' internal states is associated with sensitive caregiving behaviors (Laranjo et al., 2008; Meins et al., 2012) and likely plays an important role in protecting against subsequent behavioral difficulties (Meins et al., 2013).

The extent to which caregivers use emotion language and mental state talk has important implications for the development of the child. For example, parents' use of emotion language positively predicted an aggregate measure of preschoolers' emotion understanding, controlling for age and children's cognitive-language ability (Denham et al., 1994). Emotion language provides an opportunity for parents to scaffold children's emotional experiences through labeling and explanation which facilitates children's awareness and understanding of emotions (Malatesta & Haviland, 1982), but also children's problem solving skills and affective perspective taking (Dunn et al., 1991; Fenning, Baker, & Juvonen, 2011).

It is clear that parents' emotion socialization practices have important implications for proximal outcomes such as children's emotional understanding, awareness, and regulation, but there is also evidence that parents' socialization of emotion through language has implications for distal behavioral outcomes as well, including CP (Garner et al., 2008; Hill et al., 2006; Olson et al., 2013) and CU behaviors (Centifanti et al., 2015; Ciucci et al., 2014; Pasalich et al., 2014; Pasalich, Dadds, Vincent, et al., 2012; Woodworth & Waschbusch, 2008). For example, hard-to-manage children and their mothers engage in fewer emotionally connected conversations than other mother-child dyads (Brophy & Dunn, 2002), and mothers of children with externalizing problems score lower on reports of their conversations about their children's emotional experiences (Katz & Windecker-Nelson, 2004). Mothers' use of emotional themes in language with preschoolers is negatively associated with children's anger perception bias and predicts less physical aggression, and mothers' tendencies to comment on the internal states of their infants at 8 months is negatively correlated with externalizing behaviors at 61 months (Garner et al., 2008).

In addition to examining the extent to which early emotion socialization practices influence later CP, the current study will be the first to simultaneously incorporate measures of emotion socialization with measures of both positive and negative parenting in the prediction of CU behaviors. Youth high on CU behaviors typically demonstrate deficits in conscience, empathy, emotional understanding, and emotion recognition (Frick et al., 2014a), and given the emotional and affective deficits associated with CU behaviors and the clear links between parents' socialization practices and healthy emotional development, understanding the extent to which early emotion language use predicts later CU behaviors has important research and clinical implications.

Only three studies have investigated the associations between emotion socialization and children's CU behaviors, and findings suggest that, although early emotion socialization practices may be important, the effects may be complicated and may differ for children with CP who are either high or low on CU. In a study of clinically referred boys aged 3 to 9 years, Pasalich and colleagues (2012) found that mothers' use of negative emotion language was associated with lower CP for boys who were high on CU behaviors, but not for boys who were low on CU behaviors. The authors interpreted this finding as suggesting that mothers of children high on CU behaviors may use negative emotion language during interactions to draw their children's attention to other people's negative affect, a strategy that has been shown to be effective in overcoming emotion recognition deficits (Dadds et al., 2008; Pasalich, Dadds, Vincent, et al., 2012; van Baardewijk, Stegge, Bushman, & Vermeiren, 2009). In a second study, Pasalich and colleagues (2014) found that mothers of children demonstrating high CU behaviors are more likely to use emotional socialization practices that are dismissing of child emotion (Pasalich et al., 2014). Finally, controlling for sensitive caregiving, Centifanti and colleagues (2015) found that mental state language at 8 months indirectly predicted children's CU behaviors through emotion understanding (Centifanti et al., 2015).

This work provides initial support for the importance of examining links between parents' early emotion socialization behaviors and the development of CP and CU behaviors, but also highlights the need for additional research. For example, no work has been done to examine the influences of emotion language use in infancy, a period critical for the healthy development of children's emotional and sociocognitive skills (Garrett-Peters et al., 2008; Meins et al., 2002; Taumoepeau & Ruffman, 2008). Furthermore, no study has simultaneously examined the relative influences of emotion language use and mental state talk on subsequent CP and CU behaviors, a relevant line of inquiry for CU behaviors in particular given the associations with deficits in emotional understanding but not the ability to understand others' thoughts and intentions (Centifanti et al., 2015; Viding, McCrory, & Seara-Cardoso, 2014).

Although it is clear that both negative and positive aspects of caregiving as well as emotion socialization practices in infancy likely influence the development of children's CP and CU behaviors, no study has simultaneously incorporated multiple measures of caregiving and emotion socialization in the prediction of later behavior problems. An open question in the literature is whether or not emotion language and mental state talk represent distinct indicators of maternal behaviors, if they are best characterized as joint indicators of emotion socialization behaviors, or indicators of maternal sensitivity more broadly. As such, prior to investigating the extent to which these early caregiving constructs predict later CP and CU behaviors, exploratory and confirmatory factor analysis will be used to examine if emotion language and mental state talk are most accurately characterized as distinct measures of maternal behaviors, indicators of a common 'emotion socialization' factor, or indicators of maternal sensitivity. Research shows that sensitive parenting behaviors are moderately positively correlated with mental state language and both negative and positive emotion language use (Garrett-Peters et al., 2008; Laranjo et al., 2008; McMahon & Meins, 2012). These preliminary analyses will provide a foundation for subsequent analyses in the current dissertation but also future work aimed at better understanding the contributions of the early caregiving environment to the development of CP and CU behaviors.

Current Study

The overarching goal of the current study was to better understand caregiving and emotion socialization experiences in infancy and the extent to which these early experiences predict children's CP and CU behaviors. Recent measurement work done with the sample used in the current study suggests that CU behaviors are best captured using a two-factor model which distinguishes between empathic-prosocial (EP) and callous-unemotional (CU) items derived from the same measure (Willoughby, Mills-Koonce, Waschbusch, & Gottfredson, 2014). Guided by this recent work, measures of EP and CU will be used as outcomes in this study. The literature presented in the introduction does not distinguish between EP and CU behaviors, but instead presents research that considers CU behaviors as a single construct because of the paucity of research on these outcomes. As there is no evidence available to suggest differential findings across these outcomes in the literature, study hypotheses for EP and CU behaviors only differ in direction given the valence of the items used to create the CU behavior constructs.

The first study of this dissertation employed factor analytic and structural equation modeling techniques using a large longitudinal sample of mothers and their children to address the following research questions. First, how are early emotion socialization behaviors associated with each other and with broader measures of sensitive caregiving in infancy? Second, to what extent are later CP and CU behaviors predicted by caregiving and emotion socialization behaviors in infancy? I expected early maternal caregiving behaviors to be best characterized by three distinct factors (i.e., sensitivity, harsh-intrusion, and emotion socialization). Although no previous work suggests a specific factor structure, I hypothesized that mothers' positive language use, negative language use, and mental state talk would load onto a common emotion socialization factor distinct from maternal sensitivity which includes detachment (reversed), positive regard, animation, and stimulation, as determined by previous factor analytic work (Blair et al., 2008; Network, 1997; Willoughby et al., 2013). For the structural equation model, I hypothesized that maternal sensitivity at 6 months would negatively predict children's CU behaviors, negatively predict CP, and positively predict EP behaviors in first grade. I hypothesize that maternal harsh-intrusion at 6 months will positively predict children's CU behaviors, positively predict CP, and negatively predict EP behaviors at first grade. Finally, I hypothesized that maternal emotion socialization at 6 months would negatively predict children's CU behaviors, negatively predict CP, and positively predict EP behaviors in first grade.

Methods

Sample

The current study uses data from the Family Life Project (FLP), a longitudinal study designed to study families that live in areas of high rural poverty. Specifically, participants were recruited from areas in Eastern North Carolina (NC) and Central Pennsylvania (PA) using a developmental epidemiological design. Complex sampling procedures were used to recruit a representative sample of 1,292 families at the time the mothers gave birth to a child, with low-income families in both states, and African American families in NC, being over-sampled. African-American families were not over-sampled in PA, as the target communities were 95% Caucasian.

A two-stage randomized sample was drawn. In the first stage, 3 of 7 hospitals were randomly sampled within 3 counties in PA because there were too many hospitals to permit recruitment at all of them. With fewer hospitals, such sampling of hospitals was not necessary in NC. In the second stage, recruitment of four groups of families in NC and two groups in PA was completed. Families were classified according to whether they were low-income or not in both

PA and NC and according to whether the child was African-American or not in NC. Given logistical constraints related to obtaining family income data in the context of hospital screening, family income was dichotomized (low vs. not low) for purposes of guiding recruitment. Families were designated as low income if they reported household income < 200% poverty rate, use of social services requiring a similar income requirement (e.g., food stamps, WIC, Medicaid), or had less than a high school education.

In PA, families were recruited in person from three hospitals. These three hospitals represented a weighted probability sample (hospitals were sampled proportional to size within county) of seven total hospitals that delivered babies in the three target PA counties and provided 89% coverage. PA hospitals were sampled because the number of babies born in all seven target hospitals far exceeded the number needed for purposes of the design. In NC, families were recruited in person and by phone. In-person recruitment occurred in all three of the hospitals that delivered babies in the target counties. Phone recruitment occurred for a small number of families who resided in target counties but delivered in non-target county hospitals in order to insure that all families in the three counties having children during the recruitment year were contacted. These families were located through systematic searches of the birth records located in the county courthouses of nearby counties. At both sites, recruitment occurred seven days per week over the 12-month recruitment period spanning September 15, 2003 through September 14, 2004 using a standardized script and screening protocol.

In total, FLP recruiters identified 5,471 (57% NC, 43% PA) women who gave birth to a child during the recruitment period, 72% of which were eligible for the study. Eligibility criteria included residency in target counties, English as the primary language spoken in the home, and no intent to move from the area in the next three years. Consent was given by the mother for herself and her child. In the event that the mother was a non-emancipated minor, consent was received from the participant's legal guardian.

The current study uses observational parenting data collected during home visits when the target children were 6 months (n =1,141) of age. Measures of parents' emotion socialization practices were collected during home visits at 6 months (n = 1,157) and measures of conduct problems (n = 1,078) and callous-unemotional behaviors (n = 1,080) were collected at the 1st grade home visit. There were 63 participants who were missing data on all variables of interest (i.e., ODD, CU behaviors, parenting, and emotion socialization practices), and these participants were not included in analyses. Participants who were missing data on all variables of interest did not vary systematically from those who were not missing data as a function of state, $X^2(1) = 0.12$, $p = .73$, race, $X^2(1) = 0.52$, $p = .46$, poverty, $X^2(1) = 0.78$, $p = .37$, or sex, $X^2(1) = 0.58$, $p = .44$. The final sample used in the current study consisted of 1,229 families that had at least partial data on the variables of interest at one of the assessment points.

Procedure

Data were collected during home visits completed when the child was approximately 6 months old and when the child was in the 1st grade. Visits consisted of interviews, questionnaires, child assessments, and observations of mother-child interactions. All interviews and questionnaires were computerized. At the 6 month visit, mothers and their children were videotaped while engaging in a free play activity using a standard set of toys. The mother was instructed to play with their child as they normally would for 15 minutes. Emotion socialization data was obtained from a picture-book task completed at the 6 month visit. The mother was asked to sit in a comfortable chair or couch with her child and was given the book *Baby Faces*

(DK Publishing, 1998) to work through with her child. At first grade, primary caregivers were asked to report on children's levels of conduct problems and callous-unemotional behaviors.

Measures

Caregiving Behaviors. Mother-child interactions during the recorded tasks at 6 months were later coded to assess levels of mothers' sensitivity (level of responsiveness and support offered to the child contingent on the child's needs), intrusion (intrusive, insensitive behaviors), detachment (degree to which the mother is disengaged), stimulation of development (degree to which parent fosters the child's development), positive regard (positive feelings and warmth directed toward the child), negative regard (negative regard and hostility), and animation (Cox, Paley, Burchinal, & Payne, 1999; Network, 1997). Trained coders assigned a rating on each of the aforementioned constructs using a scale ranging from 1 *(not at all characteristic)* to 5 *(highly characteristic)*. Each coding team consisted of four to five coders and included one or two master coders. Each coder was trained to be reliable with the master coder(s). Each coder completed approximately 30% of the assigned video tapes with the master coder(s). Reliability was calculated using the intraclass correlation for the independent ratings made for the overlapping coding assignments. Reliability across subscales and composites was high (intraclass correlations >.80 for all subscales).

Emotion Socialization Behaviors. Maternal discourse data were obtained from a picture-book task that was administered at a 6 month home visit. The mother was asked to sit in a comfortable chair or couch with her infant and was given the book Baby Faces (DK Publishing, 1998). This wordless picture book contained a picture of a baby face on each page, with each baby showing a different emotion. The videotaped interactions between the mothers and their 6 month old infants were transcribed using the Systematic Analysis of Language Transcripts

(SALT) software (Miller & Chapman, 1985). Research assistants were trained in coding the transcripts for mothers' emotion language and mental state comments and using a coding manual that was adapted from previously used coding systems developed by Cervantes and Callanan (Cervantes & Callanan, 1998) and Meins and colleagues (Meins et al., 2012; Meins, Fernyhough, Arnott, Turner, & Leekam, 2011). *Positive* and *negative emotion language* use was coded to represent the extent to which the mother uses the book as an opportunity to talk about emotions. Aspects of mothers' emotion language, including labeling and elaboration of emotion words in reference to the book and to the infant's general emotional state were coded. *Mental state talk* refers to the mothers' tendency to frame the interaction in a mentalistic context and infer and comment on her infant's mental state, typically by using words such as think, feel, and want. Emotion language and mental state talk were coded during the same interaction. Consistent with previous research using these variables in this sample, all analysis variables were calculated as a ratio of number of emotion language or mental state utterances to the number of minutes of the interaction. Reliability and validity associated with the use of the current coding procedure has been established in the literature (Garrett-Peters et al., 2008, 2011).

Conduct Problems and Callous-Unemotional Behaviors. Levels of Conduct Problems were rated by maternal primary caregivers using the Disruptive Behavior Disorder Rating Scale (DBDRS) at 1st Grade. The DBDRS (Pelham, Gnagy, Greenslade, & Milich, 1992) is a DSM-IV guided rating scale that includes subscales for assessing oppositional defiance (ODD), hyperactivity-impulsivity, conduct disorder (CD), and inattention. ODD items assess various qualities including defiance, argumentativeness, and anger. CD items focus on more disruptive behaviors such as aggression towards people and animals, destruction of property, theft, and serious violations of rules. Composite scores representing oppositional defiant disorder and conduct disorder, what I broadly refer to as CP, were calculated ($\alpha = 0.92$). The psychometrics of the DBDRS have been evaluated (see Wright, Waschbusch, & Frankland, 2007) and the validity of the DBDRS has been established (Erford, 1997; Friedman-Weieneth, Doctoroff, Harvey, & Goldstein, 2009).

The Inventory of Callous Unemotional (ICU; Frick, 2004) traits was used to assess callous-unemotional behaviors at first grade. The ICU was completed by maternal primary caregivers who responded to 24 items on a 4-point likert scale ranging from 0 (not at all true) to 3 (definitely true). The items that comprise the ICU were developed from other highly established clinical assessments (e.g. APSD, PCL-YV) and include questions about the extent to which the child uses emotions, expresses feelings, cares about getting in trouble, seems cold and uncaring, and hurts others' feelings. The factor structure and predictive utility of the ICU has been confirmed with samples ranging in age from 13 to 20 years of age (see Essau, Sasagawa, & Frick, 2006; Fanti, Frick, & Georgiou, 2009; Roose, Bijttebier, Claes, & Lilienfeld, 2011) and with samples as young as age 3 (see Ezpeleta, de la Osa, Granero, Penelo, & Domènech, 2013). The current study uses the two-factor model which distinguishes between empathic-prosocial (EP; $\alpha = 0.87$) and callous (CU; $\alpha = 0.75$) behaviors outlined by Willoughby and colleagues (Willoughby et al., 2014) in the FLP. Informed by this work, the current study uses continuous measures of CP, EP, and CU behaviors as outcomes.

Additional covariates. Child's sex was collected at the time of recruitment and *child's age* in months was based on age at the first grade visit. *Maternal Education* was assessed using self-report at each home visit. Analyses include whether or not the mother reported completing high school at any time point. An index of *maternal mental health* was assessed at the 6 month visit using the Global Severity Index (GSI) from the Brief Symptom Inventory (BSI; (Derogatis

& Melisaratos, 1983)), a highly sensitive self-report screening index for psychological distress and mental health. The GSI is comprised of ratings on maternal depression, somatization, and anxiety. Parent-report and observational measures of infant *temperament* were also included as covariates in an attempt to control for individual differences in general irritability or distress. Measures of temperament were drawn from the Infant Behavior Questionnaire (IBQ; Rothbart, 1981), a parent report measure of temperament completed by primary caregivers at the 6 month home visit, and the Infant Behavior Record (IBR; Bayley, 1969), an observational measure completed by research assistants and used to evaluate infant behavior across the 6 month home visit. Measures of infants' distress to limitations ($\alpha = .81$) and distress/fear to novelty ($\alpha = .90$) were taken from the IBQ and a measure of observed irritability ($\alpha = .70$) was taken from the IBR.

Analysis plan

The research questions proposed in study one were addressed using factor analytic and structural equation modeling approaches. First, bivariate correlations and an exploratory factor model were used to examine the extent to which positive emotion language, negative emotion language, and mental state talk adequately load onto a single 'emotion socialization' factor in the presence of the sensitive parenting indicators. These preliminary analyses provided information about the feasibility of including positive emotion language, negative emotion language, and mental state language as indicators of 'emotion socialization' in subsequent confirmatory factor models. The EFA was completed using PROC FACTOR in SAS version 9.4. The adequacy of the indicators was determined by the number of factors extracted, by examining the percentage of common variance that was explained by successive factors, and by assessing the interpretability of the factors extracted. An oblique rotation was used (ROTATE=PROMAX) given the hypothesized interrelation between maternal sensitivity and emotion socialization indicators.

Second, in order to explicitly test whether the ‘emotion socialization’ measures should comprise a separate factor from maternal sensitivity, two models were estimated and compared using a chi-square difference test. I first estimated a model with two factors – one representing maternal sensitivity and one representing emotion socialization. The means and variances were constrained to zero and one, respectively, in order to identify the model, but the correlation between the two factors was unconstrained. A second model was estimated identical to the first except that the correlation between the two factors was constrained to equal 1.0. In this case, the two factors are assumed to be perfectly correlated, or a single factor. The X^2 values from the two models were formally compared to assess the difference in fit. A ‘significant’ difference in the X^2 values suggests that the constrained model can be rejected and that the ‘emotion socialization’ measures should comprise their own factor (see (Bollen & Grandjean, 1981) for an example of this approach to testing the independence of two factors).

Third, the indicators for the harsh-intrusion composite were added and two confirmatory factor models were estimated in Mplus 7.1 in order to explicitly compare a 2-factor model, where ‘emotion socialization’ measures load onto the sensitivity factor, and a 3-factor model, where ‘emotion socialization’ variables comprise a distinct factor in the presence of the harsh-intrusion measures. Previous factor analytic work with the observational measures of parenting used in this dissertation has guided the creation of a sensitive parenting composite [comprised of sensitivity, detachment, positive regard, animation, stimulation of development] and a harsh-intrusion composite [comprised of intrusion, negative regard] (C. Blair et al., 2008; Network, 1997). The inclusion of the mental state talk measure either in the set of ‘emotion socialization’ variables or not was informed by the results of the preliminary EFA models. A BIC difference test, where BIC = $T_m - df\ln(N)$, was used to compare these non-nested models. In this context, a BIC greater than zero suggests the saturated model fits the data better than the hypothesized model. A BIC less than zero suggests the hypothesized model has better fit than the saturated model. The difference between these scores allows for a comparison of the two models where a score between 0 and 2 indicates weak evidence for their difference, a score between 2 and 6 suggests positive evidence, a score between 6 and 10 suggests strong evidence, and a score above 10 suggests very strong evidence that the model with the lower BIC is preferred to the other model (see Raftery, 1996 for a detailed description of this approach). In all, fit indices, Akaike Information Criterion (AIC), a formal comparison of Bayesian Information Criterion (BIC), indicator communalities, and examination of factor loadings guided the selection of a 2- or 3- factor model to be carried forward in subsequent analyses.

Finally, the factor structure from the preceding confirmatory factor models was included in a structural equation model that tested the extent to which caregiving and emotion socialization behaviors at six months predict CP and CU behaviors in first grade. Given the complex sampling design of the Family Life Project, analyses utilized individual probability weights associated with oversampling of low-income and African American Families and stratification on income, state, and race. Additional model covariates included child’s gender, child’s age in months at the time of the outcome, maternal education, a measure of maternal mental health symptomology, maternal rated distress to limitations and novelty at 6 months, and research assistant rated irritability at 6 months. The robust maximum likelihood (MLR) estimator was used to accommodate the use of sampling weights and stratification. Missing data was handled using the full information maximum likelihood methods (Enders & Bandalos, 2001).

Overall model fit was determined using root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), and comparative fit index (CFI). Good fit was defined as CFI values ≥ 0.95, RMSEA values ≤ 0.06, and SRMR values ≤ 0.08 (Hu & Bentler, 1999). Please see Appendix A for a discussion of the methodological and analytic decisions and considerations relevant to study one.

Results

Demographics

Each of the sensitive parenting indicators were positively correlated, $r = .48 - .74$, $p < .01$, and negative regard and intrusion were positively correlated, $r = .46$, $p < .01$. Positive emotion and negative emotion language use were positively correlated, $r = .54$, $p < .01$. CP and CU behaviors were positively correlated, $r = .51$, $p < .01$, and EP behaviors were negatively correlated with CP and CU behaviors, $r = -.37$, $p < .01$ and $r = -.22$, $p < .01$, respectively. Distress to limitations, distress to novelty, and observed irritability at 6 months were all positively correlated, $r = .09 - .36$, $p < .01$. Distress to limitations was positively correlated with CP and CU behaviors, $r = .12$, $p < .01$, and negatively correlated with EP behaviors, $r = -.10$, $p < .01$. Distress to novelty was negatively correlated with EP behaviors, $r = -.15$, $p < .001$, and positively correlated with CU behaviors, $r = .07$, $p < .05$.

Skewness values for each of the latent variable indicators were between ±2 and skewness values for each of the outcomes were between ±2.4 supporting the assumption of distributional normality (George, & Mallery, 2003; Gravetter & Wallnau, 2013; Trochim & Donnelly, 2006). Further, descriptive statistics support the use of a proportion score for the positive emotion language, negative emotion language, and mental state talk variables. For example, the interquartile range for the length of the mother-infant interaction was 120 to 203 seconds and was normally distributed. Additionally, the length of the interaction and the number of maternal utterances during the interaction was positively correlated, $r = .75$, $p < .01$.

Caregiving and Emotion Socialization Measurement Models

Exploratory Factor Analysis. Results from the EFA are presented in Table 2.1. An EFA was performed on the sensitive parenting indicators (i.e., positive regard, stimulation of development, sensitivity/responsiveness, animation, and detachment – reversed), positive emotion language use, negative emotion language use, and mental state talk. Two factors with eigenvalues greater than 1.0 were retained: one that contained the sensitive parenting indicators and another that included the emotion language use variables. Mental state talk loaded onto the first factor with the sensitive parenting indicators. The common variance explained by the two factors were 3.77 and 1.42, respectively (total communality = 5.19). Although mental state talk loaded onto the sensitive parenting factor, mental state talk will be treated as a separate manifest variable in subsequent analyses for the following reasons. First, all of the factor loadings for the sensitive parenting indicators and the emotion language variables were greater than .75, compared to mental state talk's .49 loading on the first factor. Second, the factors accounted for at least 60% of the variance in each of the indicators, but only 24% of the variance in mental state talk. Third, not including the mental state talk variable in the sensitive parenting factor will preserve the factor structure of a sensitivity composite that has been used in a number of previous studies. Consistency in measurement will allow for comparisons to be drawn between the current study and extant work that uses the same composite. As such, mental state talk will be included in subsequent models as a manifest variable separate from other parenting and emotion socialization factors.

Confirmatory Factor Models

A confirmatory measurement model for the sensitive and harsh-intrusive parenting composites was estimated prior to determining whether or not the emotion language variables should be included in the sensitive factor or as a separate factor. Modification indices suggested that the sensitivity/responsiveness indicator be allowed to covary with the detachment (reversed), intrusion, and negative regard indicators. The revised sensitivity and harsh-intrusion measurement model demonstrated good fit to the data, $X^2(10) = 50.89$, $p = 0.001$; CFI = 0.98; RMSEA = 0.06; SRMR = 0.02. Standardized loadings ranged from 0.60 to 0.85. Both the sensitivity and harsh-intrusion factors had significant latent variance, $p < .05$, and were significantly correlated, $\Phi = -0.04$, $p < .01$.

Next, in order to explicitly test whether or not the emotion language use variables should comprise a latent factor separate from sensitivity, two models were compared using a chi-square difference test following the procedures outlined by Bollen and colleagues (Bollen & Grandjean, 1981). In both models, the means and variances were constrained to zero and one, respectively, for identification. In the first model the correlation between the two factors was unconstrained and, in the second model, the correlation between the two factors is constrained to equal 1.0. The unconstrained model demonstrated adequate fit to the data given its simplicity, $X^2(12) = 87.79$, $p = 0.001$; CFI = 0.98; RMSEA = 0.07; SRMR = 0.02. The maternal sensitivity and emotion language factors were positively correlated, $\rho_{\xi 1 \xi 2} = 0.29$, $p < .001$. Standardized factor loadings ranged from 0.53 to 0.83. The constrained model ($\rho_{\xi 1 \xi 2} = 1.0$) demonstrated poor fit to the data, $X^2(13) = 451.29$, $p = 0.001$; CFI = 0.88; RMSEA = 0.17; SRMR = 0.09. Consistent with the findings from the EFA, chi-square difference test confirms that the constrained model should be rejected and the two factor solution be used, $X^2(1) = 363.5$, $p < 0.001$.

Then, negative regard and intrusion were included to form a harsh-intrusion factor, and two confirmatory factor models were estimated to examine the extent to which emotion language use should comprise a factor separate from sensitive parenting in the presence of the additional harsh-intrusion parenting factor. The model where positive and negative emotion language use loaded on to the sensitive parenting factor did not fit the data well, $X^2(23) = 384.04$, $p = 0.001$; CFI = 0.90; RMSEA = 0.12; SRMR = 0.07. Additionally, the standardized factor loadings for positive and negative emotion language were 0.28 and 0.23, respectively. In comparison, the model where positive and negative emotion language comprised an 'emotion language' separate from sensitive parenting did fit the data well, $X^2(21) = 87.86$, $p = 0.001$; CFI = 0.98; RMSEA = 0.05; SRMR = 0.03. The standardized factor loadings for positive and negative emotion language use were 0.79 and 0.67, respectively. Further, a BIC difference test, where BIC = $T_m - df\ln(N)$, was used to compare these two models (see (Raftery, 1996)). The BIC for the model where the emotion language variables loaded on the sensitive parenting factor had a BIC of 221.61, suggesting a preference for the saturated model. The model where the emotion language variables loaded onto a separate factor had a BIC of -60.44, suggesting a preference for the hypothesized model. Consistent with the EFA and the chi-square difference test, the difference between these models ($|\Delta BIC| = 282.05$) provides strong evidence that emotion language variables comprise a latent factor separate from sensitive parenting.

A final confirmatory measurement model that included mental state talk as a separate manifest variable was estimated in order to assess model fit and latent correlations before testing the hypothesized structural model. The sensitive parenting factor was significantly correlated with the harsh-intrusion factor, $\Phi = -0.12$ $p < .01$, the emotion language factor, $\Phi = 0.31$, $p < .01$, and mental state talk, $\Phi = 0.36$, $p < .01$. The emotion language factor was significantly correlated with mental state talk, Φ = 0.20, $p < .01$, but not the harsh-intrusion factor, Φ = 0.04, $p = .33$. The harsh-intrusion factor was not significantly correlated with mental state talk, Φ = -0.04, $p = .36$. The final measurement model demonstrated good fit to the data, $X^2(27) = 127.75$, $p = .001$; CFI = 0.97; RMSEA = 0.05; SRMR = 0.03, and standardized factor loadings ranged from 0.60 to 0.85.

Structural Equation Models Predicting later CP and CU Behaviors

Significant standardized path coefficients indicate that higher maternal sensitivity at 6 months predicts lower levels of conduct problems, β = -0.09, $p < .05$, lower levels of callous behaviors, β = -0.11, $p < .01$, and higher levels of empathic-prosocial behaviors, β = 0.10, $p < .05$, in first grade. Further, maternal harsh-intrusion predicts higher levels of callous behaviors in first grade, β = 0.08, $p < .05$, and mental state talk predicts lower levels of callous behaviors in first grade β = -0.07, $p < .01$. The conditional residuals of first grade CP, EP, and CU behaviors were allowed to covary, $cov(\zeta_{CP}\ \zeta_{EP}) = -0.07$, $p < .001$, $cov(\zeta_{CP}\ \zeta_{CU}) = 0.05$, $p < .001$, $cov(\zeta_{CU}\ \zeta_{EP}) = -0.04$, $p < .001$. The final model provided good fit to the data, $X^2(105) = 339.33$, $p = .001$; CFI = 0.95; RMSEA = 0.04; SRMR = 0.04. Figure 2.1 presents the standardized path coefficients for the associations between maternal sensitivity, harsh-intrusion, emotion language use, and mental state talk at 6 months, and children's CP, EP, and CU behaviors at first grade. All standardized parameter estimates and factor loadings including estimates between the model covariates and variables of interest are shown in Table 2.2. The full SEM allowed all exogenous variables to covary and model covariates were included in the final structural model. Control variables are not shown in Figure 2.1 for ease of reading but are included in Table 2.2.

Discussion

This study advances understanding of the development of CP and CU behaviors by simultaneously examining the influences of maternal sensitivity, harsh-intrusion, emotion language use, and mental state talk in infancy on children's later conduct problems, empathic-prosocial, and callous behaviors. Exploratory and confirmatory factor models suggest that mothers' use of positive and negative emotion language words factor together and that mothers' mental state talk represents a socialization practice separate from emotion language use and measures of maternal sensitivity and harsh-intrusion. Consistent with study hypotheses, analyses indicated that maternal sensitivity predicts lower levels of CP and CU behaviors and higher levels of empathic-prosocial behaviors in first grade, above and beyond the relative influences of negative parenting and emotion socialization behaviors. Partially consistent with study hypotheses, harsh-intrusion and mental state talk were found to only significantly predict CU behaviors, and mothers' emotion language use was not found to uniquely predict CP, EP, or CU behaviors. Taken together with other research investigating the influences of a broad range of aspects of the early caregiving environment on the development of CP and CU behaviors (e.g., (Luna C.M. Centifanti et al., 2015; Dadds, Jambrak, Pasalich, Hawes, & Brennan, 2011; Waller et al., 2015b), this study underscores the diversity of influential experiences a child has in infancy, highlights the importance of incorporating multiple measures of the caregiving environment in research on the development of externalizing behavior problems, and begins to elucidate potentially heterogeneous pathways to CP and CU outcomes.

The finding of significant positive associations between maternal sensitivity and children's empathic-prosocial behaviors joins a body of literature which demonstrates links between early positive and supportive parenting behaviors and the development of empathy

(Kiang et al., 2004) and prosociality (Hastings, Utendale, W. L., & Sullivan, Hastings, Utendale, & Sullivan, 2007; Newton et al., 2014). Mothers' warmth, engagement, and sensitive responding are thought to model prosociality for children (Rice & Grusec, 1975), scaffold children's social-cognitive awareness of others' needs and empathic behaviors (Krevans & Gibbs, 1996), and have been found to predict conscience development in children showing fearlessness and punishment-insensitivity (Kochanska, 1997). Additionally, the negative links between maternal sensitivity and children's CP and CU behaviors are consistent with research on the topic. For example, low levels of parental sensitivity and positivity are associated with high levels of CP and CU behaviors (Kroneman, Hipwell, Loeber, Koot, & Pardini, 2011), are reciprocally related to CU behaviors in a study of children ages 2 to 3 (Waller, Gardner, Viding, et al., 2014), and have been found to be predictive of CU behaviors at 27 months in an adoption study where parents were not genetically related to their children (Waller et al., 2015a).

The current findings fit nicely with extant literature given that, in addition to broadly supporting the healthy development of secure attachment relationships (De Wolff & van Ijzendoorn, 1997) and effective emotional and behavioral regulation (Blair et al., 2008; Moore et al., 2009), early sensitivity fosters optimal functioning in basic and complex cognitive and emotional areas such as fear, guilt, and empathy (Swain et al., 2007), deficits in which are associated with CP and CU behaviors (Blair, Peschardt, Budhani, Mitchell, & Pine, 2006; Frick & White, 2008). It is of note that maternal sensitivity during free play is predictive of conduct problems, callous-unemotional behaviors, and empathic-prosocial behaviors, above and beyond the influences of harsh-intrusion and two observational measures of emotion socialization, which unambiguously speaks to the importance of maternal sensitivity in infancy for the development of externalizing psychopathology.

The current study also provides support for the role of maternal harsh-intrusion in infancy in the development of CU behaviors, which is consistent with previous research that demonstrates links between negative parenting practices and callous-unemotional outcomes in older childhood (Fontaine et al., 2011; Pardini et al., 2007) and early childhood (Waller et al., 2012; Willoughby et al., 2013). Contrary to previous research studies suggesting that harsh and controlling parenting styles may contribute to patterns of aggressive or coercive behaviors and interactions (e.g., Patterson et al., 1983; Smith et al., 2014), we did not find significant links between maternal harsh-intrusion and children's CP. However, at this age and in this analytic framework, which examines the influences of early harsh-intrusion on CP and CU outcomes simultaneously, it may be the case that negative parenting styles in infancy have a stronger influence on the emergence of CU-related constructs such as a lack of conscience, punishment sensitivity, and blunted fear responsivity than they do the emergence of aggression or defiance. For example, the establishment of mutually responsive interaction patterns between a mother and her infant serve as a foundation for the child's early conscience development (Kochanska et al., 2010; Kochanska, Barry, Aksan, & Boldt, 2008), which may inhibit future callousness (Kochanska, Kim, Boldt, & Yoon, 2013). Harsh and intrusive mothers likely undermine the emergence of mutually responsive interaction patterns which might contribute to subsequent impairments in the development of conscience. Over and above the influences of a lack of sensitivity or warmth, mothers who display harsh-intrusive parenting styles may inhibit the child's ability to develop a sense of contingency and security with the parent. Furthermore, harsh, controlling, or erratic behavior may contribute to the infants' difficulties with understanding emotional displays or perspectives of others (Daversa, 2010; Waller et al., 2012), strong correlates of CU behaviors at older ages (Ciucci et al., 2014; Woodworth & Waschbusch, 2008).

Contrary to our hypothesis that emotion language use and mental state talk would load onto a common emotion socialization factor, the current findings provide evidence that, in infancy, these two related constructs are distinct from each other and from observed measures of harsh-intrusion and sensitivity. To our knowledge, this is the first study to provide empirical evidence that mental state talk and emotion language use represent distinct components of the emotion socialization environment at this age. Consistent with the limited literature on the topic, mental state talk at six months was found to negatively predict CU behaviors at first grade. This finding aligns with recent work showing that mothers' mental state comments at 8 months predict later CU behaviors through their influence on children's emotion understanding (Centifanti et al., 2015). However, although appropriate mind-related language has been shown to predict lower levels of externalizing behaviors in a low-income sample (Meins et al., 2013), the current study did not find links between mental state talk at 6 months and later CP nor EP behaviors suggesting that, in this context, mental state talk does not uniquely contribute to the development of these outcomes above and beyond the influences of maternal sensitivity. Also contrary to study hypotheses and extant literature demonstrating links between emotion language use and later CP and CU behaviors (Pasalich et al., 2014; Pasalich, Dadds, Vincent, et al., 2012), the current study found that the use of negative and positive emotion language words in infancy did not directly predict any of the outcomes of interest.

According to Meins (1999) and others, a distinct and crucial correlate of maternal sensitivity involves the extent to which mothers appropriately interpret and respond to their infants' emotional cues (Cohn & Tronick, 1989; Kochanska, 1997; Meins, 1999). Perceiving her infant's cues, interpreting them correctly, and responding to them appropriately requires the mother to recognize that her infant has individual intentions, thoughts, and desires. This process is reflected in the mother's use of mental state talk and lays the ground work for more complex forms of emotion socialization (Meins, 1999; Meins et al., 2002). In this sense, the finding that mothers' mental state talk, but not emotion language use, predicts eventual CU behaviors is consistent with developmental theory. Mental state talk is one of the earliest predictors of children's emotion understanding abilities (Laranjo, Bernier, Meins, & Carlson, 2010; Meins et al., 2013) and, at six months, might constitute a more engaging, purposeful, and meaningful developmental experience than does the labeling or elaboration of specific emotions. Moreover, the influence of early experiences that support emotional understanding on later CU behaviors are theoretically consistent with the emotion processing deficits (Dadds et al., 2009) and aggressive behaviors characterized by unemotionality (Marsee, Silverthorn, & Frick, 2005) which are common correlates of CU behaviors at older ages.

Implications and Future Directions

The current study makes a number of contributions to the literature. First, we provide evidence that mothers' emotion language use and mental state talk represent distinct, yet correlated, emotion socialization practices. Second, these findings confirm the important role of maternal sensitivity in the development of conduct problems, empathic-prosocial, and callous behaviors. Third, regarding the relative influence of the environment on the development of CU behaviors, this study suggests not only that the parent-infant relationship is important for the development of CU outcomes, but that a diversity of early experiences play a role in the emergence of CU behaviors, and that maternal mental state talk, in addition to sensitivity and harsh-intrusion, may be an important contributor to the development of the callous and unemotional phenotype.

Our results suggest that early infancy may be a useful developmental period to target for intervention, and suggest that multiple aspects of the early caregiving environment, including mental state talk, should be the focus of efforts aimed at prevention. Evidence linking parenting behaviors and family-processes with CP and CU behaviors has been translated into a wide range of effective interventions at older ages (Hawes, Dadds, Brennan, Rhodes, & Cauchi, 2013). The majority of the evaluative work suggests that decreases in CP and CU symptoms are primarily accounted for by changes in parenting practices (Deković, Asscher, Manders, Prins, & van der Laan, 2012; Hawes & Dadds, 2006). When considered alongside research suggesting that the most effective interventions are typically administered early and are family based (Hawes et al., 2013), the current findings provide motivation for continued work investigating the associations between observational measures of caregiving in infancy and the development of CP and CU behaviors.

Specific to the inclusion of early emotion socialization as an intervention focus, a small body of research suggests that the emotional deficits associated with CU behaviors may be malleable. For example, Dadds and colleagues (2006) found that deficits in emotion recognition can temporarily be overcome by training children to focus on salient features of the face (Dadds et al., 2006). Further, Havighurst and colleagues have shown that parenting interventions which focus specifically on emotion socialization practices contribute to improved child emotional knowledge and behavior (Havighurst et al., 2014; Havighurst, Wilson, Harley, Prior, & Kehoe, 2010). It's becoming increasingly clear that parents' emotion socialization practices have important implications for the development of CU behaviors, and that emotion-related caregiving behaviors may be a viable target for intervention.

The current study is focused on children's experiences of caregiving behaviors during the first year of life, because this is a period of profound developmental change in the socio-cognitive systems, including the ability to anticipate and learn from punishment (Dadds & Salmon, 2003; Pauli-Pott, Friedl, Hinney, & Hebebrand, 2009) and develop conscience and prosociality (Kochanska, 1997), and this period lays the groundwork for more complex emotional understanding (Denham et al., 2008; Garrett-Peters et al., 2008). That being said, there is also a need for research on this topic using older and longitudinal samples, as the importance of the parenting relationships for the links between psychopathic traits and antisocial behavior persist into adolescents and young adulthood (Silva & Stattin, 2015). The research by Pasalich and colleagues which demonstrates links between emotion language use and CU behaviors is based on samples of older children suggesting that the relative influence of emotion-specific elaboration versus mental state talk may change over time (Pasalich et al., 2014). Future research should investigate the associations between multiple aspects of caregiving and CP and CU behaviors across time.

Additionally, although parents' emotion socialization practices (i.e., emotion verbalizations) are a main focus of this study, it is important to note that the nature of parents' emotion-related behaviors are partially determined by parental beliefs about their own emotions and those of their children (Katz, Gottman, & Hooven, 1996). Often referred to as parental meta-emotion or meta-emotion philosophy (Gottman, Katz, & Hooven, 1996; Hooven, Gottman, & Katz, 1995), parents' beliefs about emotions include their views of their emotions and those of their children but also their beliefs about the importance of teaching emotions and their developmental knowledge of emotions. Parents' beliefs about emotions are associated with their parenting and emotion-related practices and with their children's emotion regulation, academic achievement, and behavior problems (Gottman et al., 1996; Hooven et al., 1995). More recent work suggests that emotion-focused interventions are associated with decreases in the extent to which parents dismiss the importance of emotions which contributes to children's better emotion understanding and behavior (Havighurst et al., 2014). As such, it would be useful for future studies to expand their measurement of the early caregiving environment to include parents' beliefs about emotion socialization, in addition to observational measures of parents' behaviors.

The findings of the current study should be considered in the context of the following limitations. First, emotion language use and mental state talk were coded from the same interaction. Although it is possible for parents to demonstrate these behaviors simultaneously (e.g., making a mind-related comment while elaborating on an emotional experience or using emotion words), the extent to which a mothers' ability to score highly on one construct may limit her ability to score highly on the other is unknown. There is no explicit reason to expect emotion language use and mental state talk to systematically influence one another, but this limitation should be noted. Second, emotion language and mental state talk are positively correlated with each other and are correlated with the indicators of maternal sensitivity indicators in the same direction. However, negative emotion language use is also positively correlated with negative regard and both positive and negative emotion language use are positively correlated with intrusion, whereas mental state talk is negatively correlated with intrusion. Because a wordless picture book was used to collect these data, it is theoretically possible to arrive at a high score on emotion language use either by sensitively elaborating on emotions during the task or by simply labeling emotions in a detached or intrusive manner. Whereas mental state talk is likely to only be observed in the context of warm, engaged, and sensitive mother-infant interactions. Future work should be done to better elucidate the influences of emotion language elaboration versus emotion labeling.

This study highlights the importance of parenting and emotion socialization practices in infancy for the development of CP, empathic-prosocial, and callous behaviors. The findings are of both scientific and societal significance given the costs incurred by individuals exhibiting high levels of antisocial behaviors over time (Romeo, Knapp, & Scott, 2006). There is increasing interest in research aimed at describing and understanding the unique etiological pathways associated with these maladaptive outcomes (Frick & Viding, 2009; Frick et al., 2003; Hawes, Brennan, & Dadds, 2009), and this study contributes to this work by including multiple dimensions of parenting behaviors. This is an important first step toward understanding heterogeneous pathways to disorder and should prompt future research focused on testing hypotheses regarding specific caregiving processes that may contribute to heightened risk for later CP and CU behaviors.

Table 2.1 Factor Loadings from an Exploratory Factor Model

Items	Factor One	Factor Two	h^2
Detachment (reversed)	**0.85**	-0.10	0.74
Animation	**0.84**	-0.09	0.72
Positive Regard	**0.83**	-0.18	0.73
Stimulation of Development	**0.77**	-0.03	0.60
Sensitivity/Responsiveness	**0.75**	-0.23	0.62
Negative Emotion Language	0.30	**0.82**	0.77
Positive Emotion Language	0.36	**0.80**	0.76
Mental State	0.49	-0.02	0.24

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

Table 2.2. Standardized Parameter Estimates for the Full SEM

	β	95% CI
Maternal Sensitivity → CP	-0.088*	-0.060 to -0.001
Maternal Harsh-Intrusion → CP	0.011	-0.026 to 0.033
Emotion Language → CP	-0.045	-0.04 to 0.009
Mental State Talk → CP	-0.014	-0.009 to 0.005
Child Gender (Male = 1) → CP	0.068*	0.004 to 0.089
Child Age in First Grade → CP	-0.035	-0.011 to 0.004
Distress to Limitations (6m) →CP	0.089*	0.005 to 0.073
Distress to Novelty (6m) → CP	-0.018	-0.034 to 0.020
Irritability (6m) → CP	-0.032	-0.035 to 0.014
Maternal Mental Health Severity → CP	0.161**	0.003 to 0.008
Education (HS+ = 1) → CP	-0.028	-0.135to 0.064
Maternal Sensitivity → EP	0.106**	0.017 to 0.097
Maternal Harsh-Intrusion → EP	-0.017	-0.046 to 0.029
Emotion Language → EP	-0.010	-0.050 to 0.039
Mental State Talk → EP	-0.008	-0.017 to 0.014
Child Gender (Male = 1) → EP	-0.160**	-0.238 to -0.102
Child Age in First Grade → EP	0.019	-0.008 to 0.014
Distress to Limitations (6m) →EP	-0.058	-0.086 to 0.007
Distress to Novelty (6m) → EP	-0.082*	-0.087 to -0.006
Irritability (6m) → EP	0.040	-0.014 to 0.055
Maternal Mental Health Severity → EP	0.018	-0.003 to 0.005
Education (HS+ = 1) → EP	0.018	-0.086 to 0.157
Maternal Sensitivity → CU	-0.103**	-0.057 to -0.01
Maternal Harsh-Intrusion → CU	0.075*	0.002 to 0.047
Emotion Language → CU	-0.014	-0.029 to 0.020
Mental State Talk → CU	-0.076*	-0.017 to -0.002
Child Gender (Male = 1) → CU	-0.007	-0.044 to 0.035
Child Age in First Grade → CU	-0.052	-0.012 to 0.002
Distress to Limitations (6m) →CU	0.048	-0.009 to 0.049
Distress to Novelty (6m) → CU	0.012	-0.019 to 0.027
Irritability (6m) → CU	-0.033	-0.034 to 0.013
Maternal Mental Health Severity → CU	0.107**	0.001 to 0.006
Education (HS+ = 1) → CU	-0.024	-0.114 to 0.059

Notes: * *p* < .05, ** *p* < .01.

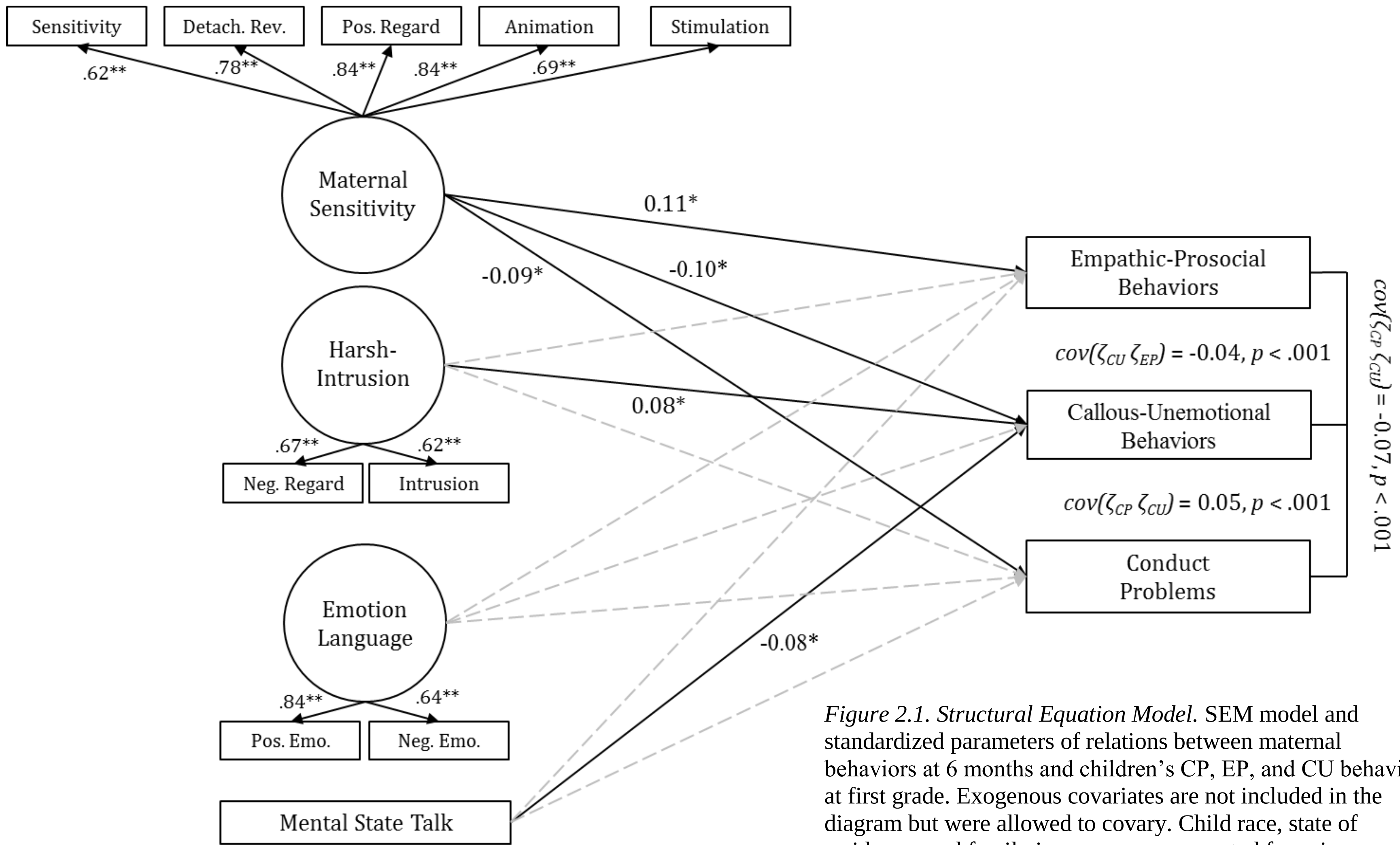


Figure 2.1. Structural Equation Model. SEM model and standardized parameters of relations between maternal behaviors at 6 months and children's CP, EP, and CU behaviors at first grade. Exogenous covariates are not included in the diagram but were allowed to covary. Child race, state of residency, and family income were accounted for using individual probability weights and stratification variables. The model provides good fit to the data: $X^2(105) = 339.33$, p =

Chapter Three: Study Two: Biobehavioral Functioning, Early Parenting, and the Development of CP and CU Behaviors

Introduction

Advances in neuroscience, molecular biology, and genomics have supported research which shows that both environmental and biological levels of analyses should be incorporated in empirical and theoretical models of the development of behavior problems (Sameroff, 2010; Shonkoff, 2010). Although early caregiving experiences play a fundamental role in the development of behavioral disorders (Campbell, 1995; Waller et al., 2013), there is an appreciation that children's biobehavioral functioning, as well as the probabilistic interactions between biobehavioral functioning and early experience, predict the emergence of behavior problems. This appreciation informs contemporary research on the development of conduct problems (CP) and callous-unemotional (CU) behaviors (Frick et al., 2014a).

CU behaviors, considered to be a downward extension of specific components of adult psychopathy, provide unique insight into disruptive behavior problems in childhood (Frick et al., 2014b). Often exhibited in the presence of CP, CU behaviors describe non-normative emotional, affective, and cognitive deficits—such as a lack of guilt, empathy, and fear, as well as an over-focus on reward and insensitivity to punishment (Blair et al., 2006; Dadds et al., 2005; Frick & White, 2008; Kotler & McMahon, 2005)—and typically signify risk for later antisocial behavior and psychopathy (Lynam et al., 2007; Rowe et al., 2010). CU behaviors are useful in identifying homogeneous patterns of offending among children with elevated conduct problems (Lynam, Loeber, & Stouthamer-Loeber, 2008; Rowe, Costello, Angold, Copeland, & Maughan, 2010), but also among youth who do not demonstrate CP (Fontaine et al., 2011). It is clear that both CP and CU behaviors are etiologically heterogeneous (Frick & White, 2008), and research that incorporates behavioral and psychobiological functioning has provided insight into the unique developmental pathways of these behaviors.

The majority of findings with older children and adolescents suggest that behavior problems are associated with lower levels of baseline or diurnal hypothalamic-pituitary-adrenal (HPA) axis functioning (Fairchild et al., 2008; Frick & Morris, 2004; Frick & Viding, 2009; E. a. Shirtcliff, Granger, Booth, & Johnson, 2005) whereas with young children there is evidence that behavior problems are typically associated with reactive or heightened behavioral and HPA axis patterns of functioning (Beauchaine, Gatzke-Kopp, & Mead, 2007; Frick & Viding, 2009; Patriquin, Lorenzi, Scarpa, & Bell, 2014). Consistency in the associations between behavioral and HPA axis activity and reactivity and CP and CU behaviors need not be expected across early and later childhood given the ongoing potential for behavioral and biological functioning to both modify and mediate the associations between experience and psychopathological outcomes (e.g., Gunnar & Vazquez, 2001; Gunnar & Donzella, 2002; Miller et al., 2007).

To date, research findings on the associations between behavioral and HPA axis functioning and later behavior problems support the possibility of multiple pathways to disorder. Consistent with a developmental psychopathology framework (Cummings, Davies, & Campbell, 2000), it is possible that children's behavioral fear reactivity and HPA axis functioning moderate the influence of early caregiving experiences as well as serve as a mechanism through which early experience influences the onset and persistence of behavioral problems (Miller et al., 2007; Ruttle et al., 2011). As such, the goal of this manuscript is to examine the extent to which infants' behavioral and HPA axis functioning moderates and/or mediates the influences of early caregiving experiences on the development of CP and CU behaviors. The current manuscript tests multiple paths to disordered behavior with a goal of contributing to a body of literature which suggests that psychopathology emerges from the probabilistic associations between early patterns of behavioral and psychobiological activity and reactivity and early experience (Boyce & Ellis, 2005; McEwen, 1998a; Ruttle et al., 2011).

Biobehavioral Functioning and CP and CU Behaviors

Two well-established biobehavioral measures used in this research are observational assessments of behavioral fear reactivity and the activity of the HPA axis, which is used to index physiological regulation at rest and in response to a contextual stress (Calkins et al., 2013; Gunnar & Quevedo, 2007; Mills-Koonce et al., 2015). Cortisol, a stress hormone that reliably represents activity in the HPA axis (Gunnar & Quevedo, 2007), is a useful measure for the study of etiological pathways to CP and CU behaviors (Loney, Butler, Lima, Counts, & Eckel, 2006) given its associations with fear reactivity (Mills-Koonce et al., 2015), sensation seeking (Rosenblitt, Soler, Johnson, & Quadagno, 2001), and persistent aggression (Goozen et al., 1998; Rolf Loeber, Green, Lahey, Frick, & Mcburnett, 2000).

Emotional responses become increasingly differentiated in infancy, with frustration responses developing around 3 months of age and specific fear responses developing around 6 to 9 months of age (Lemery, Goldsmith, Klinnert, & Mrazek, 1999; Alan Sroufe, 1996b). Longitudinal observations of behavioral fear reactivity and physiology suggest that there is individual variability in experiences of fear which fall on a natural continuum (Kagan, Snidman, Arcus, & Reznick, 1994), and early fear-inducing tasks have been shown to elicit both behavioral and cortisol responses in infancy (Ursache et al., 2014) which are predictive of later CP and CU behaviors (Mills-Koonce et al., 2015). Psychobiological models of fear processing suggest that early differences in reactivity are likely to be a product of underlying individual differences in genetic and neurobiological functioning, but also subject to developmental processes which actively consolidate individual differences in fear reactivity across time (Calkins et al., 2013; Miller et al., 2007; Mills-Koonce et al., 2015; Posner & Rothbart, 2000).

Broadly speaking, findings on the psychobiological and behavioral correlates of behavior problems are generally mixed. While some literature suggests that externalizing problems in middle childhood and adolescence are associated with low levels of basal cortisol (Alink et al., 2008; Fairchild et al., 2008), a number of studies have provided support for the links between conduct problems and elevated HPA axis and behavioral activity and reactivity in early childhood (e.g., Calkins & Dedmon, 2000; Calkins et al., 2013; Scarpa, Haden, & Tanaka, 2010). For example, Calkins and Dedmon (2000) found that aggressive boys demonstrated more negative affect and regulatory difficulties than non-aggressive boys (Calkins & Dedmon, 2000), and Bradley and Corwyn (2008) found that reactive temperamental characteristics in the first years of life are predictive of later externalizing behaviors, particularly in the context of maladaptive caregiver-child relationships (Bradley & Corwyn, 2008). Specific to HPA axis functioning, cortisol reactivity to both a fear and frustration task was predictive of reactive aggression in a mixed-sex sample of children (Lopez-Duran, Hajal, Olson, Felt, & Vazquez, 2009), and elevated baseline cortisol in preschool predicts later behavior problems (Essex, Klein, Cho, & Kalin, 2002).

Most clinical research with children and adolescents suggests that CU behaviors are associated with distinct psychobiological profiles characterized by low baseline cortisol and blunted cortisol reactivity (Frick et al., 2013; Loney et al., 2006). Behaviorally, older children and adolescents high on CU behaviors are less responsive to punishment (Muñoz Centifanti &

Modecki, 2013), demonstrate less anxiety (Barker, Oliver, Viding, Salekin, & Maughan, 2011; Blair, Budhani, Colledge, & Scott, 2005), and are more likely to underestimate the likelihood of being punished for transgressions (Byrd, Loeber, & Pardini, 2014). Further, youth high on CU behaviors exhibit a temperamental profile characterized by fearlessness, blunted behavioral stress responses to fear and stress inducing stimuli (Frick et al., 2013), low basal cortisol (Loney et al., 2006), and blunted cortisol reactivity (Stadler et al., 2011).

Little is known about the associations between behavioral and HPA axis functioning in infancy and the development of CU behaviors as the majority of the research linking low psychobiological and behavioral activity and underreactivity to CU behaviors was conducted using clinical samples of children and adolescents. An important exception includes recent work by Mills-Koonce and colleagues (2014) who, using the current sample, reported findings contrary to research with older children. Mills-Koonce found that children high on conduct problems and CU behaviors in the 1st grade had higher levels of baseline cortisol and demonstrated more behavioral fear reactivity at 15 months of age compared to children with low levels of conduct problems and CU behaviors (Mills-Koonce et al., 2015). This study suggests that, similar to the patterns of early behavioral and HPA axis functioning associated with CP, infants with later CU behaviors may display elevated cortisol activity and behavioral reactivity very early in life, which stands in contrast to the findings that CU behaviors are associated with reduced biobehavioral functioning in older childhood and adolescence (Frick & White, 2008; Ruttle et al., 2011; Shirtcliff et al., 2005).

Biobehavioral Functioning and Early Caregiving: Mediated Pathways

Patterns of biobehavioral functioning consolidate in early development as regulatory strategies shift from external and dyadic (i.e., parent-infant) to internalized and effortful on the part of the infant (Calkins et al., 2013; Gunnar & Quevedo, 2007; McEwen & Seeman, 1999). Although stress reactivity in early childhood has its foundations in nervous system functioning, the development of this physiology is shaped, in part, by social influence including early experiences with caregivers (Crockenberg & Leerkes, 2004; Doom & Gunnar, 2013). For example, maternal sensitivity and engagement in infancy has been shown to predict reduced overall cortisol activity across baseline and challenge tasks in toddlerhood (Blair et al., 2008), and HPA functioning has been shown to mediate the associations between multiple dimensions of parenting on later cognitive abilities (Blair et al., 2011). Importantly, previous research with children high on CP and CU behaviors suggests that they are more likely to experience harsh, insensitive parenting early in life (Waller, Hyde, Grabell, Alves, & Olson, 2014; Willoughby et al., 2013) and are more likely to form disorganized attachment relationships (Pasalich, Dadds, Hawes, et al., 2012), both of which strain the infants' limited resources for self-regulation and, through the stress induced by the demand for self-regulation, may contribute to increased behavioral reactivity and consistently high levels of circulating cortisol (Dadds, Moul, Hawes, Mendoza Diaz, & Brennan, 2015; Gunnar & Quevedo, 2007).

Ongoing and persistent stress, such as the stress associated with insensitive and harsh caregiving experiences which fail to support immature regulatory capacities, may result in the alteration of physiological stress response systems either upward or downward through a process referred to as allostatic load (McEwen, 2000). Although normal patterns of HPA functioning are typically established within the first year of life (Gunnar & Quevedo, 2007), the behavioral and HPA systems continue to develop into early childhood and may be sensitive to external influences in infancy. Animal models suggest that early care directly influences behavioral and HPA axis functioning in offspring (Meaney & Szyf, 2005), and a growing body of theory and research suggests that sustained periods of activation of behavioral and physiological stress response systems may contribute to allostatic load and subsequent pathophysiology (see Calkins et al., 2013; Bruce S. McEwen & Wingfield, 2003). Explicitly tested in the current study is the extent to which insensitive, harsh, and controlling caregiving experiences in infancy contribute to elevated behavioral fear reactivity and heightened cortisol functioning, and if these patterns of biobehavioral functioning serve as a mechanism that mediates the influences of early caregiving on later CP and CU behaviors.

In addition to examining the extent to which heightened behavioral reactivity and HPA axis functioning mediates the influences of early caregiving on later CP and CU behaviors, findings from the current study may also contribute initial support for a developmental model that helps to explain why CP and CU behaviors are associated with reduced HPA axis and behavioral activity and reactivity in later childhood and adolescence. Although stress exposure may initially cause elevated behavioral and HPA axis functioning, prolonged exposure to elevated levels of stress may result in a blunting effect or down-regulation of stress responses (Alink et al., 2008; McEwen, 1998a; Miller et al., 2007; Ruttle et al., 2011). A meta-analysis by Alink and colleagues showed that externalizing problems are related to higher cortisol levels in very young children, but not older children (Alink et al., 2008; Bakermans-Kranenburg, Van IJzendoorn, Pijlman, Mesman, & Juffer, 2008). A meta-analysis by Miller and colleagues found a negative association between the amount of time since the onset of a stressor and cortisol secretion. Specifically, individuals who had experienced recent stress demonstrated higher cortisol levels whereas individuals who had experienced a prolonged stressor exhibited lower levels of cortisol (Miller et al., 2007). This evidence suggests that prolonged activation of the HPA system may trigger adaptive recalibration whereby cortisol release is down regulated due to the negative effects of prolonged exposure to cortisol on neurological and cardiovascular functioning (Gunnar & Vazquez, 2001; Gunnar & Quevedo, 2007; Susman, 2006). Although there is still much to learn about the complexities of this biopsychosocial interplay, a model wherein infants' behavioral and HPA axis functioning mediates the associations between early experience and later psychopathological outcomes is a plausible alternative to a main effects model of early behavioral and psychobiological associations with later CP and CU behavior. Although not investigating the longitudinal associations between early care and psychobiological functioning across childhood, the current study will provide initial insight into the likelihood of such a developmental model by examining the extent to which caregiving experiences in infancy predict later CP and CU behaviors via their influence on early behavioral and HPA axis functioning in infancy.

Biobehavioral Functioning and Early Caregiving: Moderated Pathways

Both differential susceptibility (Belsky et al., 2009; Pluess & Belsky, 2011) and biological sensitivity (Boyce & Ellis, 2005) models posit that children are differentially affected by variations in developmental context, and research has identified high levels of cortisol and behavioral fear or stress reactivity as markers for greater susceptibility or sensitivity to early adverse contexts. Obradovic and colleagues (2010) found that children who exhibited high levels of baseline cortisol demonstrated the most and least prosocial behaviors depending on the quality of their rearing environment (Obradović, Bush, Stamperdahl, Adler, & Boyce, 2010), and positive parenting has been shown to reduce behavior problems for children with reactive temperamental characteristics (Gallitto, 2014). This research suggests patterns of elevated cortisol activity and high behavioral reactivity may indicate enhanced child sensitivity or susceptibility to early caregiving environments. Given there is evidence that both CP and CU behaviors are associated with heightened behavioral fear reactivity and elevated baseline cortisol and cortisol reactivity in infancy (Mills-Koonce et al., 2015; Wagner et al., 2015), it is possible these patterns of biobehavioral functioning will exacerbate the influences of harsh and insensitive caregiving experiences on later CP and CU behaviors (Obradović, Bush, & Boyce, 2011; Van Aken, Junger, Verhoeven, Van Aken, & Deković, 2007; Wagner, Propper, Gueron-Sela, & Mills-Koonce, 2015).

Although much research has identified high levels of cortisol and behavioral fear reactivity as potential susceptibility factors, there are also etiological models of CU behaviors which posit that low behavioral and HPA axis functioning may moderate the influence of early caregiving behaviors by undermining normative socialization processes. For example, children who exhibit low baseline cortisol functioning and reduced behavioral and cortisol reactivity to fear stimuli may be less affected by parental socialization efforts (Frick & Morris, 2004) which may, in turn, disrupt the development of conscience and empathy (Frick et al., 2014). Work by Kochanska and colleagues (1997) suggests that normative disciplining strategies during early childhood produce negative emotional arousal in children which supports conscience development and internalization of parents' expectations (Kochanska, 1997). For children who exhibit low behavioral and HPA axis activity, the processes outlined by Kochanska and colleagues may be disrupted due to a lack of adequate deviation anxiety which might contribute to later deficits in empathy, conscience, and complex emotions (Dadds & Salmon, 2003). Further, research by ethologists suggests that emotions, particularly fear and sadness, elicit negative arousal which inhibit aggressive or violent acts. Low behavioral and biological responses to emotional stimuli (Centifanti & Modecki, 2013; Shirtcliff et al., 2009; White et al., 2013) that are associated with CU behaviors may weaken the influences of others' emotions of distress and parents' attempts to use effective disciplining strategies (Blair, 2013). Interactions between early caregiving experiences and infants' biobehavioral functioning in the prediction of CU behaviors have not been examined in the literature, and the lack of research findings limits the extent to which direct hypotheses about these associations can be made. However, the reviewed literature suggests the possibility of multiple pathways to CU whereby patterns of biobehavioral functioning differentially moderate the relative influences of harsh-intrusive and sensitive caregiving behaviors (e.g., heightened biobehavioral functioning exacerbates the influences of negative parenting experiences whereas reduced biobehavioral functioning undermines the influences of positive parenting experiences).

Current Study

The current study proposed multiple pathways to CP and CU behaviors. First, a path analysis modeling approach was used to examine the extent to which baseline cortisol, cortisol reactivity across fear and frustration tasks, and behavioral fear reactivity mediated the influences of caregiving and emotion socialization experiences at 6 months on children's CP and CU behaviors in first grade. I hypothesized that harsh-intrusive and insensitive parenting behaviors would predict elevated baseline cortisol and more cortisol and behavioral reactivity which would, in turn, predict higher levels of CP and CU behaviors. Second, the current study examined the extent to which the associations between early caregiving experiences and children's CP and CU behaviors are moderated by baseline cortisol, cortisol reactivity, and behavioral fear reactivity in infancy. I hypothesized that infants with heightened cortisol activity and reactivity across fear and frustration tasks and elevated behavioral fear reactivity who are exposed to unsupportive caregiving environments during infancy and early childhood (i.e., harsh-intrusive and insensitive parenting behaviors, low emotional socialization) would exhibit the highest levels of CP behaviors in the first grade. Due to the paucity of research on the subject, I refrained from making a directional hypothesis regarding these associations in the prediction of CU behaviors.

Methods

Sample

The Family Life Project (FLP) is a large longitudinal study of children and families living in non-urban, lower income communities in the U.S. Families and their newborns that lived in two major geographical areas of high child rural poverty (including three counties in eastern North Carolina and three counties in central Pennsylvania) were recruited using a stratified random sampling procedure yielding a representative sample of 1,292 families recruited over a one-year period at the time mothers gave birth to a child. See study one and Willoughby et al. (2013) for more information on the recruitment of the FLP sample. The current study uses observational parenting data collected during home visits when the target children were 6 months (n =1,141). Measures of parents' emotion socialization practices were collected during home visits and 6 months (n = 1,157). Baseline cortisol and cortisol reactivity across fear and frustration tasks were collected at 15 (n=1,007) months. Behavioral fear reactivity was measured during the 15 (n = 903) month visit. Measures of conduct problems (n = 1,078) and callous-unemotional behaviors (n = 1,080) were collected at the 1st grade home visit. There were 58 participants who were missing data on all variables of interest (i.e., ODD, CU behaviors, parenting, cortisol, behavioral reactivity, and emotion socialization practices) and these participants were not included in the analyses. Participants who were missing on all variables of interest did not vary systematically from those who were not missing data as a function of state ($X^2(1) = 0.01$, $p = 0.93$), race ($X^2(1) = 0.98$, $p = 0.32$), poverty ($X^2(1) = 1.64$, $p = 0.19$), or sex

($X^2(1) = 0.16$, $p = 0.69$). The final sample used in the current study consisted of 1,234 families that had at least partial data on the variables of interest at one of the assessment points.

Procedure

Data were collected during home visits completed when the child was approximately 6 and 15 months old, and when the child was in the 1st grade. Visits consisted of interviews, questionnaires, child assessments, and observations of mother-child interactions. All interviews and questionnaires were computerized. At the 6 visit, mothers and their children were videotaped while engaging in a free play activity using a standard set of toys. The mother was instructed to play with their child as they normally would for 15 minutes. Emotion socialization data was obtained from a picture-book task completed at the 6 month visit. The mother was asked to sit in a comfortable chair or couch with her child and was given the book *Baby Faces* (DK Publishing, 1998) to work through with her child.

Children and families were visited for in-home data collection protocols at 15-month home visits, during which primary caregivers (almost exclusively biological mothers) completed demographic questionnaires and children participated in two procedures designed to elicit behavioral and physiological reactivity (Goldsmith & Rothbart, 1990). The first procedure was a mask presentation task during which children were presented with four unusual masks, one at a time. The experimenter wore the masks for 10 seconds while calling the child's name and moving slowly from side to side in front of the child. The second task was a toy removal tasks during which the child was encouraged to play with an attractive toy for 60 seconds. The child's mother then removed the toy and engaged in conversation with the experimenter for 2 minutes. The mother then returned the toy to the child but continued to converse with the experimenter for 1 minute. Three saliva samples were collected to assess changes in cortisol indicative of child's

HPA response. A pre-task baseline was collected before administration of the challenge tasks, a sample was taken 20 minutes after infants' peak arousal to the tasks, and a final sample was taken 40 minutes after peak arousal. Peak arousal was determined by the data collectors using clear guidelines established in the experimental protocol (i.e., 20 seconds of hard crying) and typically occurred at the conclusion of the mask task. Behavioral coding of infants' response to the toy removal task and the cortisol collection that occurred 40 minutes post-arousal are not used in the current study. At first grade, primary caregivers were asked to report on children's levels of conduct problems and callous-unemotional behaviors.

Measures

Salivary cortisol. Unstimulated whole saliva was collected by using either cotton or hydrocellulose absorbent material and expressing the sample into 2-ml cryogenic storage vials using a needleless syringe (cotton) or by centrifugation (hydrocellulose). All samples were assayed for salivary cortisol with a highly sensitive enzyme immunoassay (Salimetrics, State College, PA) that has been U.S. Food and Drug Administration 510(k) cleared for use as an in vitro diagnostic measure of adrenal function. The test used 25 ml of saliva, had a range of sensitivity from 0.0007 to 1.8 g/dl, and had average intra- and interassay coefficients of variation of <10% and 15%, respectively. All samples were assayed in duplicate. The criterion for repeat testing was variation between duplicates of > 20%, and the average of the duplicates was used in all analyses. The cortisol distributions were subject to log transformation to correct for positive skew. Values >3 SD above the mean were removed as outliers (i.e., $n = 14$ for cortisol reactivity and $n = 19$ for baseline cortisol). Analysis variables include a baseline cortisol sample that was collected prior to the administration of the fear and frustration tasks. A second sample was collected 20-minutes following peak arousal and cortisol reactivity levels were calculated by subtracting the pre-task levels from the 20-min post-peak arousal levels.

Behavioral Fear Reactivity. The Infant Behavior Record (IBR; Bayley, 2006) was adapted to allow the research assistants to provide global ratings of infants' temperaments across the 15 month home visit (see Stifter, Willoughby, & Towe-Goodman, 2008; C. A. Stifter & Corey, 2001). Originally designed to assess infant behavior during a test of mental development, the IBR has since been recast as a temperament assessment reflecting dimensions such as social orientation and activity level. For our purposes, the IBR was used by research assistants to rate infants' behavioral fear reactivity over the course of the 15 month home visit. The purpose of the home visits was to assess infants' reactions to several challenges, collect biological measures, and observe parent-child interactions. Observers completed their ratings at the end of each home visit, which provided a broad assessment of infants' behavioral fear reactivity in the context of data collection, transitions between tasks, and while interacting with relative strangers. Each of the observers at the 15 month home visit provided scores (i.e., 0 to 10) for infants' behavioral fear reactivity (ICC = .75). Consistent with previous work (Stifter et al., 2008), mean scores were used as the analysis variable in the current study.

Caregiving Behaviors. Mother-child interactions during the recorded tasks at 6 months were later coded to assess levels of mothers' sensitivity (level of responsiveness and support offered to the child contingent on the child's needs), intrusion (intrusive, insensitive behaviors), detachment (degree to which the mother is disengaged), stimulation of development (degree to which parent fosters the child's development), positive regard (positive feelings and warmth directed toward the child), negative regard (negative regard and hostility), and animation (Cox et al., 1999; Network, 1997). Trained coders assigned a rating on each of the aforementioned constructs using a scale ranging from 1 *(not at all characteristic)* to 5 *(highly characteristic)*. Each coding team consisted of four to five coders and included one or two master coders. Each coder was trained to be reliable with the master coder(s). Each coder completed approximately 30% of the assigned video tapes with the master coder(s). Reliability was calculated using the intraclass correlation for the independent ratings made for the overlapping coding assignments. Reliability across subscales and composites was high (intraclass correlations >.80 for all subscales). Consistent with the factor analytic work from study one, and with previous factor analytic work with the observational measures of parenting used in this dissertation (Blair et al., 2008; Network, 1997), mean scores were used to represent maternal sensitivity [comprised of sensitivity, detachment, positive regard, animation, stimulation of development] and a harsh-intrusion [comprised of intrusion, negative regard].

Emotion Socialization Behaviors. Maternal discourse data were obtained from a picture-book task that was administered at a 6 month home visit. The mother was asked to sit in a comfortable chair or couch with her infant and was given the book Baby Faces (DK Publishing, 1998). This wordless picture book contained a picture of a baby face on each page, with each baby showing a different emotion. The videotaped interactions between the mothers and their 6 month old infants were transcribed using the Systematic Analysis of Language Transcripts (SALT) software (Miller & Chapman, 1985). Research assistants were trained in coding the transcripts for mothers' emotion language and mental state comments and using a coding manual that was adapted from previously used coding systems developed by Cervantes and Callanan (Cervantes & Callanan, 1998) and Meins and colleagues (Meins et al., 2012, 2011). *Positive* and *negative emotion language* use was coded to represent the extent to which the mother uses the book as an opportunity to talk about emotions. Aspects of mothers' emotion language, including labeling and elaboration of emotion words in reference to the book and to the infant's general emotional state were coded. *Mental state talk* refers to the mothers' tendency to frame the interaction in a mentalistic context and infer and comment on her infant's mental state, typically by using words such as think, feel, and want. Emotion language and mental state talk were coded during the same interaction. All analysis variables were calculated as a ratio of number of emotion language or mental state utterances to the number of minutes of the interaction. Informed by the factor analytic work done in study one, a mean score of positive and negative emotion language was used to represent maternal emotion language use at 6 months. Reliability and validity associated with the use of the current coding procedure has been established in the literature (Garrett-Peters et al., 2008, 2011).

Conduct Problems and Callous-Unemotional Behaviors. Levels of conduct problems were rated by maternal primary caregivers using the Disruptive Behavior Disorder Rating Scale (DBDRS) at 1st Grade. The DBDRS (Pelham et al., 1992) is a DSM-IV guided rating scale that includes subscales for assessing oppositional defiance, hyperactivity-impulsivity, conduct disorder, and inattention. ODD items assess various qualities including defiance, argumentativeness, and anger. CD items focus on more disruptive behaviors such as aggression towards people and animals, destruction of property, theft, and serious violations of rules. Composite scores representing oppositional defiant disorder and conduct disorder, what I broadly refer to as CP, were calculated ($\alpha = 0.92$). The psychometrics of the DBDRS have been evaluated (see Wright et al., 2007) and the validity of the DBDRS has been established (Erford, 1997; Friedman-Weieneth et al., 2009).

The Inventory of Callous Unemotional (ICU; Frick, 2004) traits was used to assess callous-unemotional behaviors at first grade. The ICU was completed by maternal primary caregivers who responded to 24 items on a 4-point likert scale ranging from 0 (not at all true) to 3 (definitely true). The items that comprise the ICU were developed from other highly established clinical assessments (e.g. APSD, PCL-YV) and include questions about the extent to which the child uses emotions, expresses feelings, cares about getting in trouble, seems cold and uncaring, and hurts others' feelings. The factor structure and predictive utility of the ICU has been confirmed with samples ranging in age from 13 to 20 years of age (see Essau et al., 2006; K. A. Fanti et al., 2009; Roose et al., 2011) and with samples as young as age 3 (see Ezpeleta et al., 2013). The current study uses the two-factor model which distinguishes between empathic-prosocial (EP; $\alpha = 0.87$) and callous (CU; $\alpha = 0.75$) behaviors outlined by Willoughby and colleagues (Willoughby et al., 2014) in the FLP. Informed by this work, the current study uses continuous measures of CP, EP, and CU behaviors as outcomes.

Additional covariates. Child's sex was collected at the time of recruitment and child's age in months was based on age at the first grade visit. Maternal Education was assessed using self-report at each home visit. Analyses include whether or not the mother reported completing high school at any time point. An index of maternal mental health was assessed at the 6 month visit using the Global Severity Index (GSI) from the Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983), a highly sensitive self-report screening index for psychological distress and mental health. The GSI is comprised of ratings on maternal depression, somatization, and anxiety. Parent-report and observational measures of infant temperament were also included as covariates in an attempt to control for individual differences in general irritability or distress. Measures of temperament were drawn from the infant Behavior Questionnaire (IBQ; Rothbart, 1981), a parent report measure of temperament completed by primary caregivers at the 6 month home visit, and the Infant Behavior Record (IBR; Bayley, 1969), an observational measure completed by research assistants and used to evaluate infant behavior across the 6 month home visit. Measures of infants' distress to limitations (α = .81) and distress/fear to novelty (α = .90) were taken from the IBQ and a measure of observed irritability (α = .70) was taken from the IBR. Time of day of cortisol collection was electronically recorded and included in the analyses to account for the well-known diurnal pattern of cortisol in which levels of salivary cortisol are lower at later assessment times during the day. Infant body temperature was also collected at the time of cortisol collection and was included as a covariate to account for associations between possible fever and circulating cortisol.

Analysis plan

The research questions proposed in this study were addressed in the following ways. First, I examined the extent to which baseline cortisol activity, cortisol reactivity, and behavioral fear reactivity mediate the associations between caregiving experiences in infancy and later CP and CU behaviors. The measurement model for the parenting variables determined in study one informed the creation of mean scores that were used to represent parenting and emotion socialization practices in infancy. A path analysis framework was used to estimate this model and all three mediators were examined simultaneously. Second, twelve interaction terms (4 parenting variables and 3 moderators) were simultaneously entered as exogenous predictors of study outcomes. Predictors and outcomes were centered to aid interpretation. The Johnson-Neyman (JN) procedure was used to examine precise regions of significance (RoS) across the continuum of observed moderator values. The JN procedure, and corresponding figures, provided the simple slopes for the association between the predictor and outcome of interest across all observed moderator values, as well as the point at which the simple slope became significantly different from zero (Johnson & Neyman, 1936). Additionally, significant interactions in the final model were probed at one standard deviation above and below the moderator variable and regions of significance were examined.

Given the complex sampling design of the Family Life Project, analyses utilized individual probability weights associated with oversampling of low-income and African American Families and stratification on income, state, and race. Additional model covariates included child's gender, child's age in months at the time of the outcome, maternal education, maternal rated distress to limitations and novelty at 6 months, and research assistant rated irritability at 6 months. Additionally, time-of-day and infant temperature were included as covariates given the use of salivary cortisol. The robust maximum likelihood (MLR) estimator was used to accommodate the use of sampling weights and stratification. Missing data was handled using the full information maximum likelihood methods (Enders & Bandalos, 2001). Overall model fit was determined using root mean square error of approximation (RMSEA), standardized room mean square residual (SRMR), and comparative fit index (CFI). Good fit was defined as CFI values ≥ 0.95, RMSEA values ≤ 0.06, and SRMR values ≤ 0.08 (Hu & Bentler, 1999). A detailed discussion of the methodological and analytic decisions relevant to study two can be found in Appendix B.

Results

Demographics

Table 3.1 presents the bivariate correlations, means, and standard deviations for the model covariates and variables of interest. Maternal sensitivity was negatively correlated with harsh-intrusion, $r = -.18$, $p < .01$, positively correlated with emotion language use, $r = .23$, $p < .01$, and positively correlated with mental state talk, $r = .38$, $p < .01$. Mental state talk was negatively correlated with harsh-intrusion, $r = -.06$, $p < .05$, and positively correlated with emotion language use, $r = .12$, $p < 0.01$. Maternal sensitivity is negatively correlated with CP, $r = -.10$, $p < .01$, positively correlated with EP behaviors, $r = .14$, $p < .01$, and negatively correlated with CU behaviors, $r = -.17$, $p < .01$. Maternal harsh-intrusion is positively correlated with CU behaviors, $r = .11$, $p < .01$. Emotion language use is negatively correlated with CP, $r = -.06$, $p < .01$, and mental state talk is positively correlated with EP behaviors, $r = .08$, $p < .01$, and negatively correlated with CU behaviors, $r = -.14$, $p < .01$.

Maternal sensitivity at 6 months is negatively correlated with baseline cortisol, $r = -.09$, $p < .01$, and positively correlated with behavioral fear reactivity at 15 months, $r = .07$, $p < .05$. Harsh-intrusion at 6 months is negatively correlated with behavioral fear reactivity, $r = -.09$, $p < .01$. CP at first grade is positively correlated with baseline cortisol at 15 months, $r = .07$, $p < .05$, and negatively correlated with behavioral fear reactivity at 15 months, $r = -.08$, $p < .05$. EP behaviors are negatively correlated with baseline cortisol, $r = -.12$, $p < .01$, and positively correlated with behavioral fear reactivity at 15 months, $r = .10$, $p < .01$. CU behaviors are positively correlated with baseline cortisol at 15 months, $r = .07$, $p < .05$, and negatively correlated with behavioral fear reactivity at 15 months, $r = -.11$, $p < .01$.

CP and CU behaviors were positively correlated, $r = .51$, $p < .01$, and EP behaviors were negatively correlated with CP and CU behaviors, $r = -.37$, $p < 0.01$ and $r = -.22$, $p < .01$, respectively. Distress to limitations, distress to novelty, and observed irritability at 6 months were all positively correlated, $r = .09 - .36$, $p < 0.01$. Distress to limitations was positively correlated with CP and CU behaviors, $r = .12$, $p < .01$, and negatively correlated with EP behaviors, $r = -.10$, $p < .01$. Distress to novelty was negatively correlated with EP behaviors, $r = -.15$, $p < .001$, and positively correlated with CU behaviors, $r = .07$, $p < .05$.

Tests of Mediation

Significant standardized path coefficients indicate that higher maternal sensitivity at 6 months predicts lower levels of conduct problems, β = -0.09, $p < .05$, lower levels of callous behaviors, β = -0.09, $p < .01$, and higher levels of empathic-prosocial behaviors, β = 0.09, $p < .05$, in first grade. Higher harsh-intrusion at 6 months predicts higher levels of CU behaviors, β = 0.09, $p < .01$. Higher mental state talk at 6 months predicts lower levels of CU behaviors, β = -0.08, $p < .05$. Additionally, higher levels of behavioral fear reactivity at 15 months is associated with lower CP, β = -0.11, $p < .01$, fewer CU behaviors, β = -0.11, $p < .01$, and more EP behaviors, β = 0.10, $p < .01$. Higher levels of baseline cortisol at 15 months is associated with more CP, β = 0.08, $p < .01$, and fewer EP behaviors, β = -0.13, $p < .01$. The association between baseline cortisol and CU behaviors approached significance, β = 0.06, $p < .10$.

Higher levels of harsh-intrusion and more emotion language use at 6 months predicted reduced behavioral fear reactivity at 15 months, β = -0.07, $p < .01$ and β = -0.06, $p < .01$, respectively. The association between higher levels of maternal sensitivity at 6 months and lower levels of baseline cortisol at 15 months approached significance, β = -0.07, $p < .10$. The indirect pathways from higher levels of harsh-intrusion and more emotion language use at 6 months to CP, EP, and CU behaviors in first grade through reduced behavioral fear reactivity at 15 months approached significance (all $p < .10$). The conditional residuals of first grade CP, EP, and CU behaviors were allowed to covary, $cov(e_{CP}\ e_{EP}) = -0.07$, $p < .001$, $cov(e_{CP}\ e_{CU}) = 0.05$, $p < .001$, $cov(e_{CU}\ e_{EP}) = -0.04$, $p < .001$. Figure 3.1 presents the significant pathways for the associations between maternal sensitivity, harsh-intrusion, emotion language use, and mental state talk at 6 months, baseline cortisol, cortisol reactivity, and behavioral fear reactivity at 15 months, and children's CP, EP, and CU behaviors at first grade. All standardized parameter estimates are shown in Table 3.2. All covariate associations can be found in Appendix C. The full path model allowed all exogenous variables to covary and model covariates were included in the final model. Control variables are not shown in Figure 3.1 for ease of reading.

Tests of Moderation

Main effect associations between maternal sensitivity, harsh-intrusion, mental state talk, and emotion language use at 6 months, baseline cortisol, cortisol reactivity, and behavioral fear reactivity at 15 months, and CP, EP, and CU behaviors at first grade were consistent with the findings in the mediation analyses. All standardized parameter estimates including estimates between the model covariates and model outcomes are shown in Table 3.3. Plots of the regions of significance for each interaction can be found in Appendix D. Significant interactions and simple slope analyses are presented in Table 3.4 and described in turn.

Tests of moderating relationships revealed significant interactions between maternal sensitivity and cortisol reactivity in the prediction of conduct problems, $\beta = -0.14$, $p < .01$. Simple slopes analyses (Figure 3.2) revealed that the negative relationship between maternal sensitivity and later CP was significant for individuals demonstrating high cortisol reactivity (+1 SD simple slope = −.112 [CI: -.18 to -.04], $p < .01$) but not low cortisol reactivity (-1 SD simple slope = .017 [CI: -.04 to .07], $p = .52$). Investigation of the RoS revealed that the association between sensitivity and CP becomes significant just below the mean of cortisol reactivity (mean simple slope = −.047 [CI: -.08 to -.01], $p < .05$) indicating that the negative association between maternal sensitivity at 6 months and children's later CP is stronger for individuals demonstrating average to high levels of cortisol reactivity at 15 months.

Additionally, harsh-intrusion and baseline cortisol interacted to predict conduct problems, $\beta = 0.10$, $p < .05$. Simple slopes analyses (Figure 3.3) revealed that the positive relationship between maternal harsh-intrusion and later CP was significant for individuals demonstrating high baseline cortisol (+1 SD simple slope = .064 [CI: .002 to .13], $p < .05$) but not low cortisol reactivity (-1 SD simple slope = -.034 [CI: -.09 to .02], $p = .21$). Investigation of the RoS showed that the association between harsh-intrusion and CP becomes significant just below one standard deviation above the mean of baseline cortisol (simple slope at RoS = .060 [CI: .001 to .12], $p < .05$) indicating that the positive association between maternal harsh-intrusion at 6 months and children's later CP is stronger for individuals demonstrating high levels of baseline cortisol at 15 months.

The interaction between mental state talk and baseline cortisol in the prediction of conduct problems was significant, $\beta = 0.07$, $p < .05$. However, simple slopes analyses revealed that the negative relationship between mental state talk and later CP was not significant for individuals demonstrating high baseline cortisol (+1 SD simple slope = .009 [CI: -.004 to .022], $p = .16$) or low baseline cortisol (-1 SD simple slope = -.008 [CI: -.018 to .002], $p = .10$). RoS revealed that the simple slope for the association between mental state talk and CP was only significant for participants at about two standard deviations below the mean of baseline cortisol (simple slope at RoS = -.02 [CI: -.035 to .00], $p < .05$). The results from this interaction were not plotted and will not be discussed as only six participants have moderator scores in this range.

Harsh-intrusion and baseline cortisol, $\beta = -0.10$, $p < .05$, interacted to predict EP behaviors. Simple slopes analyses (Figure 3.4) revealed that the relationship between harsh-intrusion and later EP behaviors was significant for individuals demonstrating high baseline cortisol (+1 SD simple slope = -.084 [CI: -.16 to -.004], $p < .05$) but not individuals low baseline cortisol (-1 SD simple slope = .063 [CI: -015 to .141], $p = .12$). RoS revealed that the simple slopes for the association between harsh-intrusion and EP behaviors are significant for participants just below one standard deviation above the mean on baseline cortisol (simple slope at high RoS = -.078 [CI: -.155 to -.002], $p < .05$), but also for individuals who are about two standard deviations below the mean of baseline cortisol (simple slope at low RoS = .125 [CI: .001 to 0.248], $p < .05$). However, the simple slope located at two standard deviations below the mean of baseline cortisol was not plotted and will not be discussed as only six participants have moderator scores in this range. Findings indicate that the negative association between harsh-intrusion at 6 months and children's later EP behaviors is significant for individuals demonstrating high levels of baseline cortisol at 15 months.

Additionally, emotion language use and baseline cortisol interacted to predict EP behaviors, $\beta = 0.08$, $p < .05$. Simple slopes analyses (Figure 3.5) revealed that the association between emotion language use and later EP behaviors was not significant for individuals demonstrating high baseline cortisol (+1 SD simple slope = .023 [CI: -.004 to .022], $p = .16$) or low baseline cortisol (-1 SD simple slope = -.031 [CI: -.018 to .002], $p = .07$). However, the RoS revealed that the simple slopes for the association between emotion language use and EP behaviors is significant for participants just beyond one standard deviation below the mean of baseline cortisol (simple slope at RoS -1.2 SD = -.039 [CI: -.035 to .00], $p < .05$) indicating a negative association between emotion language use at 6 months and children's later EP behaviors for individuals demonstrating very low levels of baseline cortisol at 15 months.

Mental state talk interacted with behavioral fear reactivity to predict CU behaviors, $\beta = 0.07$, $p < .05$. Simple slopes analyses (Figure 3.6) revealed that the association between mental state talk and later CU behaviors was not significant for individuals demonstrating high behavioral fear reactivity (+1 SD simple slope = -.003 [CI: -.012 to .006], $p = .51$) but was significant for individuals demonstrating low behavioral fear reactivity (-1 SD simple slope = -

.02 [CI: -.015 to .000], $p < .01$). RoS revealed that the simple slopes for the association between mental state talk use and CU behaviors is significant for participants at about half of one standard deviation above the mean of behavioral fear reactivity and below (simple slope at RoS +0.5 SD = -.008 [CI: -.035 to .00], $p < .05$) indicating a negative association between mental state talk at 6 months and children's later CU behaviors for individuals demonstrating average to low levels of behavioral fear reactivity at 15 months.

Discussion

Research on the early environmental (e.g., Wagner et al., 2016; Waller et al., 2015b) and biological (e.g., (Mills-Koonce et al., 2015; Wagner et al., 2015) correlates of later CP and CU behaviors contributes to the cumulating evidence that the development of these externalizing behavior problems is complex, and likely characterized by both moderated and mediated pathways to disorder. Not only are distinct patterns of behavioral and HPA axis functioning known to moderate the influences of early caregiving experiences on later behavioral outcomes (Conradt, Measelle, & Ablow, 2013; Wagner, Propper, et al., 2015), but caregiving experiences during infancy play an important role in setting the stage for later physiological and behavioral adaptation (Alink et al., 2008; Miller et al., 2007; Ruttle et al., 2011). Animal (Meaney & Szyf, 2005) and human (Gunnar & Quevedo, 2007) models suggest that responsive and sensitive maternal behaviors in infancy encourage and facilitate appropriate levels of behavioral and biological arousal, whereas harsh and intrusive maternal behaviors may disrupt infants' behavioral and biological responses to stress; both of which can have long-term consequences for the infant's developing stress physiology. The current study is the first to explicitly examine both moderated and mediated pathways to CP and CU behaviors using multiple measures of caregiving and biobehavioral functioning infancy. Findings that are inconsistent with study hypotheses will be discussed separately from those that are consistent with extant literature and expected associations.

Tests of Mediation

Consistent with the findings in study one, sensitive caregiving at 6 months predicted lower levels of CP and CU behaviors, and higher levels of EP behaviors, at first grade. Additionally, higher baseline cortisol at 15 months predicted elevated levels of CP and lower levels of EP behaviors. The association between baseline cortisol and CU behaviors in first grade was positive and approached significance. While the observed associations between baseline cortisol and CP and EP behaviors differ from much of the literature on older children suggesting links between low basal psychophysiology and stimulation-seeking behavior problems (Goozen et al., 1998; Raine, Reynolds, Venables, Mednick, & Farrington, 1998), findings in this study are consistent with research on links between elevated basal cortisol in early childhood and infancy and higher CP (e.g., Alink et al., 2012) and CU behaviors at later ages (Mills-Koonce et al., 2015).

Interestingly, findings from this study provide evidence that higher maternal sensitivity may partially contribute to lower baseline cortisol in infancy, which was found to predict higher levels of EP behaviors and lower levels of CP and CU behaviors. The near-significant association between sensitivity and baseline cortisol is consistent with work suggesting that supportive and responsive care may contribute to lower basal cortisol and better regulated neuroendocrine stress responses (Gunnar & Donzella, 2002; Mills-Koonce et al., 2011; Spangler, Schieche, & Ackermann, 1994). Research suggests that, under conditions of supportive care, lower baseline cortisol may play a beneficial developmental role in that it buffers or protects the developing brain and contributes to stress resilience (Gunnar & Quevedo, 2007). Although the indirect pathways from sensitivity on CP, EP, and CU behaviors through baseline cortisol only approached significance, this work provides preliminary motivation for future studies on the associations between early experience, the development of neuroendocrine systems, and CP and CU behaviors.

Contrary to study hypotheses, analyses also suggest that less RA-rated behavioral fear reactivity at 15 months is associated with more CP and CU behaviors and less EP behaviors in first grade. These findings are not surprising given the vast number of studies showing links between temperamental fearlessness and CP and CU behaviors in older children (Frick & White, 2008; Raine et al., 1998). A common view point posits that the under arousal of biological stress systems is aversive and individuals seek stimulation indiscriminately in order to raise arousal levels (Gatzke-Kopp, Raine, Loeber, Stouthamer-Loeber, & Steinhauer, 2002). However, the current findings do stand in contrast to a paper by Mills-Koonce and colleagues which reported higher levels of behavioral fear reactivity at 15 months for youth later high on CP and CU behaviors compared to participants who did not demonstrate elevated CP and CU behaviors.

The discrepancy in findings is most likely attributable to differences in the measurement of behavioral fear reactivity between studies. In the Mills-Koonce and colleagues paper, behavioral fear reactivity was coded during a 2-minute task during which infants were shown scary masks. In contrast, the current study measures behavioral fear reactivity using an unstructured observational coding approach where research assistants assess the infant's fear behaviors throughout a 2-hour home visit. At the very least, the intensity of these measures varies greatly in that the former likely includes elements of frustration and helplessness that are not present in the measurement approach used in the current study. The behavioral fear measure used in this study more closely imitates real world experiences as the infant is being observed when confronted by strange adults, novel tasks, and unexpected transitions. That is to say, it is possible that the measure used in the current study more accurately assesses fear-like behavior in a social context than does the paradigm used by Mills-Koonce and colleagues, which could provide better alignment with temperamental features associated with CP and CU behaviors such as fearlessness, stimulation-seeking qualities, and punishment insensitivity. Interestingly, the current study did not find associations between cortisol reactivity, assessed during fear and frustration tasks, and study outcomes suggesting that, in this case, behavioral measurement of fear reactivity across a lab visit may capture behavioral variability that is more likely to be encountered in everyday life than laboratory-based paradigms and therefore is a stronger predictor of CP and CU behaviors.

Also consistent with study one, harsh-intrusion predicted higher levels of CU behaviors and mental state talk predicted lower levels of CU behaviors at first grade. Further, mediation analyses indicate that harsh-intrusive caregiving in infancy predicted less behavioral fear reactivity at 15 months. The indirect paths from harsh-intrusion to CP, EP, and CU behaviors through behavioral fear reactivity approached significance. These findings are consistent with work suggesting that early experiences of harsh, intrusive, dysfunctional, or non-optimal parenting contribute to fearlessness and punishment insensitivity, attributes often associated with CP and CU behaviors in older children (Dadds & Salmon, 2003). Individual differences in fear conditioning in early childhood have been shown to predict aggressive behaviors in middle childhood (Gao, Raine, Venables, Dawson, & Mednick, 2010), and it’s possible that fearlessness in early childhood represents an adaptation to the experience of harsh and intrusive parenting that results in long-term risks for the development of CP and CU behaviors.

It is important to jointly consider the associations between elevated baseline cortisol and reduced behavioral fear reactivity, as measured in the current study, with later CP, EP, and CU behaviors. Although links between behavioral responses and cortisol functioning are typically observed in early life (Lewis & Ramsay, 2005; Ursache et al., 2014), similarity in the direction of effects of cortisol activity and behavior need not be expected given work that suggests a gradual disassociation of functioning and behavior as children age. For example, cortisol activity in response to frustration and fear tasks tends to decrease in frequency and magnitude over time, whereas behavioral responses do not (Gunnar & Quevedo, 2007; Gunnar et al., 2009). Researchers have posited that confounds between participant age and the type of stressor employed in developmental research contribute to a lack of concordance between behavior and HPA reactivity at later ages (Ursache et al., 2014). More likely is that the disassociation of HPA axis and behavior may be attributable to differential behavioral and HPA axis responses to early environmental experiences (Gunnar & Vazquez, 2001; Jansen, Beijers, Riksen-Walraven, & de Weerth, 2010).

Although mediation findings in the current study only approach significance, when taken together they provide evidence that insensitive, harsh, and intrusive parenting experiences in infancy may contribute to elevated baseline cortisol and reduced behavioral fear reactivity at 15 months, which in turn predict CP, EP, and CU behaviors at first grade. A few implications for these findings can tentatively be offered. First, they may provide additional evidence that HPA and behavioral functioning are differentially influenced by early experiences. Insensitive caregiving may contribute to elevated levels of circulating cortisol at baseline whereas harsh and intrusive behaviors might contribute to the blunting of behavioral fear reactivity. Second, when considered with findings of the biological correlates of CP and CU in older childhood and adolescence suggesting lower baseline cortisol and blunted fear reactivity, our findings might indicate that behavioral responses are more malleable or quicker to adapt to environmental input. Third, these findings add to the growing body of literature showing that the development of CU behaviors is influenced by early environmental experiences and is not solely determined by genetically mediated processes. At the very least, these findings are consistent with the theoretical concept of equifinality and provide initial insight into differential pathways to CP and CU behaviors based on a diversity of early experiences and their influences on biological and behavioral systems across time.

Tests of Moderation

There are theoretical models available that support the study of how biobehavioral functioning and early experiences interactively contribute to pathways to disorder. For example, the biological sensitivity to context model (BSC; Boyce & Ellis, 2005) posits that individuals demonstrating a susceptibility factor, typically characterized as psychobiological or behavioral hyper-activity or reactivity (Obradović & Boyce, 2009), may garner increased benefit from supportive and enriching environments but may be at risk for worse outcomes, particularly in the context of chronically unsupportive or harsh environments (Doom & Gunnar, 2013; Ellis & Boyce, 2011; Gunnar & Quevedo, 2007; McEwen & Wingfield, 2003). The results reported here from moderation analyses show that infants who exhibited average or higher cortisol reactivity across fear and frustration tasks at 15 months showed higher levels of CP in the context of insensitive parenting but lower levels of CP in the presence of sensitive parenting behaviors in infancy. Additionally, infants who exhibited baseline cortisol at or above one standard deviation above the mean at 15 months demonstrated higher levels of CP and fewer EP behaviors in the context of harsh and intrusive parenting in infancy. Taken together, results suggest that high levels of baseline cortisol and cortisol reactivity may exacerbate the deleterious effects of insensitive and harsh-intrusive caregiving on the development of CP and EP behaviors.

These findings add to the surprisingly sparse research on the extent to which individual differences in neuroendocrine functioning render infants more susceptible to the influences of early caregiving experiences on the development of CP and CU behaviors over time. The current study supports the possibility that infants who demonstrate elevated and reactive cortisol functioning are susceptible to early harsh, negative, and insensitive experiences with caregivers. In infancy, the sensitive and supportive parent serves as an external regulator by facilitating the development of children's self-regulatory capacities through structured and responsive care (Calkins et al., 2008; Perry et al., 2013). Insensitive parenting in infancy likely fails to provide external regulation and support which is particularly detrimental for infants who exhibit high levels of cortisol reactivity, thus contributing to elevated levels of CP in childhood. Furthermore, sensitive and contingent responding on the part of the parent socializes empathy, conscience, and expectations (Kochanska & Murray, 2013), and harsh-intrusive parenting likely undermines these processes for children with elevated baseline cortisol.

A large body of work suggests that, although reactive children may be more vulnerable to contextual risk, they may also show more adaptive responses to nurturing environments (Blair, 2002; Obradović et al., 2010; Obradović, 2012). Graphed estimates of the interaction between maternal sensitivity and cortisol reactivity indicate that infants exhibiting high cortisol reactivity develop lower levels of CP in the presence of sensitive caregiving in infancy. The idea that highly reactive infants are positioned to benefit from sensitive and supportive caregiving environments more than infants who are not reactive is consistent with theoretical and empirical writing on the topic, and the current findings suggest that infants who exhibit high cortisol have less behavior problems when they experience sensitive caregiving early in life.

Consistent with research linking fearless temperamental characteristics and CU behaviors in older children (K. a. Fanti, Panayiotou, Lazarou, Michael, & Georgiou, 2015), main effect associations suggest lower levels of behavioral reactivity as observed by research assistants during the 15 month home visit are associated with elevated CU behaviors in first grade. However, individuals demonstrating average to low levels of behavioral reactivity exhibit much lower levels of CU behaviors in the presence of high mental state talk in infancy, and much higher levels of CU behaviors in the absence of high mental state talk in infancy. Mental state talk is an important component of normative emotion socialization (McMahon & Meins, 2012) and supports the development of secure parent-child relationships (Laranjo et al., 2008). The current findings might suggest that mental state talk in infancy may facilitate engagement with the social environment and draw the infants' attention to internal processes, thus promoting the development of emotion understanding.

These findings are inconsistent with literature suggesting that genetically mediated fearlessness undermines normative socialization processes and inhibits the development of conscience (Dadds & Salmon, 2003; Frick & Viding, 2009). We can infer from these findings that infants who demonstrate average or lower levels of behavioral fear reactivity are susceptible to environmental influence, but that the extent to which these early experiences attenuate or exacerbate associations between fearlessness and later CU behaviors depends on the quality and type of socialization practices. Consistent with the findings of Centifanti and colleagues (Centifanti et al., 2015), our findings suggest that infancy is an important target for intervention, and highlight the importance of focusing on specific parental socialization practices in addition to broad parenting behaviors.

Findings Contrary to Expectations

As noted in study one, emotion language use is positively correlated with mental state talk and sensitivity caregiving, but also with harsh-intrusion, whereas mental state talk is negatively correlated with harsh-intrusion. The positive correlations between emotion language use and both parenting constructs contributed to two findings which were contrary to study hypotheses and extant literature. First, the association between emotion language use and behavioral fear reactivity were similar in direction and size to the association between harsh-intrusion and behavioral fear reactivity, such that more emotion language exposure at 6 months predicted less behavioral reactivity at 15 months. Second, high emotion language exposure at 6 months is associated with fewer EP behaviors at first grade, but only for infants who are one standard deviation below the mean of cortisol reactivity.

Two explanations for these contrary associations seem feasible. First, it is possible that the negative association between emotion language use and empathic-prosocial behaviors represents a compensatory response on the part of mothers. Pasalich and colleagues found that, contrary to expectations, negative emotion language use was positively associated with CU behaviors in an older sample of boys (Pasalich et al., 2014). The authors suggest that mothers may engage in more emotion language use in an attempt to compensate for deficits in emotional engagement and understanding. Research suggests that increased emotion language use does promote emotion-related behaviors and decreases CU behaviors in clinical settings (Dadds, Cauchi, Wimalaweera, Hawes, & Brennan, 2012), and it is possible that these effects influence parents' behaviors. A second explanation for these contrary findings is that the emotion language variable and the harsh-intrusion variable confer similar influence on outcomes when maternal sensitivity and mental state talk are included in analytic models. Mental state talk is likely to only be observed in the context of warm, engaged, and sensitive mother-infant interactions. However, because a wordless picture book was used to collect these data, it is theoretically possible to arrive at a high score on emotion language use either by sensitively elaborating on emotions during the task or by simply labeling emotions in a detached or intrusive manner, qualities which influence the effects of emotion language when variance associated with sensitive parenting qualities is accounted for by maternal sensitivity and mental state talk. Future research should incorporate measures of emotion language use in multiple settings and at multiple time points in order to more thoroughly investigate issues of temporality and causality in the links between emotion language use and CU behaviors.

Limitations and Implications

The results of this study should be considered in the context of the following limitations. First, it is a limitation that cortisol functioning and behavioral reactivity were only measured at 15 months. This approach facilitated the tests of mediation but may have limited the extent to which associations between early experience and cortisol functioning could be observed, as the allostatic processes associated with stress and cortisol functioning may unfold across a longer developmental period. Second, the current study cannot elucidate the potential confound between emotion labeling and emotion elaboration, something which likely contributes to the contrary findings discussed in the section above. Third, the use of a community sample in this study contributes to the generalizability of findings but also restricts the extent to which the findings can be directly compared to and integrated with studies using clinical samples of older children. Although this study provides evidence of multiple pathways to CP and CU, the use of an older, clinically enlisted, sample might yield stronger predictive associations. Fourth, there were moderately high correlations between CP, EP, and CU behaviors which contributed to some similarities in findings, particularly in models examining the direct influences of parenting. The similar pattern of predictors at this age may offer insight into the extent to which these constructs, which are clearly distinct at later ages, share a common set of predictors early in life which may contribute to a conceptual or methodological lack of differentiation at these ages. Fifth, the relatively limited amount of available research on the differential influences of early caregiving on the development of EP versus CU behaviors limits the extent to which the current study can substantially nest the current findings in a broader understanding of the etiology of these outcomes.

Despite the limitations, the current study makes important contributions to our understanding of the development of CP and CU behaviors by incorporating diverse measurement of early caregiving experiences as well as multiple measures of behavioral and biological functioning in infancy. Findings suggest that a diversity of early caregiving experiences influence the development of CP and CU behaviors, and that the role of parenting in infancy on CP and CU behaviors may partially depend on infants' cortisol functioning and behavioral reactivity. Specifically, the current findings join a substantial body of work which identifies elevated baseline cortisol and cortisol reactivity as a potential moderator of early experiences. We provide evidence that higher baseline and cortisol reactivity may enhance the positive influences of sensitive caregiving as well as exacerbate the negative influences of harsh-intrusive parenting on the development of CP and CU behaviors. Study two also highlights the importance of emotion language use and mental state talk in infancy and identifies mental state talk as a potential focus of intervention, particularly for infants who may be at increased risk for

CU behaviors due to below average behavioral fear reactivity. Finally, although associations only approached significance, this study suggests that the early caregiving environment does influence infants' biological and behavioral functioning which, in turn, has consequences for eventual externalizing psychopathology. Taken together, this study offers justification for future research on the development of CP, and particularly CU behaviors, in a developmental framework.

This study provides motivation for future research in the following areas. First, we failed to find strong links between cortisol functioning and early parenting experiences, despite evidence of these associations in previous studies (Blair et al., 2008; Dadds et al., 2015; Ruttle, Shirtcliff, Armstrong, Klein, & Essex, 2013)**.** The inclusion of longitudinal measurement of cortisol may better position researchers to find these associations. Second, the current study found that high baseline cortisol but low behavioral fear reactivity were associated with later CP and CU behaviors, suggesting the potential for multiple developmental pathways to these behaviors. These findings align with theory differentiating between primary and secondary subtypes of adult psychopathy. The primary subtype is associated with fearlessness, low anxiety, and is hypothesized to represent a genetically-mediated predisposition which might manifest early in development. In contrast, the secondary subtype is associated with disinhibition, high anxiety, and is thought to reflect an adaptation to harsh and abusive rearing environments (Kimonis, Frick, Cauffman, Goldweber, & Skeem, 2012; Lykken, 1957; Waller, Baskin-Sommers, & Hyde, 2016). The current findings should prompt future research that specifically investigates these potentially distinct etiological pathways in early childhood.

Third, there is some evidence that variations in HPA axis activity alter the effects of parenting on the development of neural regions and networks associated with behavioral and emotional development. Adverse parenting experiences may contribute to changes in both volume and connectivity of areas implicated in CP and CU behaviors in older samples (Jovev et al., 2014; Lupien, McEwen, Gunnar, & Heim, 2009). Neurological research shows that infants of highly sensitive and responsive mothers exhibit greater left frontal brain electrical activity patterns associated with emotionality and approach, whereas infants of insensitive mothers exhibit greater right frontal activity patterns which are associated with negative emotionality (Hane & Fox, 2006). Further, work with nonhuman primates has established links between greater left frontal activity and lower cortisol levels (Kalin, Larson, Shelton, & Davidson, 1998), suggesting that investigating the role of neurological functioning in the context of early parenting experiences would contribute to our understanding of the development of CP and CU behaviors, and the role of the HPA axis in these processes.

Relatedly, developmental research focused on understanding etiological pathways to disorder have expanded to simultaneously incorporate multiple biological systems and have also begun to examine the extent to which epigenetic processes mediate the links between early stress exposure and the etiology of externalizing psychopathology. For example, adverse experiences have been shown to contribute to elevations in baseline cortisol, possibly via methylation of glucocorticoid receptor sites (Dadds et al., 2015). Further, persistently elevated cortisol, often reflecting exposure to ongoing threatening or stressful environments (McEwen, 1998b), may result in an overall down-regulation from hyper- to hypo- HPA activity across time (Hertzman & Boyce, 2010; McEwen & Seeman, 1999). The current study should motivate future work which incorporates multiple levels of analyses across time and future research should attempt to thoughtfully integrate measures of biological functioning from multiple systems.

Summary

A fundamental tenant of contemporary developmental science is that key influential factors at each level of functioning, including genetics, biology, caregiving-relationships, and social environment, probabilistically interact to support the emergence of more complex and novel systems (Cairns, 1992; Cicchetti & Toth, 2009; Gottlieb, 2007; Sameroff, 2010). Our ability to formulate comprehensive etiological models of psychopathology depends on the extent to which researchers recognize and attempt to account for the organization, integration, and interaction of multiple levels of influences early in life (Cicchetti & Richters, 1993). This dissertation provides support for this view of developmental science by demonstrating the importance of examining multiple levels of behavioral and biological functioning, incorporating multiple forms of measurement approaches, and embracing analytic frameworks that allow for multi- and equi-finality and support causal inference.

These studies also make small, but substantial, contributions to a body of translatable knowledge aimed at informing approaches to intervention, an important goal of developmental science. The majority of the evaluative work on these interventions suggests that decreases in CP and CU symptoms are primarily accounted for by reductions in harsh/inconsistent parenting and increases in sensitive parenting practices (Hawes & Dadds, 2006). When considered alongside work suggesting that the most effective interventions are typically administered early and are family based (Hawes et al., 2014), research indicating that the positive effects of many interventions are mediated by changes in parenting practices (Deković et al., 2012) provides motivation for continued research investigating the associations between observational measures of caregiving in infancy and the development of CP and CU behaviors. The current findings suggest that mothers' emotion socialization may serve as important intervention targets, in addition to sensitivity and harsh-intrusion.

Taken together, results from study one and study two suggest that parenting in infancy plays an important role in the development of CP and CU behaviors, that multiple qualities of the early caregiving environment are influential, and that their influence likely depends on the outcomes of interest. Furthermore, the processes through which aspects of early caregiving influence CP and CU behaviors partially depend on both behavioral and biological functioning, both at baseline and in response to external stimuli. Finally, this dissertation contributes to the widely accepted view that the use of observational measurement of parent and child behaviors, diverse psychobiological measurement, and longitudinal designs are integral for understanding the complexities of family systems and child development. The road to fully understanding the etiology of complex maladaptive behaviors is a long one, and achieving the collective goals put forth by developmental science and a developmental psychopathology perspective will require the continued efforts of multidisciplinary teams working to thoughtfully integrate diverse literatures, measurement approaches, and research designs. Scientific study must strive to produce translatable knowledge to inform the development and evaluation of methods for preventing and ameliorating psychopathological outcomes as well as supporting children's healthy emotional and behavioral development (Cicchetti, 2014). It is my hope that the research in this dissertation makes a meaningful contribution towards this cause.

Table 3.1 Means, Standard Deviations, Correlation.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. Race (AA = 1)	-																				
2. Gender (Male = 1)	-.01	-																			
3. State (PA = 1)	.61*	-.07*	-																		
4. Ed. (HS+ = 1)	-.07*	-.01	-.10*	-																	
5. Age (1st)	-.16*	-.01	-.04	.03	-																
6. Dis. to Lim. (6m)	.24*	-.03	.21*	-.07^	.02	-															
7. Dis. to Nov. (6m)	.33*	-.11*	.26*	-.18*	.01	.37*	-														
8. Irritability (6m)	-.12*	-.03	-.17*	.05	.04	.09*	.12*	-													
9. Mat. GSI (6m)	.02	-.03	-.03	-.05	-.01	.19*	.14*	.02	-												
10. Time of Day	-.03	.03	.02	.02	.09*	.06	-.03	.08*	-.08*	-											
11. Body Temp.	-.12*	-.04	-.24*	.04	.07^	-.01	-.04	.06^	.07	-.09*	-										
12. Sensitivity (6m)	-.36*	-.03	-.25*	.19*	.05	-.17*	-.23*	.07	-.02	.03	.05	-									
13. Harsh-Intrusion (6m)	.35*	.03	.26*	-.12*	.01	.12*	.16*	-.07*	.09*	-.01	-.06^	-.18*	-								
14. Emotion Lang. (6m)	.07*	-.01	.07*	.05^	.01	-.01	-.07^	-.06^	.02	.02	-.01	.23*	.10*	-							
15. Mental State (6m)	-.16*	-.03	-.21*	.11*	-.08	-.10*	-.15*	.06^	-.01	-.01	.07^	.38*	-.06^	.12*	-						
16. Baseline Cort. (15m)	.12*	.02	.02	-.07^	-.07	.04	.06	-.02	-.06	-.19*	-.07	-.09*	.04	-.01	.01	-					
17. Cort. Reac. (15m)	-.09*	-.05	-.07^	-.04	.08^	-.03	.08^	.03	.02	-.03	.06^	.09	-.02	-.04	-.02	-.32*	-				
18. Fear Reac. (15m)	-.15*	-.04	-.14*	.06^	.13*	.03	-.05	.05	-.04	.04	.11*	.07^	-.09*	-.04	.05	-.02	.05	-			
19. CP (1st)	-.07	.04	-.05	-.08	-.03	.12*	.05	.01	.18*	-.05	.08	-.10*	.04	-.06^	-.05	.07^	-.03	-.08*	-		
20. EP Behaviors (1st)	-.13*	-.14*	-.10*	.06^	.01	-.10*	-.14*	.05	-.02	.07	.02	.14*	-.05	.05	.08*	-.12*	.03	.10*	-.37*	-	
21. CU Behaviors (1st)	.08*	-.01	.04	-.08*	-.07^	.12*	.07^	-.03	.12*	-.03	-.01	-.17*	.11*	-.06	-.14*	.07^	-.04	-.11*	.50*	-.22*	-
Number	1226	1229	1229	1229	1229	956	1176	1139	1191	1149	1114	1123	1123	1138	1138	988	888	1136	1078	1080	1080
Means	1.8	.43	.51	.60	.89	86.7	3.46	2.81	3.06	50.5	98.1	2.89	2.41	2.13	2.89	-2.01	.17	6.04	.27	1.92	.50
Standard Deviation	1.40	.495	.500	.491	.308	3.30	.803	.999	1.02	10.6	.984	.792	.762	1.42	2.55	.748	.661	.960	.361	.550	.353

Note: ^$p < .05$, *$p < .01$; income-to-needs is reported as a mean from 6 to 90 months; PA = Pennsylvania; AA = African American; HS = High School; CP = Conduct Problems; EP = Empathic-Prosocial; CU = Callous.

Table 3.2. Standardized Parameter Estimates for Mediation Model

Main Effects			*Indirect Pathways* [+]	
	β	95% CI	*Pathway*	*β (p-value)*
Sensitivity (6m) → CP	-.09*	-.07 to -.06	Harsh-Intr. → Fear → CP	.008^ (p = .07)
Harsh-Intrusion (6m) → CP	.02	-.02 to .04	Emo. Lang. → Fear → CP	.007^ (p = .08)
Emotion Language (6m) → CP	-.03	-.02 to .01	Harsh-Intr. → Fear → CU	.008^ (p = .06)
Mental State Talk (6m) → CP	-.01	-.01 to .01	Emo. Lang. → Fear → CU	.007^ (p = .06)
Baseline Cortisol (15m) → CP	.08*	.03 to .07	Harsh-Intr. → Fear → EP	-.008^ (p = .05)
Cortisol Reactivity (15m) → CP	.02	-.02 to .04	Emo. Lang. → Fear → EP	-.007 (p = .08)
Fear Reactivity (15m) → CP	-.11**	-.06 to -.01		
Sensitivity (6m) → EP	.09*	.01 to .11		
Harsh-Intrusion (6m) → EP	.01	-.04 to .05		
Emotion Language (6m) → EP	-.019	-.03 to .01		
Mental State Talk (6m) → EP	-.01	-.01 to .01		
Baseline Cortisol (15m) → EP	-.13**	-.14 to -.03		
Cortisol Reactivity (15m) → EP	-.03	-.08 to .03		
Fear Reactivity (15m) → EP	.10**	.02 to .09		
Sensitivity (6m) → CU	-.09**	-.06 to -.01		
Harsh-Intrusion (6m) → CU	.09**	.01 to .07		
Emotion Language (6m) → CU	-.02	-.02 to .08		
Mental State Talk (6m) → CU	-.08*	-.03 to -.01		
Baseline Cortisol (15m) → CU	.06^	-.01 to .05		
Cortisol Reactivity (15m) → CU	.03	-.03 to .03		
Fear Reactivity (15m) → CU	-.11**	-.06 to -.01		
Sensitivity (6m) → B. Cortisol	-.07^	-.14 to .00		
Harsh-Intr. (6m) → B. Cortisol	.03	- .06 to .07		
Emo. Lang. (6m) → B. Cortisol	-.03	-.06 to .02		
Mental State Talk (6m) → B. Cortisol	.06	-.06 to .04		
Sensitivity (6m) → Cortisol R.	.02	-.04 to .09		
Harsh-Intr. (6m) → Cortisol R.	.02	-.04 to .09		
Emo. Lang. (6m) → Cortisol R.	-.03	-.05 to .01		
Mental State Talk (6m) → Cortisol R.	-.06	-.03 to .04		
Sensitivity (6m) → Fear	.03	-.04 to .1		
Harsh-Intr. (6m) → Fear	-.07*	-.18 to -.01		
Emo. Lang. (6m) → Fear	-.06*	-.08 to -.04		
Mental State Talk (6m) → Fear	.03	-.01 to .03		

Notes: ^$p < .10$, * $p < .05$, ** $p < .01$; [+]Only indirect pathways $p < .10$ shown; all covariate associations can be found in Appendix C.

Table 3.3. Standardized Parameter Estimates and Confidence Intervals

	CP β (95% CI)	EP Behaviors β (95% CI)	CU Behaviors β (95% CI)
Child Gender (Male = 1)	0.070* (0.007 to 0.090)	-0.147** (-0.224 to -0.089)	-0.012 (-0.048 to 0.032)
Child Age in First Grade	-0.034 (-0.011 to 0.004)	0.005 (-0.011 to 0.012)	-0.056 (-0.013 to 0.001)
Distress to Limitations (6m)	0.099* (0.010 to 0.077)	-0.073* (-0.096 to -0.004)	0.061 (-0.004 to 0.055)
Distress to Novelty (6m)	-0.04 (-0.042 to 0.012)	-0.05 (-0.068 to 0.012)	0.002 (-0.023 to 0.024)
Irritability (6m)	-0.011 (-0.029 to 0.022)	0.035 (-0.016 to 0.051)	-0.024 (-0.031 to 0.016)
Maternal Mental Health Severity	0.154** (0.003 to 0.008)	0.025 (-0.002 to 0.005)	0.095* (0.001 to 0.006)
Education (HS+ = 1)	0.008 (-0.090 to 0.111)	-0.007 (-0.142 to 0.116)	-0.007 (-0.101 to 0.084)
Time-of-day (15m)	-0.029 (-0.003 to 0.001)	0.041 (-0.001 to 0.005)	0.014 (-0.001 to 0.002)
Body Temperature (15m)	0.001 (-0.020 to 0.021)	0.004 (-0.030 to 0.036)	0.025 (-0.010 to 0.029)
Maternal Sensitivity (6m)	-0.104** (-0.083 to -0.012)	0.086** (0.012 to 0.108)	-0.087* (-0.067 to -0.008)
Harsh-intrusion (6m)	0.031(-0.021 to 0.052)	-0.014 (-0.060 to 0.039)	0.093** (0.012 to 0.075)
Mental State Talk (6m)	0.005 (-0.007 to 0.008)	-0.003 (-0.015 to 0.014)	-0.091** (-0.019 to -0.003)
Emotion Language Use (6m)	-0.039 (-0.025 to 0.005)	-0.01 (-0.030 to 0.023)	-0.032 (-0.023 to 0.008)
Baseline Cortisol (15m)	0.117** (0.013 to 0.093)	-0.124** (-0.140 to -0.033)	0.072 (-0.007 to 0.069)
Cortisol Reactivity (15m)	0.042 (-0.021 to 0.063)	-0.02 (-0.078 to 0.046)	0.010 (-0.033 to 0.043)
Behavioral Fear Reactivity (15m)	-0.115** (-0.072 to -0.014)	0.108** (0.025 to 0.099)	-0.126** (-0.068 to -0.021)
Sensitivity X Baseline Cortisol	-0.073 (-0.106 to 0.020)	-0.063 (-0.139 to 0.025)	-0.005 (-0.054 to 0.049)
Sensitivity X Cortisol Reactivity	-0.139** (-0.169 to -0.022)	0.011 (-0.088 to 0.112)	-0.046 (-0.083 to 0.024)
Sensitivity X Fear Reactivity	0.034 (-0.027 to 0.060)	0.023 (-0.034 to 0.068)	0.036 (-0.015 to 0.047)
Harsh-Intrusion X Baseline Cortisol	0.100* (0.006 to 0.122)	-0.098* (-0.178 to -0.015)	0.036 (-0.026 to 0.071)
Harsh-Intrusion X Cortisol Reactivity	-0.013 (-0.072 to 0.054)	-0.001 (-0.091 to 0.089)	0.009 (-0.050 to 0.062)
Harsh-Intrusion X Fear Reactivity	-0.031 (-0.060 to 0.029)	0.042 (-0.015 to 0.081)	0.016 (-0.026 to 0.041)
Mental State X Baseline Cortisol	0.067* (0.000 to 0.022)	-0.069 (-0.039 to 0.003)	-0.048 (-0.019 to 0.003)
Mental State X Cortisol Reactivity	0.045 (-0.003 to 0.021)	-0.018 (-0.030 to 0.019)	-0.028 (-0.017 to 0.007)
Mental State X Fear Reactivity	-0.011(-0.010 to 0.007)	-0.038 (-0.025 to 0.008)	0.070* (0.001 to 0.017)
Emotion Language X Baseline Cortisol	-0.049 (-0.035 to 0.006)	0.077* (0.002 to 0.069)	-0.028 (-0.028 to 0.012)
Emotion Language X Cortisol Reactivity	0.016 (-0.012 to 0.022)	0.047 (-0.010 to 0.052)	0.011 (-0.014 to 0.020)
Emotion Language X Fear Reactivity	-0.034 (-0.035 to 0.008)	0.051 (-0.017 to 0.079)	-0.047 (-0.044 to 0.009)

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

Table 3.4. Simple Slopes for Moderation Analyses

Simple Slopes	Conduct Problems *b* (95% CI)	EP Behaviors β (95% CI)	CU Behaviors β (95% CI)
Sensitivity | Cortisol Reactivity			
Plus One Standard Deviation	-.112** (-.180 to -.040)	-	-
Minus One Standard deviation	.017 (-.040 to .070)	-	-
At RoS: ~Mean Cortisol Reactivity	-.047* (-.080 to -.010)	-	-
Mental State | Baseline Cortisol			
Plus One Standard Deviation	.009 (-.004 to .022)	-	-
Minus One Standard deviation	-.008 (-.018 to .002)	-	-
At RoS: -2 SD	-.02* (-.035 to .000)	-	-
Harsh-Intrusion | Baseline Cortisol			
Plus One Standard Deviation	.064* (.002 to .130)	-.084* (-.16 to -.004)	-
Minus One Standard deviation	-.034 (-.09 to .020)	.063 (-015 to .141)	-
At RoS High:	.060* (.001 to .120)	-.078* (-.155 to -.002)	-
At RoS Low:	-	.125* (.001 to 0.248)	
Emotion Language | Baseline Cortisol			
Plus One Standard Deviation	-	.023 (-.004 to .022)	-
Minus One Standard deviation	-	-.031 (-.018 to .002)	-
At RoS: -1.2 SD	-	-.039* (-.035 to .000)	-
Mental State | Fear Reactivity			
Plus One Standard Deviation	-	-	-.003 (-.012 to .006)
Minus One Standard deviation	-	-	-.02* (-.015 to .000)
At RoS: 0.5 SD	-	-	-.008* (-.035 to .000)

Notes: * $p < .05$, ** $p < .01$; RoS: Region of Significance

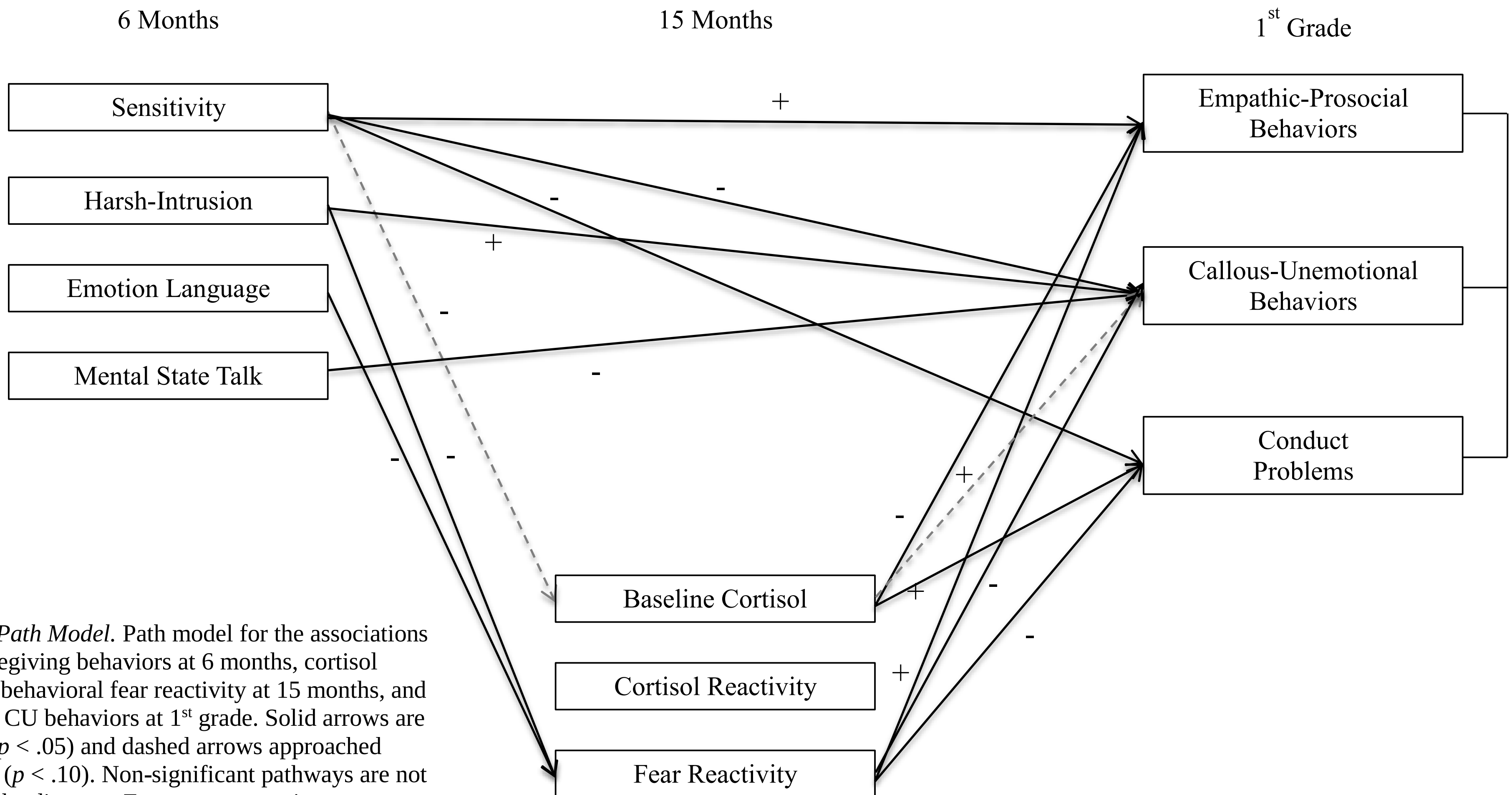


Figure 3.1. Path Model. Path model for the associations between caregiving behaviors at 6 months, cortisol activity and behavioral fear reactivity at 15 months, and CP, EP, and CU behaviors at 1st grade. Solid arrows are significant ($p < .05$) and dashed arrows approached significance ($p < .10$). Non-significant pathways are not included in the diagram. Exogenous covariates are not included in the diagram but were allowed to covary. Only directionality of associations are presented in this figure due to space restrictions. All model parameters can be found in Table 2. The indirect pathways from harsh-intrusion and emotion language to the three outcomes through fear reactivity all approached significance ($p < .10$).

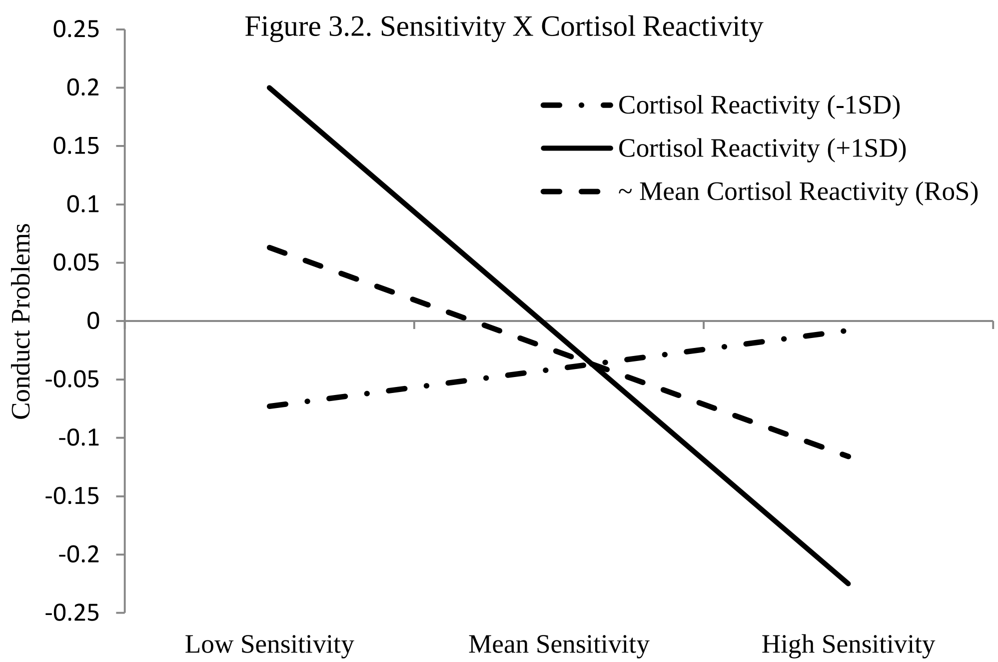
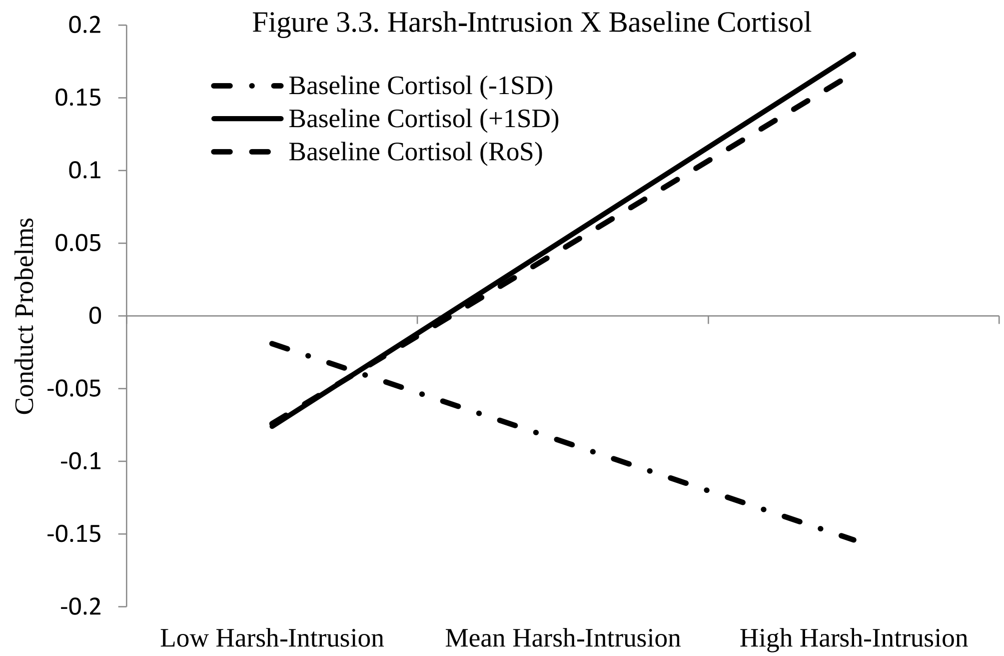


Figure 3.2. Sensitivity X Cortisol Reactivity

Figure 3.3. Harsh-Intrusion X Baseline Cortisol



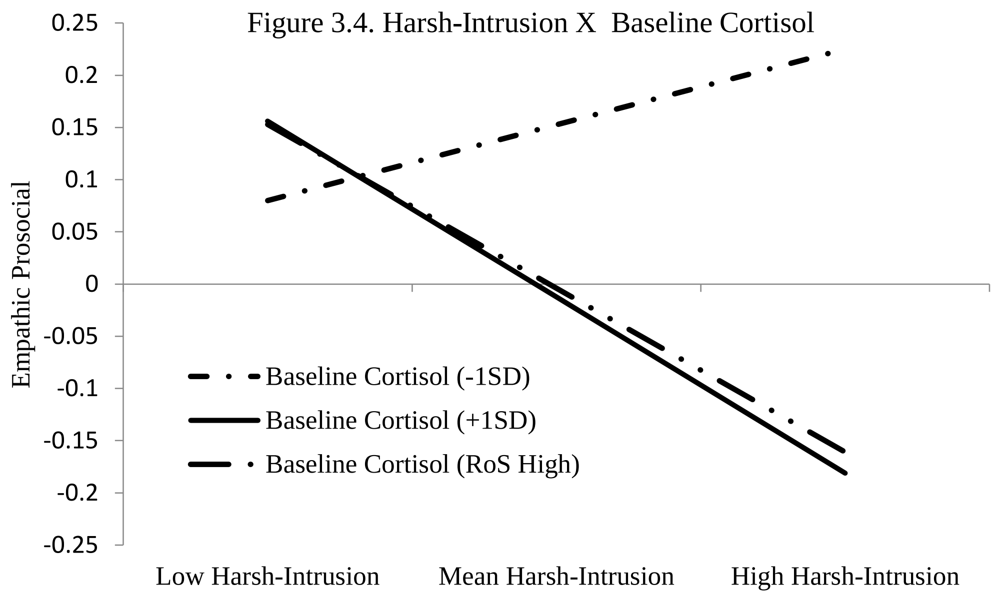


Figure 3.4. Harsh-Intrusion X Baseline Cortisol

Figure 3.5. Emotion Language X Baseline Cortisol

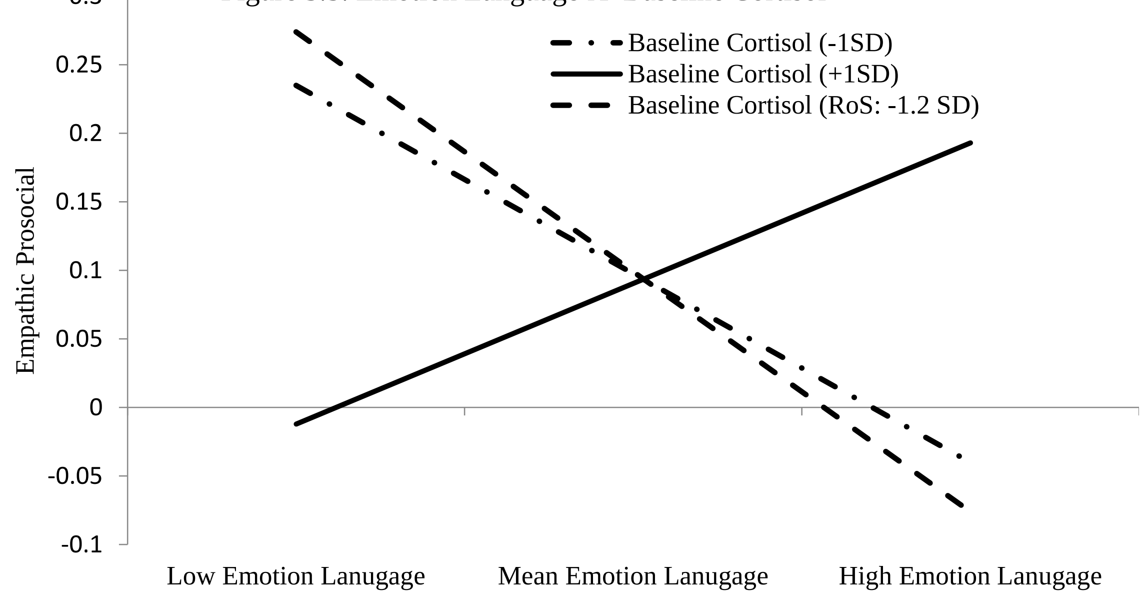
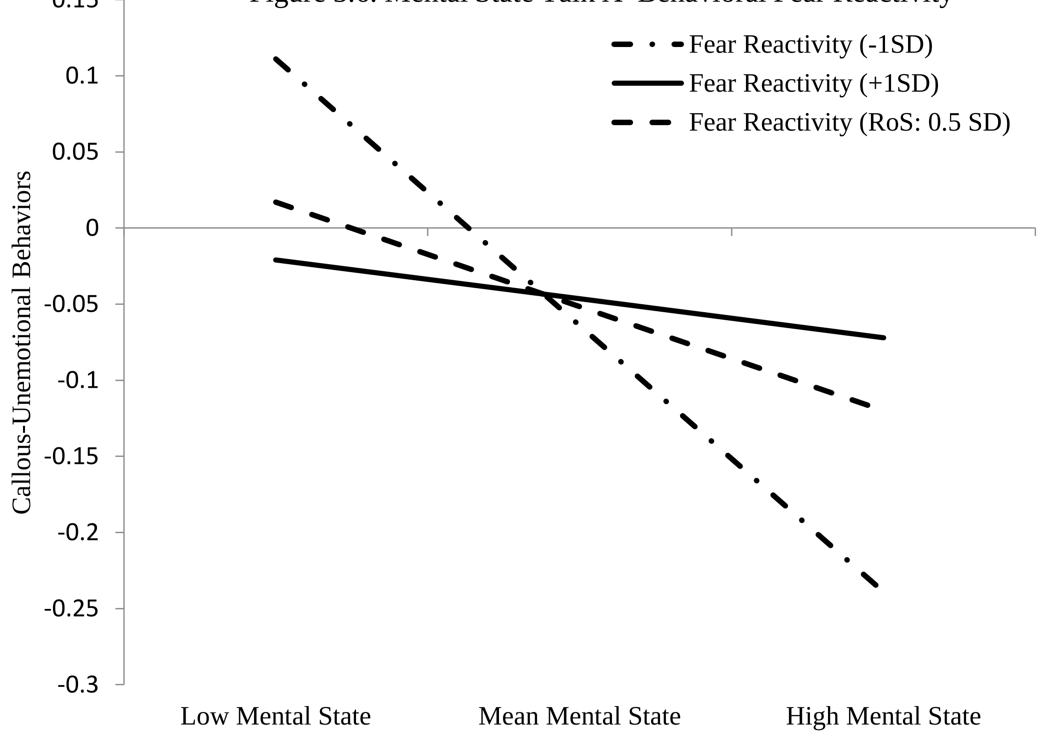


Figure 3.6. Mental State Talk X Behavioral Fear Reactivity



APPENDIX A: METHODOLOGICAL AND ANALYTIC CHALLENGES IN STUDY ONE

There has been interest in downward extensions of CU behaviors to child and adolescent samples for over a decade (Frick & Viding, 2009). This is evidenced partly by the inclusion of a “limited prosocial emotions” specifier in the revised version of the DSM-5. This specifier “applies to those individuals with a more serious pattern of behavior characterized by a callous and unemotional interpersonal style across multiple settings and relationships” and is intended to facilitate individualized treatment approaches and research (American Psychiatric Association, 2013). Despite the recent revision of the DSM-5 to include this specifier and increasing inclusion of CU behaviors in developmental and psychopathological research, there is an ongoing debate in the literature as to the best approach for measuring CU behaviors in childhood (Ray, Frick, Thornton, Steinberg, & Cauffman, 2015; Willoughby et al., 2014). As of a decade ago, the Antisocial Process Screening Device (APSD; Hare & Neumann, 2008) was among the most frequently used questionnaires to measure CU behaviors in childhood. Frick (2004) developed the Inventory of Callous-Unemotional traits (ICU) to address the limitations of the ASPD which included a limited number of items on the CU subscale, poor internal consistency, and limited scale variability (3-point Likert-type ratings). The ICU, which is comprised of a mix of 24 positively and negatively worded items assessed on a 4-point Likert-type rating scale, is now widely used in research (Kimonis et al., 2008).

Initial investigations into the factor structure of the ICU suggested a bifactor model, which included a general factor on which all items loaded and three specific subfactors (i.e., callous, uncaring, and unemotional). This factor model supported the creation of both overall and subscale scores and demonstrated consistency across ages and cultures (Essau et al., 2006; Fanti et al., 2009; Roose et al., 2011). However, more recent work has reported mixed results regarding the factor structure of the ICU, with researchers providing evidence for models ranging between two and five factors (Feilhauer, Cima, & Arntz, 2012; Kahn, Byrd, & Pardini, 2013; Kimonis, Branch, Hagman, Graham, & Miller, 2013). Based on a series of item response theory analyses, a recent paper in *Psychological Assessment* recommends using the total ICU as a continuous measure of CU behaviors and does not recommend continued use of the subscale structure that has been reported in multiple past studies (Ray et al., 2015).

Willoughby and colleagues (2014) recently considered five CFA models to examine the factor structure of the ICU using the Family Life Project Sample – a one factor model, a two-factor model, a three-factor model, and two bifactor models. Findings suggested that CU behaviors are best captured in the FLP sample using a two-factor model which distinguishes between empathic-prosocial (EP) and callous-unemotional (CU) behaviors (Willoughby et al., 2014). The EP and CU factors were shown to be moderately negatively correlated and were primarily delineated by the positively and negatively worded items which is consistent with published findings in other samples (Hawes et al., 2014; Houghton, Hunter, & Crow, 2012). Guided by this measurement work with the FLP sample, continuous manifest measures of CP, EP, and CU behaviors will be used as outcomes in this dissertation. As there is no evidence available to suggest differential findings across these outcomes in the literature, the introduction sections for study one and study two do not distinguish between EP and CU outcomes, but instead present literature that considers CU behaviors as a single construct. Study hypotheses for EP and CU behaviors will only differ in direction given the valence of the items used to create these outcomes.

This study will use manifest mean scores as measures of conduct problems, EP, and CU behaviors, rather than latent factors, in order to facilitate the use of the estimator MLR (Robust

Maximum Likelihood). In addition to providing parameter estimates with standard errors and chi-square test statistics which are robust to non-normality and non-independence of observations, MLR is an accurate and efficient estimation method when accommodating complex sampling weights and designs (Asparouhov, 2005). MLR also yields unbiased estimates under both the MCAR (missing completely at random) and MAR (missing at random) assumptions, whereas WLSMV cannot given its pairwise variable orientation (Enders, 2001; Mplus User's Guide).

The use of multiple self-report and maternal-report measures in social science research introduces the potential for method bias, or observed covariation between constructs that is due to shared measurement methodologies (Campbell & Fiske, 1959; Podsakoff, MacKenzie, & Podsakoff, 2012). This dissertation implements a number of procedural remedies to address the potential for different sources of method bias. First, focal predictor and outcome variables are obtained from different sources. Observational methods were used to collect all of the focal predictors, eliminating the potential for method bias. Second, there is a large temporal separation between maternal-report covariates assessed in infancy and maternal-reports of behavior problems assessed in first grade. Increased temporal separation reduces the respondent’s ability and/or motivation to allow earlier responses to influence subsequent responses (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Overall, high-quality, intensive observational measures of covariates, predictors, and outcomes apply multi-method approaches to data collection that reduce the likelihood of Type I errors due to same-source biasing of data across measures.

APPENDIX B: METHODOLOGICAL AND ANALYTIC CHALLENGES IN STUDY TWO

An important question for study two of this dissertation is how best to treat the measures of behavioral fear reactivity and cortisol activity and reactivity in theoretical and analytic models. The current study uses a specific measure of behavioral fear reactivity observationally assessed across an entire home visit whereas measures of cortisol reactivity are domain-general in the sense that they are derived from children's specific responses across both fear and frustration tasks. Because of this, the current study treats infants' baseline cortisol, cortisol reactivity, and behavioral fear reactivity as distinct, yet related, measures of physiological functioning and stress response to fear and frustration related tasks, and argues that the inclusion of both HPA functioning and behavioral reactivity in developmental research provides a clearer picture of biobehavioral functioning in infancy than does the use of a single measure (Calkins, 2011). This approach is supported by the published analyses that demonstrate concordance between measures of behavioral fear reactivity, baseline cortisol, and cortisol reactivity at 15 months in the Family Life Project sample (Mills-Koonce et al., 2015).

The current study originally proposed to use a use a measure of behavioral fear reactivity coded during the presentation of scary masks to the infant during the 15 month home visit. However, upon examination of descriptive statistics, it was observed that over one-third of the sample (n = ~350) received a score of zero indicating they demonstrated no fear reactivity. Because this variable was characterized by a zero-inflated distribution, there were a number of issues associated with estimating the hypothesized mediation model proposed in study two. After consultation with the dissertation committee chair and advisors, I've replaced this variable with another measure of observed behavioral fear reactivity assessed in the FLP during the 15 month home visit. The Infant Behavior Record (IBR; Bayley, 2006) was adapted to allow the research assistants to rate the infants' behavior across the 2.5 hour home visit. The IBR items included ratings on social approach, positive affect, attention, irritability, and fear reactivity. Whereas the measure proposed initially assessed infants' fear reactivity in response to scary masks, the IBR captures global fear reactivity and fear behaviors in the context of interacting with strangers (RAs) as well as transitioning between and participating in various tasks. Although the context of measurement is different, my advisors and I feel that using the IBR as a measure of behavioral fear reactivity preserves a number of the benefits of the previous measure (e.g., observational measurement) and aligns nicely with the literature reviewed in the introduction.

The decision to treat measures of behavioral fear reactivity, baseline cortisol, and cortisol reactivity as separate manifest variables in the current study has implications for the analytic approach. The first question proposed in this study regarding the extent to which these biobehavioral measures mediate the relationships between early caregiving experiences and children's later CP and CU behaviors can be addressed in a path model where each behavioral and psychobiological measure is included in the model simultaneously. The second study question regarding the extent to which children's behavioral fear reactivity and cortisol activity and reactivity across both fear and frustration tasks moderate the influences of early caregiving on later CP and CU behaviors presents more of an analytic challenge than does the first question.

One possible approach to testing the extent to which the predictive relationships between early parenting and emotion socialization behaviors and later behavior problems depend on cortisol activity and behavioral reactivity would be to conduct a latent profile analysis (LPA; (Magidson & Vermunt, 2004). An LPA approach is interesting to consider because it would yield a categorical latent variable with a given number of levels which would represent a profile or pattern of joint biobehavioral functioning informed by the three indicators. This latent categorical variable could then be used to estimate a multiple-group SEM which could test the extent to which the associations between early caregiving and later CP and CU behaviors vary as a function of reactivity group membership. However, in addition to issues related to outputting group membership given the probabilistic nature of assignment in LPA, there are also limitations to adopting this method given the inconsistencies in measurement across cortisol and behavior in the current study, as well as the evidence that behavioral reactivity and cortisol functioning represent distinct, yet related, processes as children age (M. Gunnar & Quevedo, 2007).

For informative purposes, an LPA was used to identify distinct groups of children based on behavioral fear reactivity, baseline cortisol, and cortisol reactivity at 15 months. Model selection was guided by the Bayesian information criterion (BIC; lower is better), Akaike information criterion (AIC; lower is better), entropy (a measure of class separation; higher is better), and the Lo, Mendel, Rubin (LMR) statistic which compares *k*-1 classes against *k* classes. A 2-class solution, which would be preferred in order to facilitate tests of moderation using a multiple-group approach, was not found to be the optimal classification of the data (AIC: 3985.97; BIC: 4035.993; entropy: 0.719). The AIC and BIC decreased by over 100 until the 5-class model, after which each additional class resulted in a similar reduction of the AIC and BIC of about 50 until the 8-class solution, which was the final model estimated. Entropy was highest for the 7-class solution (entropy: 0.80) but the LMR did not support the 7-class solution over the 6-class solution, which *was* favored over the 5-class solution (LMR (4) = 55.24, $p < 0.001$). The 6-class solution was selected because of the significant LMR test, reasonable entropy (0.76), and a small plateau in BIC and AIC reduction (AIC: 3396.31; BIC: 3526.36). In addition to being of little use for testing moderation, the six classes are very difficult to differentiate meaningfully. The sample is relatively evenly distributed across the six classes and mean differences in the three indicator variables are small to the point of inconsequence. Examination of class means for the 2- and 3- class models indicate that group separation is primarily driven by differences in behavioral reactivity, which is not surprising given the significant correlation between baseline cortisol and cortisol reactivity.

In an attempt to capitalize on the benefits of multiple-group SEM when testing moderated pathways, the initial analysis plan called for the creation of three grouping variables by dichotomizing behavioral fear reactivity, baseline cortisol, and cortisol reactivity at 1 standard deviation above the mean. The original analysis plan offered the best strategy for addressing this research question while maintaining the use of the latent factor structure for the parenting variables. However, after consideration of our discussion during the proposal defense, review of extant literature on the topic, and consultation with my advisors, I've decided it best to adopt an analysis plan that maintains the continuous nature of the moderator variables. Overall, the majority of the literature on the topic suggests that dichotomization of continuous variables is rarely defensible and often leads to biased estimates and misleading results (MacCallum, Zhang, Preacher, & Rucker, 2002; Preacher, Rucker, MacCallum, & Nicewander, 2005). Although there is theoretical justification for thinking that the moderated relationships described in my dissertation most likely exist for individuals at the extremes of my moderators (e.g., plus/minus 1 SD), there exists no solid rationale for deciding where to create the cut-offs necessary to create the dichotomous variables necessary to complete the multiple-group models originally proposed. Additionally, power to detect a moderation effect is retained by maintaining the variability in the measures of behavioral and biological functioning.

Tests of moderation are typically performed by examining the significance of interaction terms and, as such, one possible analytic approach that would maintain the variability in the moderator variables would be to capitalize on the benefits of the SEM and estimate latent interactions between the latent variables of maternal caregiving and measures of behavioral reactivity and cortisol activity and reactivity using the latent moderated structural equation approach (Corrado, 2005; Klein & Muthén, 2007). However, it is my understanding that interactions between multiple indicator latent variables are rarely used given the complexity of implementation and availability of competing strategies (H. W. Marsh, Wen, & Hau, 2004). It is a concern that the model needed to address the moderation question in study two would face issues with identification and be analytically arduous, if not intractable, given the addition of twelve additional latent interactions (four latent variables representing caregiving in infancy X three biobehavioral measures) to an already complex model. For informative purposes, I attempted to test the moderation hypotheses using the XWITH statement in Mplus. The XWITH statement allows the user to define interactions between continuous latent variables or between a continuous latent variable and an observed variable. Numerical integration was used to facilitate maximum likelihood estimation of the latent variable interactions. The interactions between the observed variables of mental state language and the three moderators were created using the DEFINE command. As suspected, the SEM model with twelve latent interactions either failed to converge or yielded incorrect model parameter estimates due to a non-positive definite derivative product matrix.

Given the difficulties associated with simultaneously estimating multiple latent interactions, the extent to which behavioral fear reactivity, baseline cortisol, and cortisol reactivity moderate the associations between early caregiving and emotion socialization behaviors and later CP, EP, and CU behaviors were tested by incorporating interaction terms in a path analytic framework. Twelve interaction terms (4 parenting variables and 3 moderators) were entered as exogenous predictors of study outcomes. Mean scores were used to represent the parenting and emotion socialization factors that were used in study one in order to facilitate the estimation of the moderating effects of behavioral fear reactivity, baseline cortisol, and cortisol reactivity simultaneously. Significant interactions in the final model were probed at 1 SD above and below the moderator variable. This analysis was a structural path model rather than the SEM initially proposed.

REFERENCES

Alink, L., Cicchetti, D., Kim, J., & Rogosch, F (2012). Longitudinal associations among child maltreatment, social functioning, and cortisol regulation. *Developmental Psychology*, *48*(1), 224–36. http://doi.org/10.1037/a0024892

Alink, L., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Mesman, J., Juffer, F., & Koot, H. M. (2008). Cortisol and externalizing behavior in children and adolescents: Mixed meta-analytic evidence for the inverse relation of basal cortisol and cortisol reactivity with externalizing behavior. *Developmental Psychobiology*, *50*, 427–450. http://doi.org/10.1002/dev.20300

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5). Diagnostic and Statistical Manual of Mental Disorders 4th edition TR.* http://doi.org/10.1176/appi.books.9780890425596.744053

Arnold, M. B. (1960). *Emotion and personality*. *New York Columbia University Press Aubergé V* (Vol. 1).

Asparouhov, T. (2005). Sampling Weights in Latent Variable Modeling. *Structural Equation Modeling: A Multidisciplinary Journal*, *12*(3), 411–434. http://doi.org/10.1207/s15328007sem1203_4

Baker, J. K., Fenning, R. M., & Crnic, K. a. (2011). Emotion Socialization by Mothers and Fathers: Coherence among Behaviors and Associations with Parent Attitudes and Children's Social Competence. *Social Development (Oxford, England)*, *20*(2), 412–430. http://doi.org/10.1111/j.1467-9507.2010.00585.x

Bakermans-Kranenburg, M. J., Van IJzendoorn, M. H., Pijlman, F. T. a, Mesman, J., & Juffer, F. (2008). Experimental evidence for differential susceptibility: dopamine D4 receptor polymorphism (DRD4 VNTR) moderates intervention effects on toddlers' externalizing behavior in a randomized controlled trial. *Developmental Psychology*, *44*(1), 293–300. http://doi.org/10.1037/0012-1649.44.1.293

Barker, E. D., Oliver, B. R., Viding, E., Salekin, R. T., & Maughan, B. (2011). The impact of prenatal maternal risk, fearless temperament and early parenting on adolescent callous-unemotional traits: a 14-year longitudinal investigation. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *52*(8), 878–88. http://doi.org/10.1111/j.1469-7610.2011.02397.x

Barker, E. D., Tremblay, R. E., Nagin, D. S., Vitaro, F., & Lacourse, E. (2006). Development of male proactive and reactive physical aggression during adolescence. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *47*(8), 783–90. http://doi.org/10.1111/j.1469-7610.2005.01585.x

Bauer, A. M., Quas, J. A., & Boyce, W. T. (2002). Associations between physiological reactivity and children's behavior: advantages of a multisystem approach. *Journal of Developmental and Behavioral Pediatrics : JDBP*, *23*, 102–113. http://doi.org/10.1097/00004703-200204000-00007

Bayley, N. (2006). Bayley Scales of Infant and Toddler Development– Third Edition. San

Antonio, TX: Harcourt Assessment. *Journal of Psychoeducational Assessment*, (25), 180–190.

Beauchaine, T. P., Gatzke-Kopp, L., & Mead, H. K. (2007). Polyvagal Theory and developmental psychopathology: emotion dysregulation and conduct problems from preschool to adolescence. *Biological Psychology*, *74*(2), 174–84. http://doi.org/10.1016/j.biopsycho.2005.08.008

Bedford, R., Pickles, A., Sharp, H., Wright, N., & Hill, J. (2014). Archival Report Reduced Face Preference in Infancy : A Developmental Precursor to Callous- Unemotional Traits ? *Biological Psychiatry*, 1–7. http://doi.org/10.1016/j.biopsych.2014.09.022

Beeghly, M. (1986). Mothers' Internal State Language to Toddlers. *British Journal of Developmental Psychology*, *4*(3), 247 – 321.

Belsky, J., & Fearon, R. M. P. (2002). Infant–mother attachment security, contextual risk, and early development: A moderational analysis. *Development and Psychopathology*, *14*(02), 293–310. http://doi.org/10.1017/S0954579402002067

Belsky, J., Jonassaint, C., Pluess, M., Stanton, M., Brummett, B., & Williams, R. (2009). Vulnerability genes or plasticity genes? *Molecular Psychiatry*, *14*(8), 746–54. http://doi.org/10.1038/mp.2009.44

Berry, D., Blair, C., Ursache, A., Willoughby, M., Garrett-Peters, P., Vernon-Feagans, L., … Granger, D. a. (2014). Child care and cortisol across early childhood: context matters. *Developmental Psychology*, *50*(2), 514–25. http://doi.org/10.1037/a0033379

Blair, C. (2002). School readiness. Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *The American Psychologist*, *57*(2), 111–127. http://doi.org/10.1037/0003-066X.57.2.111

Blair, C., Granger, D. a, Willoughby, M., Mills-Koonce, R., Cox, M., Greenberg, M. T., … Fortunato, C. K. (2011). Salivary cortisol mediates effects of poverty and parenting on executive functions in early childhood. *Child Development*, *82*(6), 1970–84. http://doi.org/10.1111/j.1467-8624.2011.01643.x

Blair, C., Granger, D. A., Kivlighan, K. T., Mills-Koonce, R., Willoughby, M., Greenberg, M. T., … Fortunato, C. K. (2008). Maternal and child contributions to cortisol response to emotional arousal in young children from low-income, rural communities. *Developmental Psychology*, *44*(4), 1095–109. http://doi.org/10.1037/0012-1649.44.4.1095

Blair, C., Granger, D., & Razza, R. P. (2005). Cortisol reactivity is positively related to executive function in preschool children attending head start. *Child Development*, *76*(3), 554–567. http://doi.org/10.1111/j.1467-8624.2005.00863.x

Blair, R. J. R. (2008). Fine cuts of empathy and the amygdala: dissociable deficits in psychopathy and autism. *Quarterly Journal of Experimental Psychology (2006)*, *61*(1), 157–70. http://doi.org/10.1080/17470210701508855

Blair, R. J. R. (2013). The neurobiology of psychopathic traits in youths. *Nature Reviews. Neuroscience*, *14*(11), 786–99. http://doi.org/10.1038/nrn3577

Blair, R. J. R., Budhani, S., Colledge, E., & Scott, S. (2005). Deafness to fear in boys with psychopathic tendencies. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *46*(3), 327–36. http://doi.org/10.1111/j.1469-7610.2004.00356.x

Blair, R. J. R., Peschardt, K. S., Budhani, S., Mitchell, D. G. V, & Pine, D. S. (2006). The development of psychopathy. *Journal of Child Psychology and Psychiatry and Allied Disciplines*. http://doi.org/10.1111/j.1469-7610.2006.01596.x

Bohlin, G., Eninger, L., Brocki, K. C., & Thorell, L. B. (2012). Disorganized attachment and inhibitory capacity: predicting externalizing problem behaviors. *Journal of Abnormal Child Psychology*, *40*(3), 449–58. http://doi.org/10.1007/s10802-011-9574-7

Boivin, M., Pérusse, D., Dionne, G., Saysset, V., Zoccolillo, M., Tarabulsy, G. M., … Tremblay, R. E. (2005). The genetic-environmental etiology of parents' perceptions and self-assessed behaviours toward their 5-month-old infants in a large twin and singleton sample. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *46*(6), 612–630. http://doi.org/10.1111/j.1469-7610.2004.00375.x

Bollen, K. a., & Grandjean, B. D. (1981). The Dimension(s) of Democracy: Further Issues in the Measurement and Effects of Political Democracy. *American Sociological Review*, *46*(5), 651. http://doi.org/10.2307/2094946

Bowlby, J. (1969). *Attachment and loss*. *Attachment* (Vol. 1).

Bowlby, J. (1977). The making and breaking of affectional bonds. I. Aetiology and psychopathology in the light of attachment theory. An expanded version of the Fiftieth Maudsley Lecture, delivered before the Royal College of Psychiatrists, 19 November 1976. *The British Journal of Psychiatry*, *130*(3), 201–210. http://doi.org/10.1192/bjp.130.3.201

Boyce, W. T., & Ellis, B. J. (2005). Biological sensitivity to context: I. An evolutionary–developmental theory of the origins and functions of stress reactivity. *Development and Psychopathology*, *17*(02), 271–301. http://doi.org/10.1017/S0954579405050145

Bradley, R. H., & Corwyn, R. F. (2008). Infant temperament, parenting, and externalizing behavior in first grade: a test of the differential susceptibility hypothesis. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *49*(2), 124–31. http://doi.org/10.1111/j.1469-7610.2007.01829.x

Bretherton, I., & Munholland, K. A. (1999). Internal working models in attachment relationships: A construct revisited. In *Handbook of attachment: Theory, research, and clinical applications* (pp. 89–111).

Brophy, M., & Dunn, J. (2002). What did mummy say? Dyadic interactions between young "hard to manage" children and their mothers. *Journal of Abnormal Child Psychology*, *30*(2), 103–112. http://doi.org/10.1023/A:1014705314406

Byrd, A. L., Loeber, R., & Pardini, D. A. (2014). Antisocial behavior, psychopathic features and abnormalities in reward and punishment processing in youth. *Clinical Child and Family Psychology Review*, *17*(2), 125–56. http://doi.org/10.1007/s10567-013-0159-6

Cairns, R. B. (1992). The making of a developmental science: The contributions and intellectual heritage of James Mark Baldwin. *Developmental Psychology*, *28*(1), 17–24. http://doi.org/10.1037//0012-1649.28.1.17

Calkins, S. D. (2011). Biopsychosocial Models and the Study of Family Processes and Child Adjustment. *Journal of Marriage and the Family*, *73*(4), 817–821. http://doi.org/10.1111/j.1741-3737.2011.00847.x

Calkins, S. D., & Dedmon, S. E. (2000). Physiological and Behavioral Regulation in Two-Year-Old Children with Aggressive / Destructive Behavior Problems, *28*(2), 103–118.

Calkins, S. D., & Fox, N. a. (2002). Self-regulatory processes in early personality development: A multilevel approach to the study of childhood social withdrawal and aggression. *Development and Psychopathology*, *14*(03), 477–498. http://doi.org/10.1017/S095457940200305X

Calkins, S. D., Graziano, P. a, Berdan, L. E., Keane, S. P., & Degnan, K. a. (2008). Predicting cardiac vagal regulation in early childhood from maternal-child relationship quality during toddlerhood. *Developmental Psychobiology*, *50*(8), 751–66. http://doi.org/10.1002/dev.20344

Calkins, S. D., Propper, C., & Mills-Koonce, W. R. (2013). A biopsychosocial perspective on parenting and developmental psychopathology. *Development and Psychopathology*, *25*(4 Pt 2), 1399–414. http://doi.org/10.1017/S0954579413000680

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin*, *56*(2), 81–105. http://doi.org/10.1037/h0046016

Campbell, S. B. (1995). Behavior Problems in Preschool Children: A Review of Recent Research. *Journal of Child Psychology and Psychiatry*, *36*(1), 113–149. http://doi.org/10.1111/j.1469-7610.1995.tb01657.x

Campos, J. J., Campos, R. G., & Barrett, K. C. (1989). Emergent themes in the study of emotional development and emotion regulation. *Developmental Psychology*. http://doi.org/10.1037/0012-1649.25.3.394

Cassidy, J. (2008). The Nature of the Child's Ties. In *Handbook of attachment: Theory, research, and clinical applications (2nd ed.).* (pp. 3–22). Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2008-13837-001&site=ehost-live&scope=site

Catalano, R. F., & Hawkins, J. D. (1996). The Social Development Model: A Theory of Antisocial Behavior. In *Delinquency and Crime: Current Theories* (pp. 149–197).

Centifanti, L. C. M., Meins, E., & Fernyhough, C. (2015). Callous-unemotional traits and impulsivity: distinct longitudinal relations with mind-mindedness and understanding of others. *Journal of Child Psychology and Psychiatry*, http://doi.org/10.1111/jcpp.12445

Centifanti, L. C. M., & Modecki, K. (2013). Throwing caution to the wind: callous-unemotional traits and risk taking in adolescents. *Journal of Clinical Child and Adolescent Psychology : The Official Journal for the Society of Clinical Child and Adolescent Psychology, American Psychological Association, Division 53*, *42*, 106–19. http://doi.org/10.1080/15374416.2012.719460

Cervantes, C. a., & Callanan, M. a. (1998). Labels and explanations in mother-child emotion talk: Age and gender differentiation. *Developmental Psychology*, *34*(1), 88–98. http://doi.org/10.1037//0012-1649.34.1.88

Champagne, D. L., Bagot, R. C., van Hasselt, F., Ramakers, G., Meaney, M. J., de Kloet, E. R., … Krugers, H. (2008). Maternal care and hippocampal plasticity: evidence for experience-dependent structural plasticity, altered synaptic functioning, and differential responsiveness to glucocorticoids and stress. *The Journal of Neuroscience : The Official Journal of the Society for Neuroscience*, *28*, 6037–6045. http://doi.org/10.1523/JNEUROSCI.0526-08.2008

Chronis, A. M., Lahey, B. B., Pelham, W. E., Williams, S. H., Baumann, B. L., Kipp, H., … Rathouz, P. J. (2007). Maternal depression and early positive parenting predict future conduct problems in young children with attention-deficit/hyperactivity disorder. *Developmental Psychology*, *43*(1), 70–82. http://doi.org/10.1037/0012-1649.43.1.70

Chrousos, G. P., & Gold, P. W. (1992). The Concepts of Stress and Stress System Disorders. *JAMA*, *267*, 1244–1252. http://doi.org/10.1001/jama.1992.03480090092034

Cicchetti, D. (2014). Psychopathology Perspectives on Precursors and Pathways to Personality Disorder : Commentary on the Special Issue, *28*(1), 172–179.

Cicchetti, D., & Dawson, G. (2002). Editorial: Multiple levels of analysis. *Development and Psychopathology*, *14*(03), 417–420. http://doi.org/10.1017/S0954579402003012

Cicchetti, D., & Richters, J. E. (1993). Developmental considerations in the investigation of Conduct Disorder. *Development and Psychopathology*, *5*, 331–344. http://doi.org/10.1017/S0954579400004429

Cicchetti, D., & Rogosch, F. A. (1996). Equifinality and multifinality in developmental psychopathology. *Development and Psychopathology*. http://doi.org/10.1017/S0954579400007318

Cicchetti, D., & Toth, S. L. (2009). The past achievements and future promises of developmental psychopathology: the coming of age of a discipline. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *50*(1-2), 16–25. http://doi.org/10.1111/j.1469-7610.2008.01979.x

Ciucci, E., Baroncelli, A., Golmaryami, F. N., & Frick, P. J. (2014). The Emotional Correlates to Callous–Unemotional Traits in Children. *Journal of Child and Family Studies*. http://doi.org/10.1007/s10826-014-0040-3

Cohn, J. F., & Tronick, E. (1989). Specificity of infants’ response to mothers' affective behavior. *Journal of the American Academy of Child and Adolescent Psychiatry*. http://doi.org/10.1097/00004583-198903000-00016

Cole, P. M., Hall, S. E., & Radzioch, A. M. (2009). Emotional dysregulation and the development of serious misconduct. *Biopsychosocial Regulatory Processes in the Development of Childhood Behavioral Problems.* http://doi.org/10.1017/CBO9780511575877.009

Conradt, E., Degarmo, D., Fisher, P., Abar, B., Lester, B. M., Lagasse, L. L., … Hammond, J. a. (2014). The contributions of early adverse experiences and trajectories of respiratory sinus arrhythmia on the development of neurobehavioral disinhibition among children with prenatal substance exposure. *Development and Psychopathology*, *26*(4 Pt 1), 901–16. http://doi.org/10.1017/S095457941400056X

Conradt, E., Measelle, J., & Ablow, J. C. (2013). Poverty, problem behavior, and promise: differential susceptibility among infants reared in poverty. *Psychological Science*, *24*(3), 235–42. http://doi.org/10.1177/0956797612457381

Corrado, L. (2005). Generalized Latent Variable Modeling: Multilevel, Longitudinal, and Structural Equation Models. *Journal of the American Statistical Association*. http://doi.org/10.1198/jasa.2005.s25

Cox, M. J., & Paley, B. (1997). Families as systems. *Annual Review of Psychology*, *48*, 243–67. http://doi.org/10.1146/annurev.psych.48.1.243

Cox, M., Paley, B., Burchinal, M., & Payne, C. (1999). Marital perceptions and interactions across the transition to parenthood. *Journal of Marriage and the …*, *61*(3), 611–625. http://doi.org/10.2307/353564

Crockenberg, S. C., & Leerkes, E. M. (2004). Infant and maternal behaviors regulate infant reactivity to novelty at 6 months. *Developmental Psychology*, *40*(6), 1123–32. http://doi.org/10.1037/0012-1649.40.6.1123

Curran, P. J., Stice, E., & Chassin, L. (1997). The relation between adolescent alcohol use and peer alcohol use: a longitudinal random coefficients model. *Journal of Consulting and Clinical Psychology*, *65*(1), 130–140. http://doi.org/10.1037/0022-006X.65.1.130

D'Onofrio, B. M., & Lahey, B. B. (2010). Biosocial Influences on the Family: A Decade Review. *Journal of Marriage and the Family*, *72*(3), 762–782. http://doi.org/10.1111/j.1741-3737.2010.00729.x

Dadds, M. R., Cauchi, A. J., Wimalaweera, S., Hawes, D. J., & Brennan, J. (2012). Outcomes, moderators, and mediators of empathic-emotion recognition training for complex conduct problems in childhood. *Psychiatry Research*, *199*(3), 201–7. http://doi.org/10.1016/j.psychres.2012.04.033

Dadds, M. R., El Masry, Y., Wimalaweera, S., & Guastella, A. J. (2008). Reduced eye gaze explains "fear blindness" in childhood psychopathic traits. *Journal of the American Academy of Child and Adolescent Psychiatry*, *47*(4), 455–63. http://doi.org/10.1097/CHI.0b013e31816407f1

Dadds, M. R., Fraser, J., Frost, A., & Hawes, D. J. (2005). Disentangling the underlying dimensions of psychopathy and conduct problems in childhood: a community study. *Journal of Consulting and Clinical Psychology*, *73*(3), 400–10. http://doi.org/10.1037/0022-006X.73.3.400

Dadds, M. R., Hawes, D. J., Frost, A. D. J., Vassallo, S., Bunn, P., Hunter, K., & Merz, S. (2009). Learning to "talk the talk": the relationship of psychopathic traits to deficits in empathy across childhood. *Journal of Child Psychology and Psychiatry*, *50*(5), 599–606. http://doi.org/10.1111/j.1469-7610.2008.02058.x

Dadds, M. R., Jambrak, J., Pasalich, D., Hawes, D. J., & Brennan, J. (2011). Impaired attention to the eyes of attachment figures and the developmental origins of psychopathy. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *52*(3), 238–45. http://doi.org/10.1111/j.1469-7610.2010.02323.x

Dadds, M. R., Moul, C., Hawes, D. J., Mendoza Diaz, A., & Brennan, J. (2015). Individual Differences in Childhood Behavior Disorders Associated With Epigenetic Modulation of the Cortisol Receptor Gene. *Child Development*, *00*(0), n/a–n/a. http://doi.org/10.1111/cdev.12391

Dadds, M. R., Perry, Y., Hawes, D. J., Merz, S., Riddell, A. C., Haines, D. J., … Abeygunawardane, A. I. (2006). Attention to the eyes and fear-recognition deficits in child psychopathy. *British Journal of Psychiatry*, *189*, 280–281.

Dadds, M. R., & Salmon, K. (2003). Punishment Insensitivity and Parenting : Temperament and Learning as Interacting Risks for Antisocial Behavior. *Clincial Child and Family Review*, *6*(2).

Dandreaux, D. M., & Frick, P. J. (2009). Developmental pathways to conduct problems: a further test of the childhood and adolescent-onset distinction. *Journal of Abnormal Child Psychology*, *37*(3), 375–85. http://doi.org/10.1007/s10802-008-9261-5

Daversa, M. T. (2010). Early Environmental Predictors of the Affective and Interpersonal Constructs of Psychopathy. *International Journal of Offender Therapy and Comparative Criminology*, *54*(1), 6–21. http://doi.org/10.1177/0306624X08328754

Davies, P. T., & Cicchetti, D. (2004). Toward an integration of family systems and developmental psychopathology approaches. *Development and Psychopathology*, *16*(03), 477–481. http://doi.org/10.1017/S0954579404004626

De Wied, M., van Boxtel, A., Matthys, W., & Meeus, W. (2012). Verbal, facial and autonomic responses to empathy-eliciting film clips by disruptive male adolescents with high versus low callous-unemotional traits. *Journal of Abnormal Child Psychology*, *40*(2), 211–23. http://doi.org/10.1007/s10802-011-9557-8

De Wolff, M. S., & van Ijzendoorn, M. H. (1997). Sensitivity and attachment: a meta-analysis on parental antecedents of infant attachment. *Child Development*, *68*, 571–591. http://doi.org/10.1111/1467-8624.ep9710021672

Deater-Deckard, K., & Dodge, K. a. (1997). Externalizing behavior problems and discipline.

Deković, M., Asscher, J. J., Manders, W. A., Prins, P. J. M., & van der Laan, P. (2012). Within-intervention change: Mediators of intervention effects during multisystemic therapy. *Journal of Consulting and Clinical Psychology*. http://doi.org/10.1037/a0028482

Denham, S. A., Bassett, H. H., & Wyatt, T. (2008). The socialization of emotional competence. In *Handbook of socialization: Theory and research* (pp. 614–637).

Denham, S. A., Zoller, D., & Couchoud, E. A. (1994). Socialization of preschoolers' emotion understanding. *Developmental Psychology*, *30*(6), 928–936. http://doi.org/10.1037/0012-1649.30.6.928

Derogatis, L. R., & Melisaratos, N. (1983). The Brief Symptom Inventory: an introductory report. *Psychological Medicine*. http://doi.org/10.1017/S0033291700048017

Dickerson, S. S., & Kemeny, M. E. (2004). Acute stressors and cortisol responses: a theoretical integration and synthesis of laboratory research. *Psychological Bulletin*, *130*(3), 355–391. http://doi.org/10.1037/0033-2909.130.3.355

Dodge, K. a., & Pettit, G. S. (2003). A biopsychosocial model of the development of chronic conduct problems in adolescence. *Developmental Psychology*, *39*(2), 349–371. http://doi.org/10.1037/0012-1649.39.2.349

Doom, J. R., & Gunnar, M. R. (2013). Stress physiology and developmental psychopathology: past, present, and future. *Development and Psychopathology*, *25*(4 Pt 2), 1359–73. http://doi.org/10.1017/S0954579413000667

Dunn, J., Bretherton, I., & Munn, P. (1987). Conversations about feeling states between mothers and their young children. *Developmental Psychology*. http://doi.org/10.1037/0012-1649.23.1.132

Dunn, J., Brown, J., & Beardsall, L. (1991). Family talk about feeling states and children's later understanding of others' emotions. *Developmental Psychology*, *27*(3), 448–455. http://doi.org/10.1037//0012-1649.27.3.448

Eisenberg, N., Cumberland, A., & Spinrad, T. L. (1998). Parental Socialization of Emotion. *Psychological Inquiry*, *9*(4), 241–273. http://doi.org/10.1207/s15327965pli0904_1

Ellis, B. J., & Boyce, W. T. (2011). Differential susceptibility to the environment: toward an understanding of sensitivity to developmental experiences and context. *Development and Psychopathology*, *23*(1), 1–5. http://doi.org/10.1017/S095457941000060X

Enders, C. K. (2001). A Primer on Maximum Likelihood Algorithms Available for use with Missing Data. *Structural Equation Modeling: A Multidisciplinary Journal*, *8*(1), 128–141. http://doi.org/10.1207/S15328007SEM0801

Enders, C. K., & Bandalos, D. L. (2001). The Relative Performance of Full Information Maximum Likelihood Estimation for Missing Data in Structural Equation Models. *Structural Equation Modeling*, *8*, 430–457. http://doi.org/10.1207/S15328007sem0803_5

Erford, B. T. (1997). Reliability and Validity of Scores on the Disruptive Behavior Rating Scale-Teacher Version (DBRS-T). *Educational and Psychological Measurement*. http://doi.org/10.1177/0013164497057002011

Erskine, H. E., Ferrari, A. J., Polanczyk, G. V, Moffitt, T. E., Murray, C. J. L., Vos, T., … Scott, J. G. (2014). The global burden of conduct disorder and attention-deficit/hyperactivity disorder in 2010. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *55*(4), 328–36. http://doi.org/10.1111/jcpp.12186

Essau, C. A., Sasagawa, S., & Frick, P. J. (2006). Callous-unemotional traits in a community sample of adolescents. *Assessment*, *13*(4), 454–469. http://doi.org/10.1177/1073191106287354

Essex, M. J., Klein, M. H., Cho, E., & Kalin, N. H. (2002). Maternal stress beginning in infancy may sensitize children to later stress exposure: Effects on cortisol and behavior. *Biological Psychiatry*, *52*, 776–784. http://doi.org/10.1016/S0006-3223(02)01553-6

Ezpeleta, L., de la Osa, N., Granero, R., Penelo, E., & Domènech, J. M. (2013). Inventory of callous-unemotional traits in a community sample of preschoolers. *Journal of Clinical Child and Adolescent Psychology : The Official Journal for the Society of Clinical Child and Adolescent Psychology, American Psychological Association, Division 53*, *42*(1), 91–105. http://doi.org/10.1080/15374416.2012.734221

Fairchild, G., van Goozen, S. H. M., Stollery, S. J., Brown, J., Gardiner, J., Herbert, J., & Goodyer, I. M. (2008). Cortisol diurnal rhythm and stress reactivity in male adolescents with early-onset or adolescence-onset conduct disorder. *Biological Psychiatry*, *64*(7), 599–606. http://doi.org/10.1016/j.biopsych.2008.05.022

Fanti, K. A., Frick, P. J., & Georgiou, S. (2009). Linking callous-unemotional traits to instrumental and non-instrumental forms of aggression. *Journal of Psychopathology and Behavioral Assessment*, *31*(4), 285–298. http://doi.org/10.1007/s10862-008-9111-3

Fanti, K. a., Panayiotou, G., Lazarou, C., Michael, R., & Georgiou, G. (2015). The better of two evils? Evidence that children exhibiting continuous conduct problems high or low on callous–unemotional traits score on opposite directions on physiological and behavioral measures of fear. *Development and Psychopathology*, 1–14. http://doi.org/10.1017/S0954579415000371

Fearon, R. P., Bakermans-Kranenburg, M. J., van Ijzendoorn, M. H., Lapsley, A.-M., & Roisman, G. I. (2010). The significance of insecure attachment and disorganization in the development of children's externalizing behavior: a meta-analytic study. *Child Development*, *81*(2), 435–56. http://doi.org/10.1111/j.1467-8624.2009.01405.x

Feilhauer, J., Cima, M., & Arntz, A. (2012). Assessing Callous-Unemotional traits across different groups of youths: further cross-cultural validation of the Inventory of Callous-Unemotional traits. *International Journal of Law and Psychiatry*, *35*(4), 251–62. http://doi.org/10.1016/j.ijlp.2012.04.002

Fenning, R. M., Baker, B. L., & Juvonen, J. (2011). Emotion Discourse, Social Cognition, and Social Skills in Children With and Without Developmental Delays. *Child Development*, *82*, 717–731. http://doi.org/10.1111/j.1467-8624.2010.01569.x

Fontaine, N. M. G., McCrory, E. J. P., Boivin, M., Moffitt, T. E., & Viding, E. (2011). Predictors and outcomes of joint trajectories of callous-unemotional traits and conduct problems in childhood. *Journal of Abnormal Psychology*, *120*(3), 730–42. http://doi.org/10.1037/a0022620

Fortunato, C. K., Dribin, A. E., Granger, D. a, & Buss, K. a. (2008). Salivary alpha-amylase and cortisol in toddlers: differential relations to affective behavior. *Developmental Psychobiology*, *50*(8), 807–18. http://doi.org/10.1002/dev.20326

Frick, P. J. (2012). Developmental pathways to conduct disorder: implications for future directions in research, assessment, and treatment. *Journal of Clinical Child and Adolescent Psychology : The Official Journal for the Society of Clinical Child and Adolescent Psychology, American Psychological Association, Division 53*, *41*(3), 378–89. http://doi.org/10.1080/15374416.2012.664815

Frick, P. J., Cornell, A. H., Barry, C. T., Bodin, S. D., & Dane, H. E. (2003). Callous-Unemotional Traits and Conduct Problems in the Prediction of Conduct Problem Severity , Aggression , and Self-Report of Delinquency, *31*(4), 457–470.

Frick, P. J., Cornell, A. H., Bodin, S. D., Dane, H. E., Barry, C. T., & Loney, B. R. (2003). Callous-unemotional traits and developmental pathways to severe conduct problems. *Developmental Psychology*, *39*(2), 246–260. http://doi.org/10.1037/0012-1649.39.2.246

Frick, P. J., & Morris, A. S. (2004). Temperament and developmental pathways to conduct problems. *Journal of Clinical Child and Adolescent Psychology : The Official Journal for the Society of Clinical Child and Adolescent Psychology, American Psychological Association, Division 53*, *33*(1), 54–68. http://doi.org/10.1207/S15374424JCCP3301_6

Frick, P. J., Ray, J. V, Thornton, L. C., & Kahn, R. E. (2013). Can callous-unemotional traits enhance the understanding, diagnosis, and treatment of serious conduct problems in children and adolescents? A comprehensive review. *Psychological Bulletin*, *140*(1), 1–57. http://doi.org/10.1037/a0033076

Frick, P. J., Ray, J. V, Thornton, L. C., & Kahn, R. E. (2014a). Annual research review: A developmental psychopathology approach to understanding callous-unemotional traits in children and adolescents with serious conduct problems. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *55*(6), 532–48. http://doi.org/10.1111/jcpp.12152

Frick, P. J., Ray, J. V, Thornton, L. C., & Kahn, R. E. (2014b). The road forward for research on callous-unemotional traits: reply to Lahey (2014). *Psychological Bulletin*, *140*(1), 64–8. http://doi.org/10.1037/a0033710

Frick, P. J., & Viding, E. (2009). Antisocial behavior from a developmental psychopathology perspective. *Development and Psychopathology*, *21*(4), 1111–31. http://doi.org/10.1017/S0954579409990071

Frick, P. J., & White, S. F. (2008). Research review: the importance of callous-unemotional traits for developmental models of aggressive and antisocial behavior. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *49*(4), 359–75. http://doi.org/10.1111/j.1469-7610.2007.01862.x

Friedman-Weieneth, J. L., Doctoroff, G. L., Harvey, E. A., & Goldstein, L. H. (2009). The Disruptive Behavior Rating Scale-Parent Version (DBRS-PV): Factor analytic structure and validity among young preschool children. *Journal of Attention Disorders*, *13*(1), 42–55. http://doi.org/10.1177/1087054708322991

Frijda, N. H., Ekman, P., & Scherer, K. R. (1986). Theory of emotion. In *The emotions*.

Gallitto, E. (2014). Temperament as a moderator of the effects of parenting on children's behavior. *Development and Psychopathology*, 1–17. http://doi.org/10.1017/S0954579414000753

Gao, Y., Raine, A., Venables, P. H., Dawson, M. E., & Mednick, S. a. (2010). Reduced electrodermal fear conditioning from ages 3 to 8 years is associated with aggressive behavior at age 8 years. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *51*(5), 550–8. http://doi.org/10.1111/j.1469-7610.2009.02176.x

Gardner, F. (2000). Methodological issues in the direct observation of parent-child interaction: do observational findings reflect the natural behavior of participants? *Clinical Child and*

Family Psychology Review, *3*(3), 185–198. http://doi.org/10.1023/A:1009503409699

Garner, P. W., Dunsmore, J. C., & Southam-Gerrow, M. (2008). Mother–Child Conversations about Emotions: Linkages to Child Aggression and Prosocial Behavior. *Social Development*, *17*(2), 259–277. http://doi.org/10.1111/j.1467-9507.2007.00424.x

Garon, N., Bryson, S. E., & Smith, I. M. (2008). Executive function in preschoolers: a review using an integrative framework. *Psychological Bulletin*, *134*(1), 31–60. http://doi.org/10.1037/0033-2909.134.1.31

Garrett-Peters, P., Mills-Koonce, R., Adkins, D., Vernon-Feagans, L., & Cox, M. (2008). Early Environmental Correlates of Maternal Emotion Talk. *Parenting, Science and Practice*, *8*(2), 117–152. http://doi.org/10.1080/15295190802058900

Garrett-Peters, P., Mills-Koonce, R., Zerwas, S., Cox, M., & Vernon-Feagans, L. (2011). Fathers' Early Emotion Talk: Associations With Income, Ethnicity, and Family Factors. *Journal of Marriage and Family*, *73*(2), 335–353. http://doi.org/10.1111/j.1741-3737.2010.00810.x

Gatzke-Kopp, L. M., Raine, A., Loeber, R., Stouthamer-Loeber, M., & Steinhauer, S. R. (2002). Serious delinquent behavior, sensation seeking, and electrodermal arousal. *Journal of Abnormal Child Psychology*, *30*, 477–486. http://doi.org/10.1023/A:1019816930615

George, D., & Mallery, P., George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference. 11.0 update (4th ed.). Boston: Allyn & Bacon*. *BrJHaematol* (Vol. 11.0 updat).

Glueck, S., & Glueck, E. (1950). *Unraveling Juvenile delinquency*.

Goldsmith, H. H., & Rothbart, M. K. (1990). *The laboratory temperament assessment battery*.

Goozen, S. H. M. Van, Matthys, W., Cohen-kettenis, P. T., Wied, C. G., Wiegant, V. M., & Engeland, H. Van. (1998). Salivary Cortisol and Cardiovascular Activity during Stress in Oppositional-Defiant Disorder Boys and Normal Controls, *8550*.

Gottlieb, G. (2007). Probabilistic epigenesis. *Developmental Science*, *10*(1), 1–11. http://doi.org/10.1111/j.1467-7687.2007.00556.x

Gottman, J. M., Katz, L. F., & Hooven, C. (1996). Parental meta-emotion philosophy and the emotional life of families: Theoretical models and preliminary data. *Journal of Family Psychology*, *10*(3), 243–268. http://doi.org/10.1037//0893-3200.10.3.243

Gravetter, F. J., & Wallnau, L. B. (2013). Introduction to Hypothesis Testing. *Essentials of Statistics for the Behavioral Sciences*, 203–241. Retrieved from www.sagepub.com/upm-data/40007_Chapter8.pdf

Gunnar, M., & Quevedo, K. (2007). The neurobiology of stress and development. *Annual Review of Psychology*, *58*, 145–173. http://doi.org/10.1146/annurev.psych.58.110405.085605

Gunnar, M. R., & Donzella, B. (2002). Social regulation of the cortisol levels in early human development. *Psychoneuroendocrinology*. http://doi.org/10.1016/S0306-4530(01)00045-2

Gunnar, M. R., Talge, N. M., & Herrera, A. (2009). Stressor paradigms in developmental studies: What does and does not work to produce mean increases in salivary cortisol.

Psychoneuroendocrinology, *34*, 953–967. http://doi.org/10.1016/j.psyneuen.2009.02.010

Gunnar, M. R., & Vazquez, D. M. (2001). Low cortisol and a flattening of expected daytime rhythm: potential indices of risk in human development. *Development and Psychopathology*, *13*, 515–538. http://doi.org/10.1017/S0954579401003066

Hane, A. A., & Fox, N. a. (2006). Ordinary variations in maternal caregiving influence human infants' stress reactivity. *Psychological Science*, *17*(6), 550–556. http://doi.org/10.1111/j.1467-9280.2006.01742.x

Hare, R. D., & Neumann, C. S. (2008). Psychopathy as a clinical and empirical construct. *Annual Review of Clinical Psychology*, *4*, 217–246. http://doi.org/10.1146/annurev.clinpsy.3.022806.091452

Hastings, Paul D, Utendale, W. L., & Sullivan, C., Hastings, P. D., Utendale, W. T., & Sullivan, C. (2007). The socialization of prosocial development. In *Handbook of Socialization: Theory and Research* (pp. 638–664).

Havighurst, S. S., Duncombe, M., Frankling, E., Holland, K., Kehoe, C., & Stargatt, R. (2014). An Emotion-Focused Early Intervention for Children with Emerging Conduct Problems. *Journal of Abnormal Child Psychology*. http://doi.org/10.1007/s10802-014-9944-z

Havighurst, S. S., Wilson, K. R., Harley, A. E., Prior, M. R., & Kehoe, C. (2010). Tuning in to Kids: improving emotion socialization practices in parents of preschool children--findings from a community trial. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *51*(12), 1342–50. http://doi.org/10.1111/j.1469-7610.2010.02303.x

Hawes, D. J., Brennan, J., & Dadds, M. R. (2009). Cortisol, callous-unemotional traits, and pathways to antisocial behavior. *Current Opinion in Psychiatry*, *22*(4), 357–62. http://doi.org/10.1097/YCO.0b013e32832bfa6d

Hawes, D. J., & Dadds, M. R. (2006). Assessing parenting practices through parent-report and direct observation during parent-training. *Journal of Child and Family Studies*, *15*(5), 554–567. http://doi.org/10.1007/s10826-006-9029-x

Hawes, D. J., Dadds, M. R., Brennan, J., Rhodes, T., & Cauchi, A. (2013). Revisiting the treatment of conduct problems in children with callous-unemotional traits. *The Australian and New Zealand Journal of Psychiatry*, *47*(7), 646–53. http://doi.org/10.1177/0004867413484092

Hawes, D. J., Dadds, M. R., Frost, A. D. J., & Hasking, P. a. (2011). Do childhood callous-unemotional traits drive change in parenting practices? *Journal of Clinical Child and Adolescent Psychology : The Official Journal for the Society of Clinical Child and Adolescent Psychology, American Psychological Association, Division 53*, *40*(4), 507–18. http://doi.org/10.1080/15374416.2011.581624

Hawes, D. J., Price, M. J., & Dadds, M. R. (2014). Callous-Unemotional Traits and the Treatment of Conduct Problems in Childhood and Adolescence: A Comprehensive Review. *Clinical Child and Family Psychology Review*, *17*(3), 248–267. http://doi.org/10.1007/s10567-014-0167-1

Herba, C. M., Landau, S., Russell, T., Ecker, C., & Phillips, M. L. (2006). The development of emotion-processing in children: Effects of age, emotion, and intensity. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *47*, 1098–1106. http://doi.org/10.1111/j.1469-7610.2006.01652.x

Hertzman, C., & Boyce, T. (2010). How experience gets under the skin to create gradients in developmental health. *Annual Review of Public Health*, *31*, 329–347 3p following 347. http://doi.org/10.1146/annurev.publhealth.012809.103538

Hill, A. L., Degnan, K. a, Calkins, S. D., & Keane, S. P. (2006). Profiles of externalizing behavior problems for boys and girls across preschool: the roles of emotion regulation and inattention. *Developmental Psychology*, *42*(5), 913–28. http://doi.org/10.1037/0012-1649.42.5.913

Hinnant, J. B., Erath, S. A., & El-sheikh, M. (2015). Harsh Parenting , Parasympathetic Activity , and Development of Delinquency and Substance Use. *Journal of Abnormal Psychology*, *124*(1), 137–151.

Hirschi, T. (1969). A Control Theory of Delinquency. *Causes of Delinquency*, 16–34. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=psyc6&NEWS=N&AN=2007-05262-005

Hoeve, M., Dubas, J. S., Eichelsheim, V. I., van der Laan, P. H., Smeenk, W., & Gerris, J. R. M. (2009). The relationship between parenting and delinquency: a meta-analysis. *Journal of Abnormal Child Psychology*, *37*(6), 749–75. http://doi.org/10.1007/s10802-009-9310-8

Hooven, C., Gottman, J. M., & Katz, L. F. (1995). *Parental meta-emotion structure predicts family and child outcomes*. *Cognition & Emotion* (Vol. 9). http://doi.org/10.1080/02699939508409010

Houghton, S., Hunter, S. C., & Crow, J. (2012). Assessing Callous Unemotional Traits in Children Aged 7- to 12-Years: A Confirmatory Factor Analysis of the Inventory of Callous Unemotional Traits. *Journal of Psychopathology and Behavioral Assessment*, *35*(2), 215–222. http://doi.org/10.1007/s10862-012-9324-3

Hu, L. T., & Bentler, P. M. (1999). Cutoff Criteria for fit indices in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*, 1–55. http://doi.org/10.1080/10705519909540118

Jansen, J., Beijers, R., Riksen-Walraven, M., & de Weerth, C. (2010). Cortisol reactivity in young infants. *Psychoneuroendocrinology*, *35*(3), 329–338. http://doi.org/10.1016/j.psyneuen.2009.07.008

Johnson, P. O., & Neyman, J. (1936). Tests of certain linear hypotheses and their application to some educational problems. *Statistical Research Memoirs*, *1*, 57–93. http://doi.org/10.2307/302397

Jones, A. P., Ph, D., Laurens, K. R., Herba, C. M., Barker, G. J., & Viding, E. (2009). Amygdala Hypoactivity to Fearful Faces in Boys With Conduct Problems and Callous-Unemotional Traits, (January), 95–102.

Jovev, M., Whittle, S., Yücel, M., Simmons, J. G., Allen, N. B., & Chanen, A. M. (2014). The relationship between hippocampal asymmetry and temperament in adolescent borderline and antisocial personality pathology. *Development and Psychopathology*, *26*(1), 275–85. http://doi.org/10.1017/S0954579413000886

Kagan, J., Snidman, N., Arcus, D., & Reznick, J. S. (1994). *Galen's prophecy: Temperament in human nature.*

Kahn, R. E., Byrd, A. L., & Pardini, D. a. (2013). Callous-unemotional traits robustly predict future criminal offending in young men. *Law and Human Behavior*, *37*(2), 87–97. http://doi.org/10.1037/b0000003

Kahn, R. E., Frick, P. J., Youngstrom, E., Findling, R. L., & Youngstrom, J. K. (2012). The effects of including a callous-unemotional specifier for the diagnosis of conduct disorder. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *53*(3), 271–82. http://doi.org/10.1111/j.1469-7610.2011.02463.x

Kalin, N. H., Larson, C., Shelton, S. E., & Davidson, R. J. (1998). Asymmetric frontal brain activity, cortisol, and behavior associated with fearful temperament in rhesus monkeys. *Behavioral Neuroscience*, *112*(2), 286–292. http://doi.org/10.1037/0735-7044.112.2.286

Katz, L. F., Gottman, J. M., & Hooven, C. (1996). Meta-emotion philosophy and family functioning: Reply to Cowan (1996) and Eisenberg (1996). *Journal of Family Psychology*, *10*(3), 284–291. http://doi.org/10.1037//0893-3200.10.3.284

Katz, L. F., & Windecker-Nelson, B. (2004). Parental meta-emotion philosophy in families with conduct-problem children: Links with peer relations. *Journal of Abnormal Child Psychology*, *32*(4), 385–398. http://doi.org/10.1023/B:JACP.0000030292.36168.30

Kazdin, A. E. (1987). Treatment of antisocial behavior in children: current status and future directions. *Psycholog Bull*, *102*, 187–203.

Kiang, L., Moreno, A. J., & Robinson, J. L. (2004). Maternal preconceptions about parenting predict child temperament, maternal sensitivity, and children's empathy. *Developmental Psychology*, *40*(6), 1081–92. http://doi.org/10.1037/0012-1649.40.6.1081

Kim-Cohen, J., Arseneault, L., Caspi, A., Tomás, M. P., Taylor, A., & Moffitt, T. E. (2005). Validity of DSM-IV conduct disorder in 41/2-5-year-old children: a longitudinal epidemiological study. *The American Journal of Psychiatry*, *162*, 1108–1117. http://doi.org/10.1176/appi.ajp.162.6.1108

Kimonis, E. R., Branch, J., Hagman, B., Graham, N., & Miller, C. (2013). The psychometric properties of the Inventory of Callous-Unemotional Traits in an undergraduate sample. *Psychological Assessment*, *25*(1), 84–93. http://doi.org/10.1037/a0029024

Kimonis, E. R., Frick, P. J., Cauffman, E., Goldweber, A., & Skeem, J. (2012). Primary and secondary variants of juvenile psychopathy differ in emotional processing. *Development and Psychopathology*, *24*(3), 1091–103. http://doi.org/10.1017/S0954579412000557

Kimonis, E. R., Frick, P. J., Skeem, J. L., Marsee, M. A., Cruise, K., Munoz, L. C., … Morris, A. S. (2008). Assessing callous-unemotional traits in adolescent offenders: Validation of the Inventory of Callous-Unemotional Traits. *International Journal of Law and Psychiatry*, *31*(3), 241–252. http://doi.org/10.1016/j.ijlp.2008.04.002

Klein, A. G., & Muthén, B. O. (2007). Quasi-Maximum Likelihood Estimation of Structural Equation Models With Multiple Interaction and Quadratic Effects. *Multivariate Behavioral Research*, *42*(4), 647–673. http://doi.org/10.1080/00273170701710205

Kochanska, G. (n.d.). Kochanska (1997) mutually responsive orientation between moms and hcidlren.pdf.

Kochanska, G. (1997). Multiple pathways to conscience for children with different temperaments: From toddlerhood to age 5. *Developmental Psychology*, *33*(2), 228–240. http://doi.org/10.1037//0012-1649.33.2.228

Kochanska, G., Barry, R. a, Aksan, N., & Boldt, L. J. (2008). A developmental model of maternal and child contributions to disruptive conduct: the first six years. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *49*(11), 1220–7. http://doi.org/10.1111/j.1469-7610.2008.01932.x

Kochanska, G., Barry, R. a, Stellern, S. a, & O'Bleness, J. J. (2009). Early attachment organization moderates the parent-child mutually coercive pathway to children's antisocial conduct. *Child Development*, *80*(4), 1288–300. http://doi.org/10.1111/j.1467-8624.2009.01332.x

Kochanska, G., Boldt, L. J., Kim, S., Yoon, J. E., & Philibert, R. a. (2014). Developmental interplay between children's biobehavioral risk and the parenting environment from toddler to early school age: Prediction of socialization outcomes in preadolescence. *Development and Psychopathology*, 1–16. http://doi.org/10.1017/S0954579414000777

Kochanska, G., Forman, D. R., Aksan, N., & Dunbar, S. B. (2005). Pathways to conscience: early mother-child mutually responsive orientation and children's moral emotion, conduct, and cognition. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *46*(1), 19–34. http://doi.org/10.1111/j.1469-7610.2004.00348.x

Kochanska, G., & Kim, S. (2012). Toward a new understanding of legacy of early attachments for future antisocial trajectories: evidence from two longitudinal studies. *Development and Psychopathology*, *24*(3), 783–806. http://doi.org/10.1017/S0954579412000375

Kochanska, G., Kim, S., Boldt, L. J., & Yoon, J. E. (2013). Children's callous-unemotional traits moderate links between their positive relationships with parents at preschool age and externalizing behavior problems at early school age. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *54*(11), 1251–60. http://doi.org/10.1111/jcpp.12084

Kochanska, G., & Murray, K. T. (2013). Mother-Child Mutually Responsive Orientation and Conscience Development : From Toddler to Early School ' Age, *71*(2), 417–431.

Kochanska, G., Woodard, J., Kim, S., Koenig, J. L., Yoon, J. E., & Barry, R. a. (2010). Positive socialization mechanisms in secure and insecure parent-child dyads: two longitudinal studies. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *51*(9), 998–1009. http://doi.org/10.1111/j.1469-7610.2010.02238.x

Kotler, J. S., & McMahon, R. J. (2005). Child psychopathy: Theories, measurement, and relations with the development and persistence of conduct problems. *Clinical Child and Family Psychology Review*, *8*(4), 291–325. http://doi.org/10.1007/s10567-005-8810-5

Krevans, J., & Gibbs, J. C. (1996). Parents' use of inductive discipline: Relations to children's empathy and prosocial behavior. *Child Development*, *67*(6), 3263–3277. http://doi.org/10.2307/1131778

Kroneman, L. M., Hipwell, A. E., Loeber, R., Koot, H. M., & Pardini, D. a. (2011). Contextual risk factors as predictors of disruptive behavior disorder trajectories in girls: the moderating effect of callous-unemotional features. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *52*(2), 167–75. http://doi.org/10.1111/j.1469-7610.2010.02300.x

Lagattuta, K. H. (2005). When you shouldn't do what you want to do: Young children's understanding of desires, rules, and emotions. *Child Development*, *76*, 713–733. http://doi.org/10.1111/j.1467-8624.2005.00873.x

Lagattuta, K. H., Wellman, H. M., & Flavell, J. H. (1997). Preschoolers' understanding of the link between thinking and feeling: cognitive cuing and emotional change. *Child Development*, *68*, 1081–1104. http://doi.org/DOI 10.1111/j.1467-8624.1997.tb01986.x

Lahey, B. B. (2015). Why Are Children Who Exhibit Psychopathology at High Risk for Psychopathology and Dysfunction in Adulthood ?, 17–18. http://doi.org/10.1177/106342669800600101.E2

Laible, D. J., & Thompson, R. a. (2000). Mother-child discourse, attachment security, shared positive affect, and early conscience development. *Child Development*, *71*(5), 1424–1440. http://doi.org/10.1111/1467-8624.00237

Laranjo, J., Bernier, A., & Meins, E. (2008). Associations between maternal mind-mindedness and infant attachment security: Investigating the mediating role of maternal sensitivity. *Infant Behavior and Development*, *31*, 688–695. http://doi.org/10.1016/j.infbeh.2008.04.008

Laranjo, J., Bernier, A., Meins, E., & Carlson, S. M. (2010). Early manifestations of children's theory of mind: The roles of maternal mind-mindedness and infant security of attachment. *Infancy*, *15*, 300–323. http://doi.org/10.1111/j.1532-7078.2009.00014.x

Laub, J., & Sampson, R. J. (2006). Shared Beginnings, Divergent Lives: Delinquent Boys to Age 70. *Adolescence*. http://doi.org/10.1177/009430610503400144

Lazarus, R. S. (1991). Progress on a cognitive-motivational-relational theory of emotion. *The American Psychologist*, *46*(8), 819–834. http://doi.org/10.1037/0003-066X.46.8.819

Lemery, K. S., Goldsmith, H. H., Klinnert, M. D., & Mrazek, D. a. (1999). Developmental models of infant and childhood temperament. *Developmental Psychology*, *35*(1), 189–204. http://doi.org/10.1037//0012-1649.35.1.189

Lewis, M., & Ramsay, D. (2005). Infant emotional and cortisol responses to goal blockage. *Child Development*, *76*, 518–530. http://doi.org/10.1111/j.1467-8624.2005.00860.x

Liu, D., Diorio, J., Tannenbaum, B., Caldji, C., Francis, D., Freedman, A., … Meaney, M. J. (1997). Maternal care, hippocampal glucocorticoid receptors, and hypothalamic-pituitary-adrenal responses to stress. *Science (New York, N.Y.)*, *277*, 1659–1662. http://doi.org/10.1126/science.277.5332.1659

Loeber, R., Green, S. M., Lahey, B. B., Frick, P. J., & Mcburnett, K. (2000). Findings on Disruptive Behavior Disorders from the First Decade of the Developmental Trends Study, *3*(1).

Loeber, R., & Hay, D. (1997). Key issues in the development of aggression and violence from childhood to early adulthood. *Annual Review of Psychology, 48*, 371–410. http://doi.org/10.1146/annurev.psych.48.1.371

Loney, B. R., Butler, M. a, Lima, E. N., Counts, C. a, & Eckel, L. a. (2006). The relation between salivary cortisol, callous-unemotional traits, and conduct problems in an adolescent non-referred sample. *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 47*(1), 30–6. http://doi.org/10.1111/j.1469-7610.2005.01444.x

Loney, B. R., Frick, P. J., Clements, C. B., Ellis, M. L., & Kerlin, K. (2003). Callous-unemotional traits, impulsivity, and emotional processing in adolescents with antisocial behavior problems. *Journal of Clinical Child and Adolescent Psychology*, *32*(1), 66–80. http://doi.org/10.1207/S15374424JCCP3201_07

Lopez-Duran, N. L., Hajal, N. J., Olson, S. L., Felt, B. T., & Vazquez, D. M. (2009). Individual differences in cortisol responses to fear and frustration during middle childhood. *Journal of Experimental Child Psychology*, *103*, 285–295. http://doi.org/10.1016/j.jecp.2009.03.008

Lorber, M. F. (2004). Psychophysiology of aggression, psychopathy, and conduct problems: a meta-analysis. *Psychological Bulletin*, *130*, 531–552. http://doi.org/10.1037/0033-2909.130.4.531

Lorber, M. F., Del Vecchio, T., & Slep, A. M. S. (2014). The emergence and evolution of infant externalizing behavior. *Development and Psychopathology*, 1–18. http://doi.org/10.1017/S0954579414000923

Lunkenheimer, E. S., Shields, A. M., & Cortina, K. S. (2007). Parental Emotion Coaching and Dismissing in Family Interaction. *Social Development*, *16*(2), 232–248. http://doi.org/10.1111/j.1467-9507.2007.00382.x

Lupien, S. J., McEwen, B. S., Gunnar, M. R., & Heim, C. (2009). Effects of stress throughout the lifespan on the brain, behaviour and cognition. *Nature Reviews. Neuroscience, 10*(6), 434–445. http://doi.org/10.1038/nrn2639

Lykken, D. T. (1957). A study of anxiety in the sociopathic personality. *Journal of Abnormal Psychology*, *55*, 6–10. http://doi.org/10.1037/h0047232

Lynam, D. R. (1996). Early Identification of the Fledgling Psychopath : Locating the Psychopathic Child in the Current Nomenclature, *107*, 566–575.

Lynam, D. R., Caspi, A., Moffitt, T. E., Loeber, R., & Stouthamer-Loeber, M. (2007). Longitudinal evidence that psychopathy scores in early adolescence predict adult psychopathy. *Journal of Abnormal Psychology*, *116*, 155–165. http://doi.org/10.1037/0021-843X.116.1.155

Lynam, D. R., Loeber, R., & Stouthamer-Loeber, M. (2008). The Stability of Psychopathy From Adolescence Into Adulthood: The Search for Moderators. *Criminal Justice and Behavior, 35*(2), 228–243. http://doi.org/10.1177/0093854807310153

MacCallum, R. C., Zhang, S., Preacher, K. J., & Rucker, D. D. (2002). On the practice of dichotomization of quantitative variables. *Psychological Methods*, *7*(1), 19–40.

http://doi.org/10.1037//1082-989X.7.1.19

Maccoby, E. E. (1992). The role of parents in the socialization of children: An historical overview. *Developmental Psychology*, *28*(6), 1006–1017. http://doi.org/10.1037//0012-1649.28.6.1006

Magidson, J., & Vermunt, J. K. (2004). Latent class models. In *The Sage handbook of quantitative methodology for the social sciences* (pp. 175–198). http://doi.org/10.3102/0091732X010001305

Malatesta, C. Z., & Haviland, J. M. (1982). Leammg Display Rules : The Socialization of Emotion Expression in Infancy, 991–1003.

Mantagos, S., Moustogiannis, A., & Vagenakis, A. G. (1998). Diurnal variation of plasma cortisol levels in infancy. *Journal of Pediatric.Endocrinology & Metabolism*, *11*, 549–553.

Mark Cummings, E., Davies, P. T., & Campbell, S. B. (2000). *Developmental psychopathology and family process: Theory, research and clinical implications*. New York: Guilford Press.

Marsee, M. a, Silverthorn, P., & Frick, P. J. (2005). The association of psychopathic traits with aggression and delinquency in non-referred boys and girls. *Behavioral Sciences & the Law*, *23*(6), 803–17. http://doi.org/10.1002/bsl.662

Marsh, A. A., Ph, D., Finger, E. C., Mitchell, D. G. V, Reid, M. E., Sims, C., … Blair, R. J. R. (2008). Reduced Amygdala Response to Fearful Expressions in Children and Adolescents With Callous-Unemotional Traits and Disruptive Behavior Disorders. *American Journal of Psychiatry*, *165*(June), 712–720. http://doi.org/10.1176/appi.ajp.2007.07071145

Marsh, H. W., Wen, Z., & Hau, K.-T. (2004). Structural equation models of latent interactions: evaluation of alternative estimation strategies and indicator construction. *Psychological Methods*, *9*(3), 275–300. http://doi.org/10.1037/1082-989X.9.3.275

McEwen, B. S. (1998a). Protective and damaging effects of stress mediators. *The New England Journal of Medicine*, *338*, 171–179. http://doi.org/10.1056/NEJM199801153380307

McEwen, B. S. (1998b). Stress, adaptation, and disease. Allostasis and allostatic load. *Annals of the New York Academy of Sciences*, *840*, 33–44. http://doi.org/10.1111/j.1749-6632.1998.tb09546.x

McEwen, B. S. (2000). Protective and damaging effects of stress mediators: central role of the brain. *Dialogues in Clinical Neuroscience*, *122,* 367–381. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/10737048

McEwen, B. S., & Seeman, T. (1999). Protective and damaging effects of mediators of stress. Elaborating and testing the concepts of allostasis and allostatic load. *Annals of the New York Academy of Sciences*, *896*, 30–47. http://doi.org/10.1111/j.1749-6632.1999.tb08103.x

McEwen, B. S., & Wingfield, J. C. (2003). The concept of allostasis in biology and biomedicine. *Hormones and Behavior*. http://doi.org/10.1016/S0018-506X(02)00024-7

McMahon, C. a., & Meins, E. (2012). Mind-mindedness, parenting stress, and emotional availability in mothers of preschoolers. *Early Childhood Research Quarterly*, *27*(2), 245–252. http://doi.org/10.1016/j.ecresq.2011.08.002

McMahon, R. J., Witkiewitz, K., & Kotler, J. S. (2010). Predictive validity of callous-unemotional traits measured in early adolescence with respect to multiple antisocial outcomes. *Journal of Abnormal Psychology*, *119*(4), 752–63. http://doi.org/10.1037/a0020796

Meaney, M. J. (2010). Epigenetics and the biological definition of gene x environment interactions. *Child Development*, *81*(1), 41–79. http://doi.org/10.1111/j.1467-8624.2009.01381.x

Meaney, M. J., & Szyf, M. (2005). Maternal care as a model for experience-dependent chromatin plasticity? *Trends in Neurosciences*. http://doi.org/10.1016/j.tins.2005.07.006

Meins, E. (1999). Sensitivity, security and internal working models: bridging the transmission gap. *Attachment & Human Development*, *1*(January 2015), 325–342. http://doi.org/10.1080/14616739900134181

Meins, E., Centifanti, L. C. M., Fernyhough, C., & Fishburn, S. (2013). Maternal mind-mindedness and children's behavioral difficulties: Mitigating the impact of low socioeconomic status. *Journal of Abnormal Child Psychology*, *41*, 543–553. http://doi.org/10.1007/s10802-012-9699-3

Meins, E., Fernyhough, C., Arnott, B., Turner, M., & Leekam, S. R. (2011). Mother- Versus Infant-Centered Correlates of Maternal Mind-Mindedness in the First Year of Life. *Infancy*, *16*(2), 137–165. http://doi.org/10.1111/j.1532-7078.2010.00039.x

Meins, E., Fernyhough, C., de Rosnay, M., Arnott, B., Leekam, S. R., & Turner, M. (2012). Mind-Mindedness as a Multidimensional Construct: Appropriate and Nonattuned Mind-Related Comments Independently Predict Infant-Mother Attachment in a Socially Diverse Sample. *Infancy*, *17*(4), 393–415. http://doi.org/10.1111/j.1532-7078.2011.00087.x

Meins, E., Fernyhough, C., Wainwright, R., Das Gupta, M., Fradley, E., & Tuckey, M. (2002). Maternal mind-mindedness and attachment security as predictors of theory of mind understanding. *Child Development*, *73*(6), 1715–1726. http://doi.org/10.1111/1467-8624.00501

Miller, G. E., Chen, E., & Zhou, E. S. (2007). If it goes up, must it come down? Chronic stress and the hypothalamic-pituitary-adrenocortical axis in humans. *Psychological Bulletin*, *133*, 25–45. http://doi.org/10.1037/0033-2909.133.1.25

Mills-Koonce, W. R., Garrett-Peters, P., Barnett, M., Granger, D. a, Blair, C., & Cox, M. J. (2011). Father contributions to cortisol responses in infancy and toddlerhood. *Developmental Psychology*, *47*(2), 388–95. http://doi.org/10.1037/a0021066

Mills-Koonce, W. R., Wagner, N. J., Willoughby, M. T., Stifter, C., Blair, C., & Granger, D. a. (2015). Greater fear reactivity and psychophysiological hyperactivity among infants with later conduct problems and callous-unemotional traits. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *56*(2), 147–154. http://doi.org/10.1111/jcpp.12289

Moffitt, T. E. (1993). Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychological Review*, *100*(4), 674–701. http://doi.org/10.1037//0033-295X.100.4.674

Moore, G. a, Hill-Soderlund, A. L., Propper, C. B., Calkins, S. D., Mills-Koonce, W. R., & Cox, M. J. (2009). Mother-infant vagal regulation in the face-to-face still-face paradigm is moderated by maternal sensitivity. *Child Development*, *80*(1), 209–23. http://doi.org/10.1111/j.1467-8624.2008.01255.x

Morrell, J., & Murray, L. (2003). Parenting and the development of conduct disorder and hyperactive symptoms in childhood: a prospective longitudinal study from 2 months to 8 years. *Journal of Child Psychology and Psychiatry*, *44*(4), 489–508. http://doi.org/10.1111/1469-7610.t01-1-00139

Morsbach, S. K., & Prinz, R. J. (2006). Understanding and improving the validity of self-report of parenting. *Clinical Child and Family Psychology Review*, *9*(1), 1–21. http://doi.org/10.1007/s10567-006-0001-5

Muthén, L. K., & Muthén, B. O. (n.d.). Users Guide.

Network, N. E. C. C. R. (1997). The Effects of Infant Child Care on Infant-Mother Attachment Security: Results of the NICHD [National Institute of Child Health and Human Development] Study of Early Child Care. *Child Development*, *68*, 860–879. Retrieved from

Neumann, C. S., Kosson, D. S., Forth, A. E., & Hare, R. D. (2006). Factor structure of the Hare Psychopathy Checklist: Youth Version (PCL: YV) in incarcerated adolescents. *Psychological Assessment*, *18*, 142–154. http://doi.org/10.1037/1040-3590.18.2.142

Newton, E. K., Laible, D., Carlo, G., Steele, J. S., & McGinley, M. (2014). Do sensitive parents foster kind children, or vice versa? Bidirectional influences between children's prosocial behavior and parental sensitivity. *Developmental Psychology*, *50*(6), 1808–16. http://doi.org/10.1037/a0036495

Nigg, J. T. (2006). Temperament and developmental psychopathology. *Journal of Child Psychology and Psychiatry and Allied Disciplines*. http://doi.org/10.1111/j.1469-7610.2006.01612.x

O'Nions, E., Sebastian, C. L., McCrory, E., Chantiluke, K., Happé, F., & Viding, E. (2014). Neural bases of Theory of Mind in children with autism spectrum disorders and children with conduct problems and callous-unemotional traits. *Developmental Science*, *5*(5), 786–96. http://doi.org/10.1111/desc.12167

Obradović, J. (2012). How can the study of physiological reactivity contribute to our understanding of adversity and resilience processes in development? *Development and Psychopathology*, *24*(2), 371–87. http://doi.org/10.1017/S0954579412000053

Obradović, J., & Boyce, W. T. (2009). Individual differences in behavioral, physiological, and genetic sensitivities to contexts: implications for development and adaptation. *Developmental Neuroscience*, *31*(4), 300–8. http://doi.org/10.1159/000216541

Obradović, J., Bush, N. R., & Boyce, W. T. (2011). The interactive effect of marital conflict and stress reactivity on externalizing and internalizing symptoms: the role of laboratory stressors. *Development and Psychopathology*, *23*(1), 101–14. http://doi.org/10.1017/S0954579410000672

Obradović, J., Bush, N. R., Stamperdahl, J., Adler, N. E., & Boyce, W. T. (2010). Biological sensitivity to context: the interactive effects of stress reactivity and family adversity on socioemotional behavior and school readiness. *Child Development*, *81*(1), 270–89. http://doi.org/10.1111/j.1467-8624.2009.01394.x

Olson, S. L., Sameroff, A. J., Lansford, J. E., Sexton, H., Davis-Kean, P., Bates, J. E., … Dodge, K. a. (2013). Deconstructing the externalizing spectrum: growth patterns of overt aggression, covert aggression, oppositional behavior, impulsivity/inattention, and emotion dysregulation between school entry and early adolescence. *Development and Psychopathology*, *25*(3), 817–42. http://doi.org/10.1017/S0954579413000199

Oxford, M., Cavell, T. A., & Hughes, J. N. (2003). Callous/unemotional traits moderate the relation between ineffective parenting and child externalizing problems: a partial replication and extension. *Journal of Clinical Child and Adolescent Psychology : The Official Journal for the Society of Clinical Child and Adolescent Psychology, American Psychological Association, Division 53*, *32*, 577–585. http://doi.org/10.1207/S15374424JCCP3204

Pardini, D. a, Lochman, J. E., & Powell, N. (2007). The development of callous-unemotional traits and antisocial behavior in children: are there shared and/or unique predictors? *Journal of Clinical Child and Adolescent Psychology : The Official Journal for the Society of Clinical Child and Adolescent Psychology, American Psychological Association, Division 53*, *36*(3), 319–33. http://doi.org/10.1080/15374410701444215

Pardini, D. A., Waller, R., & Hawes, S. W. (2015). Familial influences on the development of CP and delinquency, 201–220. http://doi.org/10.1007/978-3-319-08720-7

Parke, R. D., & Deur, J. A. N. L. (1972). Schedule of Punishment and Inhibition of Aggression in Children 1, *7*(3), 266–269.

Pasalich, D. S., Dadds, M. R., Hawes, D. J., & Brennan, J. (2011). Do callous-unemotional traits moderate the relative importance of parental coercion versus warmth in child conduct problems? An observational study. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *52*(12), 1308–15. http://doi.org/10.1111/j.1469-7610.2011.02435.x

Pasalich, D. S., Dadds, M. R., Hawes, D. J., & Brennan, J. (2012). Attachment and callous-unemotional traits in children with early-onset conduct problems. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *53*(8), 838–45. http://doi.org/10.1111/j.1469-7610.2012.02544.x

Pasalich, D. S., Dadds, M. R., Vincent, L. C., Cooper, F. a, Hawes, D. J., & Brennan, J. (2012). Emotional communication in families of conduct problem children with high versus low callous-unemotional traits. *Journal of Clinical Child and Adolescent Psychology : The Official Journal for the Society of Clinical Child and Adolescent Psychology, American Psychological Association, Division 53*, *41*(3), 302–13. http://doi.org/10.1080/15374416.2012.668844

Pasalich, D. S., Waschbusch, D. a, Dadds, M. R., & Hawes, D. J. (2014). Emotion socialization style in parents of children with callous-unemotional traits. *Child Psychiatry and Human Development*, *45*(2), 229–42. http://doi.org/10.1007/s10578-013-0395-5

Patriquin, M. a, Lorenzi, J., Scarpa, A., & Bell, M. A. (2014). Developmental trajectories of respiratory sinus arrhythmia: associations with social responsiveness. *Developmental*

Psychobiology, *56*(3), 317–26. http://doi.org/10.1002/dev.21100

Patterson, G. R. (2002). The early development of coercive Family Processes.

Patterson, G. R., Debaryshe, B. D., & Ramsey, E. (1983). A Developmental Perspective on Antisocial Behavior, 329–335.

Pauli-Pott, U., Friedl, S., Hinney, A., & Hebebrand, J. (2009). Serotonin transporter gene polymorphism (5-HTTLPR), environmental conditions, and developing negative emotionality and fear in early childhood. *Journal of Neural Transmission*, *116*(4), 503–512. http://doi.org/10.1007/s00702-008-0171-z

Pelham, W. E., Gnagy, E. M., Greenslade, K. E., & Milich, R. (1992). Teacher ratings of DSM-III-R symptoms for the disruptive behavior disorders. *Journal of the American Academy of Child and Adolescent Psychiatry*, *31*(2), 210–218. http://doi.org/10.1097/00004583-199203000-00006

Perry, N. B., Nelson, J. a, Swingler, M. M., Leerkes, E. M., Calkins, S. D., Marcovitch, S., & O'Brien, M. (2013). The relation between maternal emotional support and child physiological regulation across the preschool years. *Developmental Psychobiology*, *55*(4), 382–94. http://doi.org/10.1002/dev.21042

Petersen, I. T., Bates, J. E., Dodge, K. a., Lansford, J. E., & Pettit, G. S. (2015). Describing and predicting developmental profiles of externalizing problems from childhood to adulthood. *Development and Psychopathology*, *27*(03), 791–818. http://doi.org/10.1017/S0954579414000789

Petersen, I. T., Bates, J. E., & Staples, A. D. (2015). The role of language ability and self-regulation in the development of inattentive – hyperactive behavior problems, *27*, 221–237. http://doi.org/10.1017/S0954579414000698

Pluess, M., & Belsky, J. (2011). Prenatal programming of postnatal plasticity? *Development and Psychopathology*, *23*(1), 29–38. http://doi.org/10.1017/S0954579410000623

Pluess, M., & Belsky, J. (2012). Vantage Sensitivity: Individual Differences in Response to Positive Experiences. *Psychological Bulletin*, *139*(4), 901–916. http://doi.org/10.1037/a0030196

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method variance in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879–903. http://doi.org/10.1037/0021-9010.88.5.879

Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of Method Bias in Social Science Research and Recommendations on How to Control It. *Annual Review of Psychology*, *63*(1), 539–569. http://doi.org/10.1146/annurev-psych-120710-100452

Posner, M. I., & Rothbart, M. K. (2000). Developing mechanisms of self-regulation. *Development and Psychopathology*, *12*(3), 427–441. http://doi.org/10.1017/S0954579400003096

Posner, M. I., Rothbart, M. K., Sheese, B. E., & Voelker, P. (2014). Developing Attention: Behavioral and Brain Mechanisms. *Advances in Neuroscience (Hindawi)*, *2014*, 405094.

http://doi.org/10.1155/2014/405094

Preacher, K. J., Rucker, D. D., MacCallum, R. C., & Nicewander, W. A. (2005). Use of the Extreme Groups Approach: A Critical Reexamination and New Recommendations. *Psychological Methods*, *10*(2), 178–192. http://doi.org/10.1037/1082-989X.10.2.178

Raftery, A. E. (1996). Bayesian model selection in social research. *Sociological Methodology*, *26*(1995), 111–163.

Raine, A. (2002). Biosocial Studies of Antisocial and Violent Behavior in Children and Adults : A Review 1, *30*(4), 311–326.

Raine, A., Reynolds, C., Venables, P. H., Mednick, S. A., & Farrington, D. P. (1998). Fearlessness, stimulation-seeking, and large body size at age 3 years as early predispositions to childhood aggression at age 11 years. *Archives of General Psychiatry*, *55*(8), 745–51. http://doi.org/10.1001/archpsyc.55.8.745

Ray, J. V, Frick, P. J., Thornton, L. C., Steinberg, L. D., & Cauffman, E. (2015). Positive and Negative Item Wording and Its Influence on the Assessment of Callous-Unemotional Traits. *Psychological Assessment*.

Rice, M. E., & Grusec, J. E. (1975). Saying and doing: Effects on observer performance. *Journal of Personality and Social Psychology*, *32*(4), 584–593. http://doi.org/10.1037//0022-3514.32.4.584

Roben, C., Cole, P. M., & Laura, A. (2012). Longitudinal Relations Among Language Skills, Anger Expression, and Regulatory Strategies in Early Childhood. *Changes*, *29*(3), 997–1003. http://doi.org/10.1016/j.biotechadv.2011.08.021.Secreted

Romeo, R., Knapp, M., & Scott, S. (2006). Economic cost of severe antisocial behaviour in children--and who pays it. *The British Journal of Psychiatry : The Journal of Mental Science*, *188*, 547–553. http://doi.org/10.1192/bjp.bp.104.007625

Roose, A., Bijttebier, P., Claes, L., & Lilienfeld, S. O. (2011). Psychopathic traits in adolescence: Associations with the revised Reinforcement Sensitivity Theory systems. *Personality and Individual Differences*, *50*(2), 201–205. http://doi.org/10.1016/j.paid.2010.09.028

Rosenblitt, J. C., Soler, H., Johnson, S. E., & Quadagno, D. M. (2001). *Sensation seeking and hormones in men and women: exploring the link. Hormones and behavior* (Vol. 40).

Rowe, R., Costello, E. J., Angold, A., Copeland, W. E., & Maughan, B. (2010). Developmental pathways in oppositional defiant disorder and conduct disorder. *Journal of Abnormal Psychology*, *119*(4), 726–38. http://doi.org/10.1037/a0020798

Rutter, M. (2013). Developmental psychopathology: a paradigm shift or just a relabeling? *Development and Psychopathology*, *25*(4 Pt 2), 1201–13. http://doi.org/10.1017/S0954579413000564

Rutter, M., & Sroufe, L. A. (2000). Developmental psychopathology: Concepts and challenges. *Development and Psychopathology*, *12*(3), 265–296. http://doi.org/10.1017/S0954579400003023

Ruttle, P. L., Shirtcliff, E. a, Serbin, L. a, Fisher, D. B.-D., Stack, D. M., & Schwartzman, A. E. (2011). Disentangling psychobiological mechanisms underlying internalizing and externalizing behaviors in youth: longitudinal and concurrent associations with cortisol. *Hormones and Behavior*, *59*(1), 123–32. http://doi.org/10.1016/j.yhbeh.2010.10.015

Ruttle, P. L., Shirtcliff, E. A., Armstrong, J. M., Klein, M. H., & Essex, M. J. (2013). Neuroendocrine coupling across adolescence and the longitudinal influence of early life stress. *Developmental Psychobiology*, 1–17. http://doi.org/10.1002/dev.21138

Saarni, C. (1999). Emotional competence. *Improving Competence across the Lifespan*, *16*, 27–36.

Sameroff, A. (2010). A unified theory of development: a dialectic integration of nature and nurture. *Child Development*, *81*(1), 6–22. http://doi.org/10.1111/j.1467-8624.2009.01378.x

Sameroff, A. J. (2000). Developmental systems and psychopathology. *Development and Psychopathology*, *12*(3), 297–312. http://doi.org/10.1017/S0954579400003035

Sameroff, A. J., & Seifer, R. (1983). Familial Risk Reviews Familial Risk and Child Competence, 1254–1268.

Sapolsky, R. M. (2000). Stress hormones: good and bad. *Neurobiology of Disease*, *7*, 540–542. http://doi.org/10.1006/nbdi.2000.0350

Scarpa, A., Haden, S. C., & Tanaka, A. (2010). Being hot-tempered: autonomic, emotional, and behavioral distinctions between childhood reactive and proactive aggression. *Biological Psychology*, *84*(3), 488–96. http://doi.org/10.1016/j.biopsycho.2009.11.006

Shaffer, A., Lindhiem, O., Kolko, D. J., & Trentacosta, C. J. (2013). Bidirectional relations between parenting practices and child externalizing behavior: a cross-lagged panel analysis in the context of a psychosocial treatment and 3-year follow-up. *Journal of Abnormal Child Psychology*, *41*(2), 199–210. http://doi.org/10.1007/s10802-012-9670-3

Shaw, D. S. (2013). Future directions for research on the development and prevention of early conduct problems. *Journal of Clinical Child and Adolescent Psychology*, *42*(3), 418–28. http://doi.org/10.1080/15374416.2013.777918

Shaw, D. S., Gilliom, M., Ingoldsby, E. M., & Nagin, D. S. (2003). Trajectories leading to school-age conduct problems. *Developmental Psychology*, *39*(2), 189–200. http://doi.org/10.1037/0012-1649.39.2.189

Shirtcliff, E. a., Granger, D. a., Booth, A., & Johnson, D. (2005). Low salivary cortisol levels and externalizing behavior problems in youth. *Development and Psychopathology*, *17*(01), 167–184. http://doi.org/10.1017/S0954579405050091

Shirtcliff, E. A., Ph, D., Vitacco, M. J., Graf, A. R., Gostisha, A. J., A, B., … Zahn-waxler, C. (2009). Neurobiology of Empathy and Callousness : Implications for the Development of Antisocial Behavior. *Behavioral Sciences & the Law*, *171*, 137–171. http://doi.org/10.1002/bsl

Shonkoff, J. P. (2010). Building a new biodevelopmental framework to guide the future of early childhood policy. *Child Development*, *81*(1), 357–67. http://doi.org/10.1111/j.1467-8624.2009.01399.x

Silva, T. C., & Stattin, H. (2015). The moderating role of parenting on the relationship between psychopathy and antisocial behavior in adolescence. *Development and Psychopathology*, 1–11. http://doi.org/10.1017/S0954579415001121

Smith, J. D., Dishion, T. J., Shaw, D. S., Wilson, M. N., Winter, C. C., & Patterson, G. R. (2014). Coercive family process and early-onset conduct problems from age 2 to school entry. *Development and Psychopathology*, *26*(4 Pt 1), 917–32. http://doi.org/10.1017/S0954579414000169

Spangler, G., Schieche, M., & Ackermann, C. (1994). Maternal Sensitivity as an External Organizer for Biobehavioral Regulation in Infancy, *27*(June 1993), 425–437.

Sroufe, L. A. (1996a). Emotional Development. *Development*. http://doi.org/10.1017/CBO9780511527661

Sroufe, L. A. (1996b). *Emotional development: The organization of emotional life in the early years. Cambridge studies in social & emotional development.* http://doi.org/http://dx.doi.org/10.1017/CBO9780511527661

Sroufe, L. A. (1996). *Emotional development: The organization of emotional life in the early years*. *Cambridge studies in social emotional development*. Retrieved from http://www.eric.ed.gov/ERICWebPortal/search/detailmini.jsp?_nfpb=true&_&ERICExtSearch_SearchValue_0=ED394725&ERICExtSearch_SearchType_0=no&accno=ED394725

Sroufe, L. A., Carlson, E. A., Levy, A. K., & Egeland, B. (1999). Implications of attachment theory for developmental psychopathology. *Development and Psychopathology*, *11*, 1–13.

Stadler, C., Kroeger, A., Weyers, P., Grasmann, D., Horschinek, M., Freitag, C., & Clement, H. W. (2011). Cortisol reactivity in boys with attention-deficit/hyperactivity disorder and disruptive behavior problems: The impact of callous unemotional traits. *Psychiatry Research*, *187*, 204–209. http://doi.org/10.1016/j.psychres.2010.05.004

Stifter, C. a, Willoughby, M. T., & Towe-Goodman, N. (2008). Agree or Agree to Disagree? Assessing the Convergence between Parents and Observers on Infant Temperament. *Infant and Child Development*, *17*(4), 407–426. http://doi.org/10.1002/icd.584

Stifter, C. A., & Corey, J. M. (2001). Vagal Regulation and Observed Social Behavior in Infancy. *Social Development*, *10*(2), 189–201. http://doi.org/Article

Stringaris, A., & Goodman, R. (2009). Three dimensions of oppositionality in youth. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *50*(3), 216–23. http://doi.org/10.1111/j.1469-7610.2008.01989.x

Susman, E. J. (2006). Psychobiology of persistent antisocial behavior: Stress, early vulnerabilities and the attenuation hypothesis. *Neuroscience and Biobehavioral Reviews*. http://doi.org/10.1016/j.neubiorev.2005.08.002

Swain, J. E., Lorberbaum, J. P., Kose, S., & Strathearn, L. (2007). Brain basis of early parent-infant interactions: Psychology, physiology, and in vivo functional neuroimaging studies. *Journal of Child Psychology and Psychiatry and Allied Disciplines*. http://doi.org/10.1111/j.1469-7610.2007.01731.x

Swingler, M. M., Perry, N. B., & Calkins, S. D. (2015). Neural plasticity and the development of attention: Intrinsic and extrinsic influences. *Development and Psychopathology*, *27*(02), 443–457. http://doi.org/10.1017/S0954579415000085

Taumoepeau, M., & Ruffman, T. (2006). Mother and infant talk about mental states relates to desire language and emotion understanding. *Child Development*, *77*(2), 465–81. http://doi.org/10.1111/j.1467-8624.2006.00882.x

Taumoepeau, M., & Ruffman, T. (2008). Stepping stones to others' minds: maternal talk relates to child mental state language and emotion understanding at 15, 24, and 33 months. *Child Development*, *79*(2), 284–302. http://doi.org/10.1111/j.1467-8624.2007.01126.x

Tremblay, R. E., Nagin, D. S., Séguin, J. R., Zoccolillo, M., Zelazo, P. D., Boivin, M., … Japel, C. (2005). Physical aggression during early childhood: trajectories and predictors. *The Canadian Child and Adolescent Psychiatry Review = La Revue Canadienne de Psychiatrie de L'enfant et de L'adolescent*, *14*, 3–9. http://doi.org/10.1542/peds.114.1.e43

Trochim, W. M. K., & Donnelly, J. P. (2006). *The Research Methods Knowledge Base*. *WebRef* (Vol. 3rd).

Tronick, E. Z., Bruschweiler-Stern, N., Harrison, A. M., Lyons-Ruth, K., Morgan, A. C., Nahum, J. P., … Stern, D. N. (1998). Dyadically expanded states of consciousness and the process of therapeutic change. *Infant Mental Health Journal*, *19*(3), 290–299. http://doi.org/10.1002/(SICI)1097-0355(199823)19:3<290::AID-IMHJ4>3.0.CO;2-Q

Ursache, A., Blair, C., Granger, D. a, Stifter, C., & Voegtline, K. (2014). Behavioral reactivity to emotion challenge is associated with cortisol reactivity and regulation at 7, 15, and 24 months of age. *Developmental Psychobiology*, *56*(3), 474–88. http://doi.org/10.1002/dev.21113

Van Aken, C., Junger, M., Verhoeven, M., Van Aken, M. A. G., & Deković, M. (2007). The interactive effects of temperament and maternal parenting on toddlers' externalizing behaviours. *Infant and Child Development*, *16*, 553–572. http://doi.org/10.1002/icd.529

van Baardewijk, Y., Stegge, H., Bushman, B. J., & Vermeiren, R. (2009). Psychopathic traits, victim distress and aggression in children. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *50*(6), 718–25. http://doi.org/10.1111/j.1469-7610.2008.02023.x

Van Bakel, H. J. a, & Riksen-Walraven, J. M. (2004). Stress reactivity in 15-month-old infants: links with infant temperament, cognitive competence, and attachment security. *Developmental Psychobiology*, *44*(3), 157–67. http://doi.org/10.1002/dev.20001

Van Zeijl, J., Mesman, J., Van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Juffer, F., Stolk, M. N., … Alink, L. R. A. (2006). Attachment-based intervention for enhancing sensitive discipline in mothers of 1- to 3-year-old children at risk for externalizing behavior problems: a randomized controlled trial. *Journal of Consulting and Clinical Psychology*, *74*, 994–1005. http://doi.org/10.1037/0022-006X.74.6.994

Vando, J., Rhule-Louie, D. M., McMahon, R. J., & Spieker, S. J. (2007). Examining the Link Between Infant Attachment and Child Conduct Problems in Grade 1. *Journal of Child and Family Studies*, *17*(5), 615–628. http://doi.org/10.1007/s10826-007-9173-y

Viding, E., Blair, R. J. R., Moffitt, T. E., & Plomin, R. (2005). Evidence for substantial genetic risk for psychopathy in 7-year-olds. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *46*(6), 592–7. http://doi.org/10.1111/j.1469-7610.2004.00393.x

Viding, E., Fontaine, N. M. G., Oliver, B. R., & Plomin, R. (2009). Negative parental discipline, conduct problems and callous-unemotional traits: monozygotic twin differences study. *The British Journal of Psychiatry : The Journal of Mental Science*, *195*(5), 414–9. http://doi.org/10.1192/bjp.bp.108.061192

Viding, E., & McCrory, E. J. (2012). Why should we care about measuring callous-unemotional traits in children? *The British Journal of Psychiatry : The Journal of Mental Science*, *200*(3), 177–8. http://doi.org/10.1192/bjp.bp.111.099770

Viding, E., McCrory, E., & Seara-Cardoso, A. (2014). Psychopathy. *Current Biology*, *24*(18), R871–R874. http://doi.org/10.1016/j.cub.2014.06.055

Vygotsky, L. S. (1962). Understanding text: Achieving explanatory coherence through on-line inferences and mental operations in working memory. *Discourse Processes*, *16*, 3–34.

Wagner, N. J., Mills-Koonce, W. R., Propper, C. B., Willoughby, M. T., Rehder, P. D., Moore, G. A., & Cox, M. J. (2016). Associations between Infant Behaviors during the Face-To-Face Still-Face Paradigm and Oppositional Defiant and Callous-Unemotional Behaviors in Early Childhood. *Journal of Abnormal Child Psychology*. http://doi.org/10.1007/s10802-016-0141-0

Wagner, N. J., Mills-koonce, W. R., Willoughby, M. T., Zvara, B., Martha, J., Behaviors, C., … Willoughby, M. T. (2015). Developmental Psychology Parenting and Children ' s Representations of Family Predict Disruptive and Callous-Unemotional Behaviors Parenting and Children ' s Representations of Family Predict Disruptive and. *Developmental Psychology*.

Wagner, N. J., Propper, C., Gueron-Sela, N., & Mills-Koonce, W. R. (2015). Dimensions of Maternal Parenting and Infants' Autonomic Functioning Interactively Predict Early Internalizing Behavior Problems. *Journal of Abnormal Child Psychology*. http://doi.org/10.1007/s10802-015-0039-2

Wagner, N., Mills-Koonce, R., Willoughby, M., Propper, C., Rehder, P., & Gueron-Sela, N. (2015). Respiratory sinus arrhythmia and heart period in infancy as correlates of later oppositional defiant and callous-unemotional behaviors. *International Journal of Behavioral Development*. http://doi.org/10.1177/0165025415605391

Waller, R., Baskin-Sommers, A. R., & Hyde, L. W. (2016). Examining Predictors of Callous Unemotional Traits Trajectories Across Adolescence Among High-Risk Males. *Journal of Clinical Child & Adolescent Psychology*, *4416*(January), 1–14. http://doi.org/10.1080/15374416.2015.1102070

Waller, R., Gardner, F., Dishion, T., Sitnick, S. L., Shaw, D. S., Winter, C. E., & Wilson, M. (2014). Early Parental Positive Behavior Support and Childhood Adjustment: Addressing Enduring Questions with New Methods. *Social Development*, n/a–n/a. http://doi.org/10.1111/sode.12103

Waller, R., Gardner, F., & Hyde, L. W. (2013). What are the associations between parenting, callous-unemotional traits, and antisocial behavior in youth? A systematic review of evidence. *Clinical Psychology Review*, *33*(4), 593–608. http://doi.org/10.1016/j.cpr.2013.03.001

Waller, R., Gardner, F., Hyde, L. W., Shaw, D. S., Dishion, T. J., & Wilson, M. N. (2012). Do harsh and positive parenting predict parent reports of deceitful-callous behavior in early childhood? *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *53*(9), 946–53. http://doi.org/10.1111/j.1469-7610.2012.02550.x

Waller, R., Gardner, F., Shaw, D. S., Dishion, T. J., Wilson, M. N., & Hyde, L. W. (2014). Callous-Unemotional Behavior and Early-Childhood Onset of Behavior Problems: The Role of Parental Harshness and Warmth. *Journal of Clinical Child and Adolescent Psychology : The Official Journal for the Society of Clinical Child and Adolescent Psychology, American Psychological Association, Division 53*, (November), 37–41. http://doi.org/10.1080/15374416.2014.886252

Waller, R., Gardner, F., Viding, E., Shaw, D. S., Dishion, T. J., Wilson, M. N., & Hyde, L. W. (2014). Bidirectional Associations Between Parental Warmth, Callous Unemotional Behavior, and Behavior Problems in High-Risk Preschoolers. *Journal of Abnormal Child Psychology*, *42*(8), 1275–85. http://doi.org/10.1007/s10802-014-9871-z

Waller, R., Hyde, L. W., Grabell, A. S., Alves, M. L., & Olson, S. L. (2014). Differential associations of early callous-unemotional, oppositional, and ADHD behaviors: multiple domains within early-starting conduct problems? *Journal of Child Psychology and Psychiatry, and Allied Disciplines*. http://doi.org/10.1111/jcpp.12326

Waller, R., Shaw, D. S., Neiderhiser, J. M., Ganiban, J. M., Natsuaki, M. N., Reiss, D., … Hyde, L. W. (2015a). Toward an Understanding of the Role of the Environment in the Development of Early Callous Behavior. *Journal of Personality*, n/a–n/a. http://doi.org/10.1111/jopy.12221

Waller, R., Shaw, D. S., Neiderhiser, J. M., Ganiban, J. M., Natsuaki, M. N., Reiss, D., … Hyde, L. W. (2015b). Towards an understanding of the role of the environment in the development of early callous behavior. *Journal of Personality*, (AUGUST), n/a–n/a. http://doi.org/10.1111/jopy.12221

White, S. F., Brislin, S., Sinclair, S., Fowler, K. A., Pope, K., & Blair, R. J. R. (2013). The relationship between large cavum septum pellucidum and antisocial behavior, callous-unemotional traits and psychopathy in adolescents. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *54*, 575–581. http://doi.org/10.1111/j.1469-7610.2012.02603.x

Willoughby, M. T., Mills-Koonce, R., Propper, C. B., & Waschbusch, D. a. (2013). Observed parenting behaviors interact with a polymorphism of the brain-derived neurotrophic factor gene to predict the emergence of oppositional defiant and callous-unemotional behaviors at age 3 years. *Development and Psychopathology*, *25*(4 Pt 1), 903–17. http://doi.org/10.1017/S0954579413000266

Willoughby, M. T., Mills-Koonce, W. R., Waschbusch, D. a, & Gottfredson, N. C. (2014). An Examination of the Parent Report Version of the Inventory of Callous-Unemotional Traits in a Community Sample of First-Grade Children. *Assessment*. http://doi.org/10.1177/1073191114534886

Willoughby, M. T., Waschbusch, D. a, Moore, G. a, & Propper, C. B. (2011). Using the ASEBA to Screen for Callous Unemotional Traits in Early Childhood: Factor Structure, Temporal Stability, and Utility. *Journal of Psychopathology and Behavioral Assessment*, *33*(1), 19–30. http://doi.org/10.1007/s10862-010-9195-4

Woodworth, M., & Waschbusch, D. (2008). Emotional processing in children with conduct problems and callous/unemotional traits. *Child: Care, Health and Development*, *34*(2), 234–44. http://doi.org/10.1111/j.1365-2214.2007.00792.x

Wootton, J. M., Prick, P. J., Shelton, K. K., & Silverthorn, P. (1997). Ineffective Parenting and Childhood Conduct Problems : The Moderating Role of Callous-Unemotional Traits, (2), 301–308.

Wright, K. D., Waschbusch, D. A., & Frankland, B. W. (2007). Combining data from parent ratings and parent interview when assessing ADHD. *Journal of Psychopathology and Behavioral Assessment*, *29*(3), 141–148. http://doi.org/10.1007/s10862-006-9039-4

Zvara, B. J., Mills-Koonce, W. R., Garrett-Peters, P., Wagner, N. J., Vernon-Feagans, L., & Cox, M. (2014). The mediating role of parenting in the associations between household chaos and children's representations of family dysfunction. *Attachment & Human Development*, *16*(6), 633–55. http://doi.org/10.1080/14616734.2014.966124