THE ASSOCIATION OF MATERNAL EMOTION AND COGNITIVE CONTROL CAPACITIES TO PARENTING AND CHILD WELL-BEING

by

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ABSTRACT

Background

Parenting forms the foundation for lifelong health. Most parents are deeply invested in seeing their children succeed, but despite these intentions, many parents struggle to engage in effective parenting strategies. Parental emotion and cognitive control capacities (ECCCs) help to explain this gap between the desire to parent well and actual behaviors.

Methods

For aim 1 of this dissertation, a conceptual framework on maternal ECC and parenting was developed based on a comprehensive literature review. In aim 2, data from 152 mothers and their children ages 3-7 years were analyzed to assess maternal ECC and its association with parenting and child behaviors, with maternal social cognitions included as potential mediators. Aim 3 includes data from a five-year longitudinal study of 478 mothers and their adolescent children. This study addresses how family processes mediate the associations between maternal self-reported emotion regulation and parenting and child behaviors. Aims 2 and 3 were analyzed using Structural Equation Modeling in Mplus Version 7.

Results

Maternal ECC is related to warm, sensitive parenting and inversely related to harsh, reactive parenting. Stress, poor nutrition, substance abuse, and fatigue can impair one’s ECC. In Aim 2, maternal emotion control was inversely associated with harsh parenting; higher maternal executive functioning was associated with observed positive parenting. Maternal social cognitions mediated the relationship
between maternal ECCC and child behaviors. Maternal executive functioning moderated the association between maternal social cognitions and parenting behaviors. In Aim 3, maternal emotional reactivity was predictive of verbal-punitive and indulgent parenting. Maternal emotional distancing was inversely predictive of maternal warmth and regulation parenting through the mediators of family functioning and family monitoring.

**Conclusions**

Maternal ECCCs help a mom to engage in effective parenting. Mom’s emotion regulation is particularly important for reducing harsh, reactive parenting and child aggression. Parenting and early childhood programs are most likely to be successful if they help moms to develop strategies that reduce stress, fatigue, and other factors known to impair ECCC. Programs that work with multiple family members to strengthen healthy family processes are especially important for families where the mom has low ECCC.

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CHAPTER 1

BACKGROUND AND SIGNIFICANCE
INTRODUCTION

Virtually all parents want to be a good parent and to see their children succeed. Despite this near universal desire to parent well, every year there are 3.3 million reports of child abuse involving 6 million children in the U.S., with parents the perpetrator in 80% of cases (United States Government Accountability Office, 2011; U.S. DHHS, ACF, ACYF, & Children’s Bureau, 2011). This may underrepresent the true incidence of child maltreatment. In a nationally representative sample of 0-17 year olds in the United States, 10.2% reported having experienced some form of child maltreatment in the past year and 18.6% reported maltreatment at some point in their lifetime (Finkelhor et al, 2009). Good parenting, however, does not just represent the absence of child maltreatment; many more parents struggle to engage in parenting that is warm, nurturing, consistent and supportive (referred to generally throughout this dissertation as positive parenting; harsh, reactive, indulgent, and inconsistent parenting is referred to generally as negative parenting).

To combat child maltreatment and to increase positive parenting, parent skills training programs, early childhood home visiting programs, and crisis centers for parents who feel they may harm their children have been developed in the U.S. and globally. In the past decade, the efficacy and real world effectiveness of several parenting programs has been demonstrated (Gross et al, 2009; Sanders, 2003; Sanders et al, 2008; Olds et al, 1997). These programs have been successful in improving parenting practices and reducing child maltreatment and problem behavior in young children (Gross et al, 2009; Prinz et al, 2009; Webster-Stratton,
Rinaldi, and Reid, 2007). However, even the most successful programs are not effective with all parents; some families may already have good parenting knowledge but live in such stressful circumstances that make it difficult for them to implement what they learn in these programs (Wahler & Dumas, 1989), and the maintenance of initial positive effects continues to be challenging (Duggan et al, 1999; Nievar, van Egeren, & Pollard, 2010; Sweet & Appelbaum, 2004).

Understanding the factors that help explain why parents do not master positive parenting skills or fail to maintain them when learned is critical for advancing the public health practice of child abuse prevention. A promising area of research is that of parents’ emotion and cognitive control capacities (ECCCs) and the role they may play in the development and maintenance of parenting practices. Recent studies indicate that mothers with lower ECCC are more likely to engage in harsh parenting (Deater-Deckard et al, 2010; Gonzalez et al, 2012; Mokrova et al 2010; Lorber, 2012), and mothers who are more emotionally reactive/distant (lower differentiation) are at higher risk for engaging in child maltreatment (Skowron, Kozlowski, & Pincus, 2010). ECCCs such as inhibition, working memory, and cognitive flexibility largely control emotional response and regulation (Oschner, Silvers, & Buhle, 2012). A mother’s ability to call upon these capacities helps to explain why some moms are able to respond firmly but positively to children in stressful and demanding times.
The study of maternal ECCC is very new, and little is known about the association between maternal ECCC and parenting and child outcomes. While scientists are beginning to assess this relationship, the literature available is very disjointed. Little is known empirically about these parents with lower ECCC and why they engage in harsher parenting. Questions that are answered through this dissertation include:

- What is the relationship of maternal ECCC to positive and negative parenting and child behavior?
- Do mothers with lower ECCC view good parenting and the reasons for child misbehavior differently? Is their ability to parent according to their own beliefs impacted by their ECCCs?
- How do family processes mediate the longitudinal relationship between maternal emotion regulation and parenting and adolescent behavior?

This information increases the scientific basis for understanding the role of maternal ECCC on parenting behaviors. It also has the potential to enhance the design of intervention programs aimed at improving parenting and to help those who develop and implement parenting skills education and other parenting programs to better engage parents with lower ECCC, which will hopefully lead to improved long-term success of these programs. Ultimately, this line of research may be useful in understanding how to help parents avoid neglecting/abusing their children, an outcome that virtually all of them desire.
The focus of this dissertation will be on a mom’s ECC and how it is associated with parenting and child behaviors. The role of fathers is also important. However, mothers have been the primary focus of research that has been conducted on parental ECC and parenting. In order to build on this previous research, I have decided to focus on mothers though some of the results may also be applicable to fathers and their parenting.

**DISSERTATION ORGANIZING FRAMEWORK**

This dissertation includes a conceptual framework developed from a comprehensive review of the literature and two empirical papers; these three papers are based on the aims (described below) of this dissertation. Chapter 1 includes the dissertation aims and hypotheses, theoretical and background information, and a conceptual model for the dissertation. Chapter 2 provides detailed information on the methods and research design for the three papers, including a review of each study design and sample, key measures, and the analytic strategies used. Chapters 3-5 contain the manuscripts for the three papers: the comprehensive literature review and development of a conceptual framework of the multigenerational impact of maternal ECC and parenting (aim 1; chapter three); the empirical results on the potential mediating role of maternal social cognitions in the relationship between maternal ECCs and parenting and child behaviors (aim 2; chapter four); and the empirical results of a 5-year longitudinal study addressing the potential mediation of family processes in the relationship of maternal emotion regulation to parenting and adolescent behaviors (aim 3; chapter five). Each
The overarching goal of this dissertation is to build upon prior research to gain a better understanding of maternal emotion and cognitive control capacities (ECCCs) and their association to parenting and child behaviors and to identify how family contextual factors and processes influence these relationships. The three aims, with accompanying hypotheses, for this dissertation are as follows:

1) Develop a conceptual framework, based on a comprehensive review of the literature, to describe the likely influence of ECCCs on parenting attitudes, behaviors, and child outcomes.

2) Explore the association between maternal ECCCs and parenting attitudes and behaviors to address the following critical questions:
   a) Does parenting behavior vary by maternal ECCCs?
   b) Do the contextual factors of household chaos and SES risks influence maternal ECCCs and parenting behaviors?
c) Do parenting attitudes and beliefs mediate the association between maternal ECCC and parenting behaviors and between contextual factors (SES and Chaos) and parenting behaviors?

d) Do children have more behavioral difficulties if their mother has lower ECCC? Do parenting attitudes and behaviors mediate this relationship?

e) Are parenting attitudes and attributions (i.e. parenting expectations) more closely associated with parenting behavior among mothers with higher ECCC compared to mothers with lower ECCC?

Data for aim 2 come from the R21 HD 60110, “Maternal Self-Regulation and Harsh Parenting” project out of Virginia Tech (PIs: Kirby Deater-Deckard and Martha Ann Bell).

3) Explore how maternal emotion regulation impacts parenting and adolescent outcomes and how family processes affect this relationship, specifically:

a) Examine the longitudinal impact of maternal emotion regulation, specifically emotional reactivity and emotional distancing, on parenting dimensions and child internalizing, externalizing, and prosocial behaviors.

b) Test how the family-level factors of functioning and monitoring mediate the relationship between maternal emotion regulation and parenting.

Data for aim 3 come from the Flourishing Families Project out of Brigham Young University (PI: Randal Day; Co-Investigators: James Harper, Rick Miller, Laura Walker, Jeremy Yorgason, Roy A. Bean, and Sarah Coyne).
BACKGROUND AND SIGNIFICANCE

Emotion and Cognitive Control

Emotion and cognitive control capacities (ECCCs) allow a person to manage or control emotional, social, and cognitive processes that influence behavior so that they can achieve their goals (Hughes and Ensor, 2005; Galinsky, 2010). These processes are important for most activities people undertake such as learning to cut with scissors, riding a bicycle, pouring a glass of milk, or gaining admission into a social group (National Research Council & Institute of Medicine, 2000). ECCC is an umbrella term that includes planfulness, inhibitory control, working memory, critical thinking, emotion control, self-control, making connections, perspective taking, attention control, and more (National Research Council & Institute of Medicine, 2000; Moffitt, 2011). Scientists define ECCC differently but there is agreement in most of the literature that it includes inhibitory control, working memory, and attention control, and that other relevant cognitive processes fit within these constructs (Diamond et al, 2007; Blair & Razza, 2007). Some use it interchangeably with self-regulation, self-control, and effortful control, while others argue that while they are correlated they are not synonymous (Blair & Razza, 2007).

A form of fluid intelligence, ECCCs may actually better predict a person’s achievement than IQ does because they support a person’s ability to use what one knows rather than simply assessing one’s knowledge (Galinksy, 2010). ECCCs help a person tap their abilities to use what they already know to plan, control themselves, reflect and evaluate, and to consider things from multiple perspectives.
Development of Emotion and Cognitive Control Capacities

The development of ECCCs begins in infancy, but they are developed over time, and more complex skills do not begin to develop until the preschool years (Sheridan et al, 2012; Barbey et al, 2012; Knudsen, 2006; Huizinga & Smidts, 2011; Best, Miller, & Jones, 2009; Galinsky, 2010). ECCCs are malleable which means that parents and other adults can aid (or hinder) their child’s development of them (Bernier et al, 2012; Hughes, 2011). Adults can also actively work to develop them in themselves, but early ECCCs do predict later ECCCs (Mandell and Ward, 2011; Murray et al, 2006).

ECCCs are largely ‘housed’ in the prefrontal cortex of the brain. The development of ECCCs is a protracted process that can extend into the early 30s, but the various domains have different developmental trajectories based on where in the frontal lobe they are primarily housed (Huizinga & Smidts, 2011). It appears from brain imaging studies that the dorsal lateral prefrontal cortex plays the primary role with ECCCs, but it interplays with other areas of the brain including the orbitofrontal cortex (linked to impulse control), the anterior cingulated cortex (linked to attention and action monitoring), the frontal and posterior parietal cortex, motor areas of the brain, the cerebellum, and other areas (Niendam et al, 2012; Barrett & Fleming 2011; Ochsner, Silvers, & Buhle, 2012). Communication between the frontal and parietal lobes of the brain are essential for ECCCs to operate (Barbey et al, 2012).
ECCCs are susceptible to disease, injury, and development (Niendam et al, 2012). Since the development of ECCC is protracted, the environment is very important (Knudsen et al, 2006). However, ECCCs may be in fact one of the most heritable psychological traits (Friedman et al, 2008). In twin studies, genes have been shown to play the larger role in predicting ECCC (Vasilopoulos et al, 2012; Blair & Diamond, 2008). Socioeconomic status (SES) and family structure have also been found to be associated with ECCC in adults and children (Sarsour et al, 2011; Hughes and Ensor, 2005; Deater-Deckard et al, 2012; Noble et al, 2005; 2007; Sheridan et al, 2012; Hackman, Farah, & Meaney, 2010). ECCCs are not static and can be impacted by factors like stress, sleep, and fatigue (Schoofs, Wolf, & Smeets, 2009; Boksem, Meijman, & Lorist, 2006; Kienhuis et al, 2010).

Public Health Significance

ECCCs have been linked with many behaviors and outcomes important to public health. In fact, they are a salient feature in most public health issues influenced by individual behavior. All behaviors and tasks that require attentional control will likely be correlated with ECCC (Engle & Kane, 2004). They have been linked with a child's ability to cross the street safely (Barton & Morrongiello, 2011), risk-taking in adolescence and emerging adulthood (Pharo et al, 2011; Romer et al., 2009; Engle & Kane, 2004), school success (Diamond et al, 2007), social and mental health problems (Diamond et al, 2007; Engle & Kane 2004; Moffitt, 2011), harsh reactive parenting (Deater-Deckard et al, 2010), and are predictive of adult health, wealth, and crime (Moffitt, 2011; Diamond et al, 2007). They are also a positive predictor of
healthy friendships and family relationships and the ability to save money and spend planfully (Moffitt, 2011). Ultimately, the failure to stop, look, listen, and think before acting will impact an individual’s ability to effectively solve problems (National Research Council & Institute of Medicine, 2000; Douglas, 1972).

Parenting

Parenting plays a crucial role in the foundations of lifelong health (Bandura, 1997) and has been described as “the process by which a society manages to maintain itself” (Bogenschneider, 2006: 67). Children do best when parents are warm and supportive, responsive, spend time with their children, expect their children to follow rules, react to misbehavior with communication rather than harsh punishment, and monitor their children’s behavior (Amato & Fowler, 2002; Dumka et al, 2009). Positive parenting is linked to healthy outcomes among children including higher grades in school, fewer behavioral problems, less substance use, better mental health, and greater social competence (Amato & Fowler, 2002). On average, children do not fare as well when their parents are harsh and punitive or detached and neglectful (Waldfogel et al, 2010). The exception to this is in environments where crime and violence are salient. In these environments increased parental monitoring and maternal toughness are protective factors among adolescents (Dumka et al, 2009). Poor parenting leads to high societal costs due to increased crime, substance abuse, poor school performance, and mental health problems. Ultimately, it undermines a child’s opportunities, resulting in inequalities
in the next generation (McLanahan et al, 2010). In fact, the strongest predictor of juvenile delinquency is ineffective parenting (Kumpfer & Alvarado, 2003).

Research (Waldfogel et al, 2010) shows that the optimal parenting combination involves high levels of parental support and monitoring and the avoidance of harsh punishment. Parenting is influenced by multiple internal and external factors including culture (Cheah et al, 2009), religiosity (Snider, Clements, and Vazsonyi, 2004; Bert, 2011) parent-child interaction (Woolfson & Grant, 2006), child behavior problems (Woolfson & Grant, 2006), parenting stress (Cheah et al, 2009; Dabrowska & Pisula, 2010; Woolfson & Grant, 2006; Ponnet et al, 2012), child health and well-being (Dabrowska & Pisula, 2010; Woolfson & Grant, 2006), parent/couple relationship quality (Carlson et al, 2011; Ponnet et al, 2012), and the transmission of parenting from generation to generation (Bailey et al, 2009; Belsky, Conger, & Capaldi, 2009; Conger, Belsky, & Capaldi, 2009; Kovan, Chung & Sroufe, 2009).

It is not just parenting style that matters to children, but it is also what parents do for them that promotes or impairs their health. For example, parents set routines to build consistency for their children and ensure they get enough sleep; they manage the food their children eat; they monitor the time children spend on media (TV, social media, etc) and the amount of exercise they get; they arrange for childcare and healthcare; they are both attentive to and teach their children about personal hygiene, substance use, sexual health, and overall safety. ECCCs play a major role in a parent’s ability to carry out these functions.
Maternal Emotion and Cognitive Control and Parenting

An important skill that all parents need is the ability to be adaptable. Adaptable parents are perceptive, responsive, and flexible – all cognitive control capacities (Commonwealth Department of Family and Community Services, 2004; Kienhuis et al, 2010).

The following example illustrates the role of ECCC on adaptable parenting:

A child is crying while the mother is trying to clean her house and get ready for a doctor’s appointment. An attentive parent will be able to pick up on and interpret the child’s signals (i.e. the child is crying because he or she is hungry) and be able to do this while engaging in the competing demand of cleaning the house. To do this, the mother must be able to shift her attention between the competing task of getting the house clean and the child’s behavior and also shift her attention from her own response to the child and maintaining selective attention to the competing demands (attention control). She must also engage her working memory to be able to recognize and recall the behavior in order to appropriately interpret the cues (in this case that the child’s crying is because she is hungry) and how to “solve” the problem (stop the crying) by recognizing what has worked in the past and what has not. Finally, she must tap into inhibitory control in order to tune into her child’s needs rather than other tasks and events competing for her attention that may be more desirable to the mother. She may also engage in problem-solving (how to clean the house and take care of the crying child in a
time-sensitive situation) and emotion reappraisal (how to attune to and control her emotions in the face of her frustrations linked to accomplishing multiple tasks and calm her child).

While parents must be adaptable, their motivation to parent and to be motivated within their parental role to continue to learn to be a more ‘optimal parent’ also requires ECCCs (Kienhuis et al, 2010). For example, parents must be able place priority on the well-being of the child above their own desires (inhibitory control) and adapt both behaviorally and in their thought-processes to the child’s changing needs (attention control and working memory). The motivation to parent well also requires goal-setting, organization and planning, decision-making, problem solving, and emotion regulation.

Emotion regulation is a particularly important ECCC for parents in stressful situations. Parents with strong emotion regulation are more flexible, adaptable, and better able to cope with stress. They appropriately shift to calm, logical reasoning or strong affect according to circumstances (i.e. if the child is crossing the street without the parent, strong affect may be warranted). Parents who are not able to emotionally self-regulate tend to be more emotionally reactive in response to stressors and the emotionality of others. For example, if the child is stressed, an emotionally reactive parent will react emotionally to the child’s stress rather than reacting calmly to soothe the child (Skowron & Friedlander, 1998).
THEORETICAL FRAMEWORK

Two theories help to form the theoretical basis of this dissertation:

Bronfenbrenner's Bioecological Theory (Bronfenbrenner & Morris, 1998) and
Bowen's Family Systems Theory (Bowen, 1974).

Bioecological Theory

There are four key components of the Bioecological Theory: process, person, context, and time. Processes refer to the individual and his/her interactions with other people, objects, and symbols in his/her external environment. Person includes genetic, biological, temperament, gender, and other characteristics of the individual. Context is the most well known part of the theory and includes various spheres (microsystem, mesosystem, exosystem, and macrosystem) that influence proximal processes either directly or indirectly. The concept of time in this theory refers not only to chronological age, but also includes the historical period, duration of exposure, and cumulative impact of processes or context. (Bronfenbrenner & Morris, 1998; Tudge et al, 2009; Wachs & Evans, 2010)

In the case of maternal emotion and cognitive control capacity (ECCC) and parenting, parenting can be viewed as the process by which the mother interacts with the child. Other processes may also be influencing parenting such as the interaction that a mother and father have with each other. The mother's ECCCs are person characteristics. The context that influences parenting can include cultural acceptance of parenting behaviors, local laws governing child abuse, economic
strain, neighborhood safety, extended family support, and tools that facilitate or hinder this support (transportation, finances, communication and technology, etc). Over time, parenting may change due to age and development of the child and mother, fluidity in mother's ECCC (for example, it may have worsened with repeated or chronic exposure to stress), or the mother's development of parenting skills through life experience or training.

**Family Systems Theory**

In *Family Systems Theory* (Bowen, 1974), families are viewed as systems composed of interconnected and interdependent individuals who cannot be considered in isolation from each other. In a system, if one part changes, this impacts the rest of the system; other parts of the system will have to change to maintain equilibrium. Put into the family context, if one member of the family changes (i.e. alters his/her routines, changes parenting strategies, etc), then another person will compensate by changing as well in order to maintain the family equilibrium. Systems are adaptable, but there is a strong resistance to change and a pull toward equilibrium and predictability.

Patterns develop in family life as one member’s behavior impacts the behavior of other members. This helps to explain why positive and negative patterns of family life persist, sometimes across generations. For example, Mokrova et al, 2010, found an association between mother ADHD (where levels of attention and inhibition of impulses are lower) and family chaos. In a family, low ECCC in one member can
increase household levels of chaos because of failure to adequately plan, attend to, or control situations. This chaos can further lower ECCC in one or more members of the system. Lower ECCC further increases chaos – and so on as this recursive pattern continues a downward spiral.

While family systems theory is broadly used by therapists, it is also applicable to the proposed study. Parenting behaviors are impacted not just by the parent, but also by the child and other relationships in the family. Parents do not parent each child the same, but rather each child is parented a little different based on the pushes and pull of the system (such as one member's behavior influencing the behavior of the child, which impacts parental response). Family rules may dictate the level of emotion a parent displays during discipline as well as the amount of monitoring they provide.

In families where a level of dysfunction has arisen, using the family systems approach can help to overcome this dysfunction despite the pushes and pulls to maintain status quo. Family strengths can be identified, reinforced, and plans implemented to help family members compensate for challenges. For example, not every mother with lower ECCC engages in harsh parenting. In these families other family level factors may help compensate (positive pushes and pulls) for the mother's lower ECCC and allow positive parenting to still take place. On the other hand, where compensating forces are not in place, the negative impact of low ECCC may be felt more strongly (e.g. a downward spiral) and result in dysfunctional behavior in that generation and possibly in generations to come. (For further
discussion on family systems theory and parenting see Karraker & Grochowski, 2012 and Skowron, Kozlowski, & Pincus, 2010).

**Conceptual Framework for This Dissertation**

The conceptual framework for this dissertation (which is separate from the conceptual framework developed based on a review of literature of maternal ECCCs and parenting in aim 1, chapter 3) is an adaptation of Belsky’s (1984) Determinants of Parenting Framework. In Belsky’s framework, he conceptualized three general factors that influence parenting: parent developmental history and psychological resources, child’s unique characteristics, and contextual sources of stress and support. The framework (see Figure 1) has been modified to portray maternal ECC and its influence on parenting. While a mother’s developmental history (including genetics, her environment during the first three decades of life, and disease) primarily impacts maternal ECC, it is not a static condition, and current environmental factors (such as stress, sleep, household chaos) may influence a mother’s capacity from moment to moment. Several individual level (parenting attitudes and health), family level (marital relations and family-level factors such as stability, family structure, family connectedness, religiosity; for examples in the literature of how these factors impact parenting see Carlson et al, 2011; Feinberg et al, 2010; Klausli & Owen, 2009; Bert, 2011; Snider, Clements, & Vazsonyi, 2004; Mistry et al, 2012), and social support factors (Mistry et al, 2012) are hypothesized to mediate the relationship between maternal ECC and parenting and also to influence and be influenced by maternal ECC. Transmission of parenting from
generation to generation has also been included in this model to show its importance on parenting, though it will not be studied in this dissertation (Conger, Belsky, Capaldi, 2009).

This adaptation of Belsky’s model draws upon both bioecological theory and family systems theory. Through bioecological theory, this model looks at the proximal processes of parenting and the interplay between members of the family, the unique ECCCs of the mother (person), and external contextual forces that impact the proximal processes. Although not in Belsky’s original model, time has been added to show that the processes and contexts may change over time. The interconnectedness of individuals in the family system (family systems theory) is illustrated by the two-way arrows between maternal cognitive control capacity and the current environmental conditions box and the family, individual, and social level factors boxes: as one individual or factor changes, other individuals will automatically introduce compensatory changes to maintain system equilibrium. These changes can lead to spiraling up (family resilience) or down (family dysfunction) and ultimately impact parenting and child development.
REFERENCES


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Figure 1. Dissertation Conceptual Framework

This chapter contains detailed information on the methods used for each aim. A methods section can also be found in each paper (chapters 3-5). For aim 1, the methods include a description of how the literature review was conducted and the methodological quality score criteria used. Separate data sets were used for aims 2 and 3. This chapter includes a detailed description of the study design, sample, and sampling methods for both of these data sets as well as preliminary data analyses and the analytic plan for used each aim.

**AIM 1 METHODS**

Aim 1: Develop a conceptual framework, based on a comprehensive review of the literature, to describe the likely influence of maternal emotion and cognitive control capacities (ECCC) on parenting attitudes, behaviors, and child outcomes.

To accomplish the purpose of developing a conceptual framework for maternal ECCC and parenting, I conducted a comprehensive review of the literature. I searched PsycINFO, PubMed, Scopus, JSTORE, Cinahl Plus, Academic Search Complete, Web of Science, and Sociological Abstracts for empirical studies published from 2000 to January 2013 that specifically included measures of any aspect of maternal ECCC along with parenting and/or child outcomes. Search term and keyword combinations (with Boolean connections) included: cognitive control, executive function, task switching, working memory, inhibitory control, impulsivity, emotion control, set-shifting, emotion regulation, self control, effortful control, self regulation, parenting, and attachment. The reference lists for articles that fit
inclusion criteria were reviewed to identify articles that did not appear in the initial searches.

The following criteria were used to identify articles for inclusion:

- English language article
- Peer-reviewed publication
- Empirical studies (editorials, review articles, dissertations, and case studies were not eligible for inclusion)
- Study samples involving parents with at least one ECCC measure/task included in the study
- Published articles from 1 January, 2000 to 31 January, 2013

The majority of articles that registered in the searches included measures of child ECCC but not of parent ECCC, and thus did not meet the objectives of the search. Based on all searches, 233 articles came up for PsychInfo, 297 for PubMed, 260 for Scopus, 657 for JSTOR, 32 for Cinahl Plus, 208 for Academic Search Complete, 101 for Web of Science, and 43 for Sociological Abstracts.

Each article that met the inclusion criteria was given a methodological quality score (MQS). Table 2.1 includes the MQS criteria. Scores ranged from 6 to 14 points (out of a possible maximum score of 18).
A total of 36 articles were identified and fit inclusion criteria. The 36 articles included 16 studies of maternal ADHD, 9 studies of emotion control, and the remaining 11 studies were of multiple or individual ECCCs components such as working memory, inhibitory control, etc. Of the 36 studies given an MQS, only 2 studies measured ECCC using both self-report and tasks. Another 7 studies used only tasks/observation measures of ECCC (including one study that utilized functional brain imaging). The remaining 27 studies relied on self-report (occasionally combined with the report of a family member) of the mother’s ECCC. In terms of outcomes, both observation and self-report measures of parenting and child outcomes were used in eight studies, four used observation only, and the remainder used self-report only.

In order to develop a more complete intergenerational conceptual framework and to better understand the implications of maternal ECCC on parenting, I also searched the literature on the development of ECCCs, and searched for review articles on maternal ECCC and parenting, empirical articles on adult ECCC and household and relationship management, and key articles on the plasticity of ECCCs in adults. I did not assign these articles an MQS, but the articles were critically reviewed in order to fully synthesize current knowledge for the conceptual framework and to identify gaps in the literature and direction for future empirical research.
AIM 2 METHODS

Aim 2: Explore the association between maternal ECCC and parenting attitudes and behaviors.

Study Sample

Data for this paper come from a study conducted in 2010-2011 through a NIH Exploratory/Developmental Research Grant Program, Parent R21, awarded to K. Deater-Deckard. The initial sample includes 152 mothers and their children, ages 3-7 years, living in rural and urban areas in Appalachia and Roanoke, Virginia, areas identified as underserved and underresourced for health services. The sample was ethnically and socioeconomically representative of the area. Each participant received an honorarium for participating. The majority of participants (n=112) were recruited in Roanoke through community agencies and flyers distributed to parents through preschools and schools or posted in common areas throughout the community and on the university web site. They were given a phone number to call with any questions about participating. An additional 60 mothers were recruited through an ongoing longitudinal study in Appalachia, of whom 49 agreed to participate. Of these 161 total individuals who agreed to participate and had a child in the target age range (3-7 years), nine did not complete all of the data collection required, making a total of 152 mothers and their children included in this study. This study has been described in greater detail previously (Deater-Deckard et al, 2012a, b).
In this moderate risk sample, 62% of participants were married, 68% were Caucasian, the mean maternal age was 32.8 years (range 21-49 years) and the mean child age was 57.3 months; 31% of mothers and 35% of fathers had received a high school diploma/GED or less, and 18% of fathers were unemployed. There were some differences between the Roanoke group that was recruited through community flyers and the Appalachia group recruited through an ongoing study. In general, participants from the Appalachia ongoing study group had fewer socioeconomic risks and the children were younger (average age 33 months) compared to the more Urban Roanoke sample. Significant socioeconomic differences included that in the rural Appalachia sample, only 5% of fathers were unemployed, 19% of fathers had received a high school diploma/GED or less, and 16% of mothers reported that they were a single parent. Study “site” was included as a covariate in the analysis (1=Urban Roanoke; 2=Rural Appalachia).

Data Collection
An initial phone call was placed to those interested in participating in the study to confirm eligibility and to gain consent. The questionnaire was then mailed to each mother who was asked to complete it and bring it to her lab visit. A follow-up phone call by a member of the research team helped to assess the mother’s reading level, and if necessary, to read the questions to the mother. The questionnaire contained basic demographic information about the mother, the child’s father (not included in this study), and the child as well as social cognitive measures.
Mothers came to the lab with their children to complete mother-child dyad tasks, maternal executive functioning tasks, the Peabody Picture Vocabulary Test (PPVT)-4 (Dunn & Dunn, 2007), and psychophysiological testing (EEG and ECG). This paper highlights the results from the executive functioning tasks, mother/child dyad tasks, and the maternal report of the questionnaire.

**Measures**

The study measures and covariates for aim 2 are not listed in this chapter but are described in chapter 4.

**Statistical Analyses**

*Preliminary Analysis*

Preliminary data analyses were conducted in Stata 12. For each measure, means, medians, score ranges, standard deviations (SDs), and the interquartile range (IQR) were calculated. Simple two-sample T-tests to compare means on baseline characteristics and key study variables between study sites were conducted. Pairwise correlations were run between covariates and key study variables. Tests for collinearity using side-by-side plots and the variance inflation factors (VIFs) were conducted on key study variables. Missing data for study variables was minimal (3% had more than 10%, but less than 20%, missing data).
**Confirmatory Factor Analysis**

Confirmatory Factor Analyses (CFA) were conducted separately on each study variable to set up the measurement model. All CFAs were performed in Mplus Version 7 (Muthe´n & Muthe´n, 2012) using full information maximum likelihood (FIML). Based on the results of the CFA, latent or manifest variables were created. Latent variables are constructs that cannot be directly observed but are measured based on variables that can be observed. Manifest variables can be directly measured (Little, 2013). Model fit was assessed for each latent variable. Latent variables with a CFI value \( \geq 0.95 \) indicated good fit and any value less than 0.90 indicated poor fit. Likewise, for RMSEA, values \( \leq 0.06 \) represented good model fit and up to 0.10 indicated acceptable fit (Little, 2013; Hu & Bentler, 1999). Manifest variables were created for CFA models below the minimum fit indices. Items with factor loadings below 0.45 were dropped. The error terms on similar items were correlated to improve model fit, as indicated by the modification indices that Mplus produces. Cronbach alphas were computed for each measure after CFA was completed (see Table 2.1). All measures are listed below with a description of whether a manifest or latent variable was created.

Maternal ECCC: For *Emotion Control*, a latent variable with 10 items as indicators fit the data adequately (RMSEA of 0.070 and CFI of 0.961). No items were dropped and no error terms were correlated. In CFA for the *Executive Function* construct, factor loadings were low for three of the four items. A manifest variable was created using a composite score as described in the Measures section.
Parenting: When loading 6 items onto the *Observed Negative Parenting* latent variable, one item was dropped due to a low factor loading. Based on the modification indices, one residual on similar items was correlated. The final latent variable with five items as indicators had good model fit (RMSEA: 0.042; CFI: 0.996). The *Observed Positive Parenting* latent variable with 9 items and six correlated error terms on similar items fit the data moderately well (RMSEA: 0.082; CFI: 0.958). CFA of the *Harsh Parenting* latent variable with five items and one correlated residual yielded adequate model (RMSEA: 0.086; CFI: 0.977). For *Maternal Negativity*, a latent variable with 13 items yielded adequate model fit when one residual was correlated for the latent variable (RMSEA: 0.085, CFI: 0.914). The original intent was to create a latent variable for *Maternal Positivity*. During CFA of the 11 items on the latent variable, three items with low factor loadings were dropped and model fit was adequate. Due to low counts on some item categories because most parents did not endorse the most negative responses, some item responses were combined. However, in the larger structural models (described below) model fit was low; model fit improved when a manifest variable comprised of the average scale score for the 8 items for maternal positivity was used, so in the final models, a manifest variable was used.

Maternal Social Cognitions: Due to the large number of items in this *Traditional Parenting Attitudes* scale, to ensure adequate power in the final models, the minimum factor loading threshold for this measure was 0.50. During CFA, the 22-
item traditional parenting attitudes subscale was reduced to 13 items due to low factor loadings for 9 items. Two residuals on similar items were allowed to be correlated in the latent variable, which yielded adequate model fit (RMSEA: 0.084; CFI: 0.918). When loading 9 items onto the Hostile Attribution Bias latent variable, three items were dropped due to low factor loadings. The remaining 6 items, with one correlated residual on similar scenarios, had adequate model fit for the latent variable (RMSEA: 0.093; CFI: 0.955).

Child Behaviors: In CFA of the 11 items indicators for the Child Conduct Problems latent variable, three items were dropped due to low loadings and the final latent variable included 8 items. Model fit was adequate (RMSEA: 0.095; CFI: 0.930). Due to the large number of items for the Child Negative Affect construct, average scores from each of the tasks for the following categories were calculated: child responsiveness, noncompliance, negative affect, on-task, and activity level. The five scores were then standardized and those standardized scores were used in CFA to assess model fit. Model fit for the 5-item latent variable was adequate for the RMSEA and good for the CFI once one residual was correlated (RMSEA: 0.061; CFI: 0.994).

Household Contextual Factors: When loading 6 items onto the Household Chaos latent variable, three items were dropped due to low factor loadings during CFA. Fit could not be assessed for this latent variable because only three items were included. The original intent was to create a SES Risk latent variable, but factor loadings for the five items and model fit were low. A risk composite score was
created as described in the measures section. A family could have between 0 and 5 risks, with the mean number of risks being 1.3.

**Model Building**

The goal of model analyses was to have good model fit, maximize degrees of freedom, and to have adequate power to complete the analyses. Model fit was assessed using the comparative fit index (CFI) and root mean square error of approximation (RMSEA), values which are less sensitive to sample size when evaluating model fit than the $\chi^2$ test. CFI values $\geq 0.95$ indicate good fit and any value less than 0.90 indicate poor fit. Likewise, for RMSEA, values $\leq 0.06$ represent good model fit and up to 0.10 indicate acceptable fit (Little, 2013; Hu & Bentler, 1999). In order to ensure model fit, degrees of freedom, and adequate power, a series of four models were built that were linked to the proposed aims and hypotheses. Each model was estimated using mean and variance-adjusted weighted least squares (WLSMV) in Mplus Version 7 (Muthe´n & Muthe´n, 2012).

Missing data was dealt with using full information maximum likelihood (FIML). FIML provides unbiased parameter estimates and standard errors by using all available data to estimate a likelihood function for each subject. Separate models were analyzed for each of the parenting behavior measures. The model steps are outlined as follows:
Model 1: Maternal emotion control and executive function were included in the model as predictors of each parenting behavior (separate models for each parenting behavior).

Model 2: Household chaos and SES risk were added to model 1 as correlates of maternal emotion control and executive functioning and predictors of parenting behavior.

Model 3: The potential mediation of parental social cognitions (parenting attitudes and attributions) were first tested individually for each relationship (i.e. maternal
emotion control -> maternal hostile attribution bias -> maternal harsh discipline). Multiple mediation was conducted by adding both intervening variables to model 2.

Model 4: Child behaviors (Conduct Problems and Negative Affect) were added to Model 3 as the final outcomes. When child behaviors were added to the models, household SES risks and household chaos were collinear with maternal ECCC. Rather than remove them completely from the models they were included as predictors of maternal emotion control and maternal executive function. The decision to keep them in the models in this capacity was made because they appeared to be salient variables in the relationship between maternal ECCC and parenting (based on model 2) and there is theoretical justification for these contextual factors as predictors of maternal ECCC (Deater-Deckard et al., 2012a;b; Mokrova et al., 2010). Both measures, through the mechanism of stress, have been shown to negatively impact maternal ECCC (Lupien, McEwen, Gunnar, & Heim, 2009; Wachs & Evans, 2010). The true relationship between household contextual factors and maternal ECCC is likely recursive and I tested the models both by adding
the contextual factors as predictors of maternal ECC and as predicted by maternal ECC. Model fit was similar but slightly better with chaos and SES risk as predictors of maternal emotion control and executive function rather than being predicted by maternal ECC. The main paths of interest in the model 4 figure have been bolded and the other paths marked with dashed lines.

Model 4

Hypothesis Testing

Based on the four model steps explained above, final models were chosen. For mediation models, the paths leading to and from the intervening variable were tested to assess significance. For mediation to be present, both paths must be significant. Intervening effects with non-longitudinal data (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Iacobucci, Saldanha, & Deng, 2007) were tested using the Delta Method, which, similar to the Sobel Test, computes a z-score based on the product-of-coefficients of the indirect effects (MacKinnon, 2008). Moderation (aim 5) was tested by splitting the sample based on the maternal executive function score. Mothers with a score of 0-3 (below average) on executive functioning were
placed in the low executive functioning group (n=66), while mothers with a score of 4 or higher were placed in the normal/high executive function group (n=86). Due to power and sample size constraints, it was not possible to do comparisons on more extreme scores (i.e. comparing highest and lowest executive function scores). Moderation was considered to be present when notable differences were found between the high and low samples model results.

**Results of Preliminary Analyses**

Item-level ranges, means, and standard deviations for all constructs are in Table 2.2.

There were no significant differences in means of maternal ECCC and parenting behaviors between the urban Roanoke sample and rural Appalachian sample. As expected, there was a significant difference on mean SES risks between the two groups, with the rural Appalachia group having on average 0.66 risks and the urban Roanoke sample having an average of 1.59 risks (t=3.63, p<0.001). There were also significant differences on traditional parenting attitudes (2.39 for the rural sample and 2.60 for the urban sample; t=2.15, p=0.03) and observed child negative affect (-0.18 for the rural sample and 0.47 for the urban sample; t=4.84, p<0.001). The difference in traditional parenting attitudes means was expected given the difference in SES between the groups; consistent with current literature, families with lower SES also tend to have more authoritarian parenting attitudes (Lareau, 2003). It is possible that the differences in means on observed child negative affect may have been largely due to differences in child ages, with the younger children
(rural group) less responsive and less engaged due to differences in developmental level.

**AIM 3 METHODS**

Aim 3: Explore how maternal emotion regulation impacts parenting and adolescent outcomes and how family processes mediate these relationships.

**Study Sample**

Data for this paper come from the Flourishing Families Project, a six-year longitudinal study of the inner workings of family life and how families help children do well as they make the transition into adolescence and young adulthood. The project was conducted in Seattle, Washington and began in 2007 with annual follow-ups through the summer of 2012. This paper includes results from the first five years of the study. Participants included parents and their children who were aged 10-13 years old at baseline. Of the 500 families in the Flourishing Families Project, twenty-two families were dropped from the analyses for this study because the primary parent-reporter was the father, leaving a total sample of 478 families (of these 22 families who were dropped, 91% of them were single parent families and 50% of the primary parent respondents had a bachelor degree or higher). At baseline, 70% of mothers reported that they were married, 60% of mothers had a bachelors degree or higher, and the average maternal age was 43.1 years. Of the children who participated in the study, 47% were male, and the average child age was 11.3 years.
Data Collection

Study investigators recruited families using Polk Directories/InfoUSA, a purchased national telephone survey database which included detailed information about each household in its database, including the ages of children living there. Census tracts that were socioeconomically and racially representative of the local school districts were selected and families living in those areas were randomly selected using the Polk Directory. All families who had a child between 10 and 13 years old and who lived in the selected census tracts were eligible to participate in the study.

A total of 692 eligible families were contacted of which 61% (423) agreed to participate. Since the Polk Directory was comprised of families who were included using telephone, magazine, and Internet subscription reports, lower SES families were underrepresented in this initial study sample. In order to more closely reflect the demographics of the area, 77 additional lower income families were recruited into the sample through referrals and flyers, which increased the diversity of the study sample. Among families who refused to participate, the most frequently cited reasons not to participate included lack of time and privacy concerns.

A multi-stage recruitment protocol was used to contact each family. In the first stage, a letter of introduction was sent to all families. Interviewers then made home visits and phone calls to confirm eligibility and gain consent to participate in the study. In the third stage, interviewers scheduled an appointment to come to the family’s home to conduct the interviews. Interviews lasted on average 2.5 hours.
Parents and children completed a questionnaire and participated in five-short videotaped discussions. Questionnaires were screened for missing answers upon collection, which resulted in very little missing data. Participants were compensated $200 for their participation in each wave. The study has been further described previously (Padilla-Walker, Hardy, and Christensen, 2011).

**Measures**

The study measures and covariates for aim 3 are not listed in this chapter but are described in chapter 5.

**Statistical Analyses**

*Preliminary Analysis*

Preliminary data analyses were conducted in Stata 12. Means, medians, score ranges, and standard deviations (SDs) were computed. Simple two-sample T-tests were run to compare means on baseline characteristics and key study variables between those recruited through the Polk Telephone directories and those recruited through referrals and flyers. To check for collinearity, pairwise correlations were run between covariates, and the variance inflation factors (VIFs) were tested on key study variables. Missing data for study variables was minimal (74% had no missing data over the five years and 89% had fewer than 10 missing variables over the 5 years; 51 families missed one or more waves of follow-up data). Attrition analyses to compare means were conducted using two-sample independent t-tests.
Confirmatory Factor Analysis

Confirmatory Factor Analyses (CFA) were conducted separately on each study variable to set up the measurement model. All CFAs were performed in Mplus Version 7 (Muthén & Muthén, 2012) using full information maximum likelihood (FIML). Based on the results of the CFA, latent or manifest variables were created. During CFA, items with factor loadings below 0.45 were dropped. Model fit was assessed for each latent variable. Latent variables with a CFI value ≥0.95 indicate good fit and any value less than 0.90 indicate poor fit. Likewise, for RMSEA, values ≤0.06 represent good model fit and up to 0.10 indicate acceptable fit (Little, 2013; Hu & Bentler, 1999). The error terms of similar items were correlated to improve model fit, as indicated by the modification indices that Mplus produces. Manifest variables were created for CFA models below the minimum fit indices. For each measure, fit and factor loadings were checked for all available waves (also referred to as lags or time points) in order to create a latent variable with the same number of items and correlated error terms at each time point; a manifest variable was created if adequate model fit could not be obtained for all waves. Cronbach alphas were computed for each measure after CFA was completed (see Table 2.3). All measures are listed below with a description of whether a manifest or latent variable was created.

Maternal Emotion Regulation: During CFA, a latent variable with 11 items as indicators was created for Emotional Reactivity. The final latent variable with seven correlated error terms yielded good fit (RMSEA of 0.062 and CFI of 0.971). For
Emotional Distancing, 12 indicators were loaded onto the latent variable. Eight error terms on similar items were correlated and the final CFA yielded moderately good fit (RMSEA: 0.068, CFI: 0.961).

Parenting Dimensions: Latent variables were created for three of the four parenting measures. For Connection Parenting, a latent variable with five items fit the data well (RMSEA: 0.033, CFI: 0.995). When loading all five items onto the Regulation Parenting latent variable, with one correlated error term, model fit was good (RMSEA: 0.052, CFI: 0.995). For the Indulgent Parenting latent variable, all five items were loaded as indicators onto the latent variable during CFA. Based on the modification indices, one error term on similar items was correlated and model fit was good (RMSEA: 0.021, 0.998). The original intent was to create latent variables for the verbal-hostility (alpha: 0.71) and punitive parenting (alpha: 0.70) dimensions. Model fit was tested separately for each dimension, however model fit was poor when they were separated and so the dimensions were combined and CFA conducted on the dimensions as a single latent variable with 8 items as indicators. The model fit for the combined dimensions was also inadequate (RMSEA: 0.167; CFI: 0.860), though factor loadings for 7 of the 8 items were above the minimum threshold. The decision was made to combine the two subscales into one manifest variable because the items from the two subscales loaded well onto the latent variable, had content validity as a single construct, and the alpha for the combined subscales was higher than for each subfactor separately (combined alpha: 0.75). The manifest variable, called Verbal-Punitive Parenting, was created by summing and
averaging the eight items.

Child Behaviors: During CFA, 13 indicators were loaded onto the *Child Internalizing Behaviors* latent variable. Due to low factor loadings, three items were dropped. Based on modification indices, one error term was correlated on similar items. The final latent variable, with 10 items, fit the data well (RMSEA 0.056, CFI: 0.987). For the *Child Aggression* latent variable, five items were loaded as indicators; based on the modification indices, two error terms were correlated on similar items. The final latent variable yielded good model fit (RMSEA: 0.055, CFI: 0.999). During CFA of the *Child Prosocial Behaviors* latent variable, including 9 items as indicators, one item was dropped due to a low factor loading. The final latent variable comprised of 8 items fit the data adequately (0.087, 0.974).

Potential Mediators: The CFA for the potential mediators included a latent variable for *Family Functioning* and for *Family Monitoring*. The 12-indicator *Family Functioning* latent variable fit the model well (RMSEA: 0.097, CFI: 0.968). Five indicators were loaded onto the *Family Monitoring* latent variable. One item was dropped due to low factor loadings. The final latent variable with four items had good model fit (RMSEA: 0.097, CFI: 0.990).

*Model Building*

The goal of model analyses was to have good model fit, maximize degrees of freedom, and to have adequate power to complete the analyses. Model fit was
assessed using the comparative fit index (CFI) and root mean square error of approximation (RMSEA), values which are less sensitive to sample size when evaluating model fit than the \( \chi^2 \) test. CFI values \( \geq 0.95 \) indicate good fit and any value less than 0.90 indicate poor fit. Likewise, for RMSEA, values \( \leq 0.06 \) represent good model fit and up to 0.10 indicate acceptable fit (Little, 2013; Hu & Bentler, 1999).

Models were estimated using mean and variance-adjusted weighted least squares (WLSMV) in Mplus Version 7. Missing data was dealt with using full information maximum likelihood (FIML). FIML provides unbiased parameter estimates and standard errors by using all available data to estimate a likelihood function for each subject.

The analytic model is shown in Figure 2.2. All model paths that were tested are shown in this figure, with the primary paths of interest bolded. The most proximal prior time points (lags) for the key study variables were included in initial models to account for variation over time. A true cross-lag model was not possible because not all variables were measured in all waves of the study.

Due to collinearity between the connection and regulation parenting dimensions and also between the verbal-punitive and indulgent parenting dimensions, two separate models were analyzed: one that included connection and verbal-punitive parenting, and the other included regulation and indulgent parenting. These parenting dimension pairs were chosen because they roughly portray opposite ends of each parenting spectrum (warmth versus harshness in the connection and verbal-
punitive model; reasoning and structure versus a lack of reasoning and structure in the regulation and indulgent model).

_Hypothesis Testing: Mediation_

The models in these analyses included potential mediators. The paths leading to and from the intervening variable were tested to assess significance. For mediation to be present, both paths must be significant. Intervening effects (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Iacobucci, Saldanha, & Deng, 2007) were tested using the Delta Method, which, similar to the Sobel Test, computes a z-score based on the product-of-coefficients of the indirect effects (MacKinnon, 2008). When testing mediation, the use of structural equation modeling (SEM) is advantageous over traditional regression analyses because it requires fewer assumptions, accounts for measurement error, and allows multiple mediation effects to be simultaneously tested (Li, 2011; Little, 2013).

**Results of Preliminary Analyses**

Item-level ranges, means, and standard deviations for all constructs are in Table 2.3.

No significant differences on study background variables (maternal and child age, child gender, marital status, mother’s education status, and study sampling method) were found for those who completed all five waves (n=427) versus those who did not complete one or more waves (n=51). There were also no differences on means
for key study variables (maternal emotion regulation, potential mediators, parenting dimensions, and child behaviors).

There were some significant differences in means on study background variables for those who were randomly sampled through the Polk Directory versus those recruited through referrals and flyer. Mothers who were randomly sampled were more likely at baseline to be married (t=7.15, p<0.001), have some college education (t=5.95, p<0.001), to be older (t=5.08, p<0.001; average age 43.7 years compared to 39.7 years for those recruited via referral or flyer), and their children were younger (t=2.00, p=0.046; 11.2 years compared to 11.5 years in the referral/flyer sample). These differences were expected as a lower socioeconomic status sample was targeted through the referrals and flyers sampling approach. These differences also resulted in some mean differences on a few key study variables. Those who were randomly sampled reported higher mean family monitoring in wave 2 (t=4.65, p<0.001), lower verbal-punitive parenting (t=3.70, p<0.001) and indulgent parenting (t=-3.28, p=0.001) in wave 4, and more child internalizing problems (t=2.49, p=0.013) and less child aggression (t=2.13, p=0.034) in wave 5 compared to those recruited through referrals and flyers. There were no significant mean differences on other key study variables (maternal emotional reactivity and distancing, family functioning, connection and regulation parenting, and child prosocial behaviors). The differences in family monitoring, parenting, and child behaviors were expected based on the differences in socioeconomic status between the two groups and is consistent with existing literature (Lareau, 2003; Saunders,
Hume, Timperio, & Salmon, 2012; Slicker, 1998; Luthar, 2013). “Sampling method” (1=Polk Directory; 2=Referrals and Flyers) was included as a model covariate.

STRENGTHS AND WEAKNESSES OF STRUCTURAL EQUATION MODELING

Structural equation modeling (SEM) was used for both aims 2 and 3. It allows for the simultaneous testing of multiple independent and dependent variables, reciprocal relationships can be specified, and SEM accounts for measurement error (Li, 2011; Little, 2013). Additionally, it is often cited as one of the best ways to test mediation because the effect of multiple mediators can be assessed at the same time (Li, 2011). SEM is particularly appropriate for longitudinal analyses as the paths denote causality.

An important limitation of SEM is that it depends on a larger sample size than traditional regression analyses (MacCallum & Austin, 2000). Power analyses, using the Monte Carlo method, were conducted in advance of analyzing data to confirm that the sample sizes were large enough to find significant effects. For aim 2, in which sample size was more of a concern (but adequate based on power analyses), in the largest models, model fit was “acceptable” but not “good;” it is possible that with a larger sample size model fit would have been good. However, the models fit the data remarkably well given the modest sample size.

An additional limitation of SEM is that it depends on the model being specified correctly (Li, 2011). Careful review of the literature was conducted to ensure that
the models fit the current theory available. Multiple models were also tested to assess which model fit the data best. For example, for aim 2, the Chaos and SES risk variables were included both as predictors and also as intervening variables in the final model. Model fit was best when these variables were included as predictors. One challenge in the aim 3 data analysis was that it was not possible to assess all alternate model possibilities because not all variables were available for all waves of the data collection.
REFERENCES


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<td>Study Design - Assignment</td>
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<td>Study Design - Length</td>
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<td>Sample Size</td>
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<td>Parenting or Child Behavior</td>
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Figure 2.1. Aim 3 Analytic Model (controlling for model covariates—not shown)
CHAPTER 3

MATERNAL EMOTION AND COGNITIVE CONTROL CAPACITIES AND PARENTING: A CONCEPTUAL FRAMEWORK
ABSTRACT

Background
Parents want good outcomes for their children, but despite these desires, child maltreatment remains high in the United States. A promising area of research is that of parents’ emotion and cognitive control capacities (ECCCs). Emerging evidence suggests that ECCCs are critical to the development and maintenance of parenting practices, and may be related to parents’ ability to seek and use parenting help. However, limited research has been conducted on this topic and what research is available is informative but disjointed. The purpose of this paper is to present a cohesive conceptual framework on maternal ECCCs and parenting based on a review of literature.

Methods
I conducted a comprehensive literature review, using eight search engines, of articles published between 2000 and 2013 that addressed maternal ECC and parenting. The 36 articles identified were assigned a methodological quality score. Literature searches on the development and plasticity of ECCCs in adults were also conducted.

Results
Despite definitional differences, it appears clear that low maternal ECC increases the risk of engaging in child maltreatment and other harsh parenting practices. Whereas, higher maternal ECC is associated with positive parenting and better
child self-regulation. Contextual factors, such as SES and household chaos, play a complex and not clearly understood role on the association between maternal ECCC and parenting. Stress, fatigue, and other factors cause ECCCs to fluctuate in adults, which may impact parenting quality. There is increasing evidence of ECCC plasticity in adults, but it is not yet well-understood. A conceptual framework was developed based on the results of the literature review.

Conclusions

The conceptual framework developed can be used to inform future research and practice. Further research is necessary to better understand the complexities of how maternal ECCCs are related to parenting and what can be done to mitigate the negative influence of low maternal ECCC on child outcomes. Research that addresses how maternal ECCCs are related to mothers’ enrollment and participation in parenting programs, the role of stress and contextual factors in the relationship between maternal ECCC and parenting, and the methodological and conceptual issues identified will be especially useful in moving the field forward.
BACKGROUND

Parents take pride in the accomplishments of their children. Almost without exception, they want to be good parents and they want the best outcomes for their children. Unfortunately, this desire to parent well does not always translate into actual practice. For example, in a nationally representative sample of 0-17 year olds in the United States, 10.2% experienced some form of child maltreatment in the previous year (Finkelhor, Turner, Ormrod, & Hamby, 2009), with parents being the perpetrators of abuse in the majority (80%) of cases (United States Government Accountability Office, 2011; U.S. DHHS, ACF, ACYF, & Children's Bureau, 2011). While most parents do not abuse or neglect their children, many struggle to engage in warm, responsive parenting (referred to generally in this paper as positive parenting) and to form healthy attachments with their children. Consistently engaging in positive parenting (or even ‘good enough’ parenting) is challenging for most parents, especially when faced with stressful life circumstances or challenging child behavioral and emotional problems.

Despite the demonstrated success of multiple parent skills training and home visiting programs designed to help parents strengthen positive parenting skills (see Gross et al., 2009; Sanders, 2003; Sanders et al., 2008; Olds et al., 1997; Prinz, Sanders, Shapiro, Whitaker, & Lutzker, 2009; Webster-Stratton, Rinaldi, & Reid, 2007), none has been successful with all parents. Given the availability of effective interventions, understanding the factors that help explain why some parents do not master positive parenting skills, drop out of good programs, or fail to maintain skills
when learned, is critical for advancing child abuse prevention and promoting positive parenting—goals that also can be means to reducing child and adolescent behavioral and emotional problems and disorders.

A promising but new area of research that goes beyond the oft-cited ‘lack of motivation’ and ‘chaotic family’ explanations is that of parents’ emotion and cognitive control capacities (ECCCs). Emerging evidence from various fields suggests that ECCCs are critical in the development and maintenance of parenting practices. Moreover, aspects of ECCC deficits can be managed and even improved in adults.

The current review comes at a time when there is increasing interest in parental executive functioning and other emotion and cognitive control capacities. This review builds on a recent overview of the neurobiology of parenting by Barrett and Fleming (2011) and a review of maternal ADHD and self-regulation and their impact on parenting (Johnston, Mash, Miller & Ninowski, 2012). The available research literature pertaining to parental ECCC and caregiving is informative but disjointed. Thus, the intent of this review is to critically synthesize this research into a cohesive framework that will inform future research and practice. I have chosen to focus on mothers rather than fathers because the majority of research on parent ECCCs and caregiving has focused on the mother. Many of the results discussed in this paper are likely to be applicable to fathers, although there are sufficient differences in the ways that fathers approach parenting that this hypothesis should be fully tested.
Demands on Parenting

Mothers face a variety of parenting demands. For example, on average, mothers of “normally developing” preschool-age children deal with misbehaviors 3-4 times an hour and try to control their children’s behavior by vocalizing commands or disapproval every 3-4 minutes (Wahler & Dumas, 1989; Fawl, 1963). This can be exhausting. In the face of these and other challenges, to parent in an optimal way a mother needs to respond appropriately to her child's cues, plan and change behavior, problem-solve, make decisions, utilize flexibility in selecting tactics for each situation, and at times inhibit her own desires in order to address the needs of her child (Kienhuis, Rogers, Giallo, Matthews, & Treyvaud, 2010).

Parenting demands vary with the child's developmental level, which change with the child's chronological age, and the child's personality. In infancy, warm, attentive, stimulating, responsive, and less restrictive parenting leads to optimal child development. In the preschool years, more control is needed along with warm, nurturing caregiving. As a child transitions to adolescence, increased reasoning, consistent age-appropriate discipline, and expressions of warmth all are important (Belsky, 1984). Balancing warmth, monitoring, and support with the child’s need for autonomy is essential throughout the life course of childhood (Creveling, Varela, Weems, & Corey, 2010). Regardless of child age, research shows that optimal parenting that maximizes a child’s healthy development involves high levels of parental support and monitoring of the child, avoidance of harsh punishment, and
sensitivity to the child’s capabilities and the developmental tasks she or he faces (Waldfogel, Craigie, & Brooks-Gunn, 2010; Belsky, 1984).

Optimal parenting also includes the ability to manage a household and other relationships (Wahler & Dumas, 1989; Gross & John, 2003). What parents do in managing their households matters as much as their parenting style in the promotion or impairment of children’s health. Parents set routines to build consistency for their children and ensure they get enough sleep; they manage the food their children eat and ensure an orderly household; they monitor the time children spend on media (TV, social media, etc) and the amount of exercise they get; they arrange for childcare and healthcare; they are both attentive to and teach their children about personal hygiene, substance use, sexual health, and overall safety.

I now review what ECCCs are and more specifically how they impact a parent’s ability to meet the demands for warm, responsive, consistent patterns of parenting and organization and management to create a safe, healthful, and predictable home environment.

**Defining Emotion and Cognitive Control Capacities**

ECCCs refer to the ability to plan, make decisions, hold pertinent information in short-term memory, pay attention, avoid distractions, set priorities, regulate emotion, and control impulses. As such, ECC abilities are central to human’s successful engagement in many activities that demand planful execution of actions.
and monitoring and adjustment of actions in real time. There is little consensus on the definition of ECCCs between and even within fields (Carlson, 2005; Diamond, Barnett, Thomas, & Munro, 2007; Engle & Kane, 2004). ECCCs are known in different disciplines as executive functions, effortful control, self-control, self-regulation, and even non-cognitive abilities. There are nuanced differences between these terms and some methodological differences in how they are measured as well as overlap in the constructs, but all are processes that are predominantly centered in the prefrontal cortex (PFC) (Beaver, Wright, & Delisi, 2007; Rueda, Posner, & Rothbart, 2005; Moffitt et al., 2011; Zhou, Chen, & Main, 2012; Hofmann, Schmeichel, & Baddeley, 2012). In this paper, ECCC encompasses all of these terms, but it is worthwhile to acknowledge definitional distinctions.

Differences in Terminology

Self-control is a construct often used in sociology. In this field, most studies have focused on the social influences on self-control. Although biogenic factors that contribute to its development have largely been ignored, empirical evidence has shown that self-control is a process of the prefrontal cortex (Beaver et al., 2007).

Effortful control and executive functions, terms more commonly used in psychology, both include attention and inhibitory control. Effortful control is a broad measure of temperament and is usually measured using self-reported questionnaires. Executive functions are a set of cognitive capacities typically measured with tasks (Zhou et al., 2012). Both measures are sometimes used interchangeably with self-regulation but
are subservient to it, with self-regulation being the broader construct (Rueda et al., 2005; Hofmann et al., 2012; Sarsour et al., 2011; Blair & Razza, 2007; Liew, 2011).

In adults, emotion and cognitive control processes are intertwined, and neural functioning research has shown that “there is no cognition without emotion, and vice versa” (Zelazo, Qu, & Kesek, 2010). Emotions help to narrow and prioritize cognitive process options (Lemerise & Arsenio, 2000). The limbic system houses emotions, but “top-down” emotional control processes are ‘housed’ with other cognitive control capacities primarily in the prefrontal lobe (Ochsner & Gross, 2008).

As part of this study of maternal ECCC, I included studies of maternal ADHD because of the strong relationship between adult ADHD and executive dysfunction of the emotional and cognitive control mechanisms (Schweitzer et al., 2000; Barkley & Murphy, 2011; Nigg et al., 2005; Qian, Shuai, Chan, Qian, & Wang, 2013). Research conducted on maternal ADHD and parenting is able to inform our broader study of maternal ECCC and parenting.

Other Challenges in Defining ECCCs

In ECCC research there is a lack of agreement over whether ECCC is a unified construct or a set of independent components (i.e. working memory, inhibitory control, and emotion control; Matte-Gagne & Bernier, 2011). I apply a “unity and diversity” approach (Miyake, Friedman, Emerson, Witzki, & Howerter, 2000; Best &
Miller, 2010) in recognition that while there is overlap in the development, purpose, and functioning of the various components, each also has a unique developmental pattern. The perspective one uses influences how the relationship of ECC to parenting is modeled. If ECC components are independent, then it is important to test how each component separately impacts parenting and child development. If they are a unified construct, then the individual components are not important to assess in association with parenting. I take a more flexible approach, acknowledging that there are some important differences in how these components impact parenting but that it is also impossible to completely separate the different components (Best & Miller, 2010).

There is much discussion in the literature as to the relationship between ECCCs and fluid intelligence. ECCCs are related to language comprehension, reasoning, general fluid intelligence, and critical thinking (Engle & Kane 2004; Sanz de Acedo Lizarraga, Sanz de Acedo Baquedano, & Villanueva, 2012). Given this relationship between ECCC and intelligence, it is important in studies of ECC to control for fluid intelligence. However, while they appear to be related, some components of ECC are independent of it; individuals may score high on intelligence tests and low on executive functioning tasks (Cornoldi, Giofre, Calgaro, Stupiggia, 2012).

**Relationship Between Maternal ECC and Parenting**

Parenting is complex and many contextual and individual factors influence how a mother parents, including a mother's ECC. Theoretically, ECCCs are vital for
successful parenting, allowing parents to be perceptive, responsive, and flexible, and persistent/consistent. Parents call upon ECCCs as they plan and change behavior, respond appropriately to cues, regulate emotion in the face of stress and challenging child behavior, problem solve, and make decisions (Commonwealth Department of Family and Community Services, 2004; Kienhuis et al., 2010; Barrett & Fleming, 2011).

The following example illustrates the role of ECCCs in parenting. A child is crying while a mother is rushing to clean her house before leaving for a doctor’s appointment. An attentive parent will notice and interpret the child’s signals (e.g. the child is crying because she is hungry) and be able to do so while engaging in the competing demand of cleaning the house. To do this, the mother must be able to shift her attention between her own response to the child and maintaining selective attention to the competing demands (attention control, prioritizing, and problem solving). She must also engage her working memory to recognize and recall the child’s behavior, last meal, etc. in order to accurately interpret the cues and decide how to “solve” the problem (stop the crying) by remembering what has and has not worked in the past. Finally, she must tap into inhibitory control in order to reduce frustration and override any urge to act harshly to make the child stop crying and to more effectively respond to her child’s needs.

The motivation to effectively parent, and to be motivated to continue to learn to be an even better parent, would also be expected to require ECCCs (Kienhuis et al.,
For example, parents must be able to place priority on the well-being of the child above their own desires (inhibitory control) and adapt both behaviorally and in their thought-processes to the child’s changing needs (attention control and working memory). Other ECCC skills integral to motivation include the ability to set goals, organize and plan, make decisions, problem solve, and control emotions (Kienhuis et al., 2010).

ECCCs, particularly emotion control, appear to be especially important for parents in stressful situations. Effective emotion control helps people to be more flexible, adaptable, and better able to cope with stress (Skowron & Friedlander, 1998), allowing them to appropriately shift to calm, logical reasoning or strong affect according to circumstances (e.g., if a young child begins to cross the street without the parent, strong affect may be warranted). A person who is not able to emotionally self-regulate is more emotionally reactive in response to stressors and the emotionality of others. This has important implications for parenting. For example, if a child were stressed, an emotionally reactive parent would be more likely to react negatively to the child’s distress rather than enacting soothing behaviors that can calm the child (Skowron & Friedlander, 1998).

**METHODS**

To accomplish the purpose of developing a conceptual framework for maternal ECCC and parenting, I conducted a comprehensive review of the literature. I searched PsycINFO, PubMed, Scopus, JSTORE, Cinahl Plus, Academic Search
Complete, Web of Science, and Sociological Abstracts for empirical studies published from 2000 to January 2013 that specifically included measures of any aspect of maternal ECCC along with parenting and/or child outcomes. Search term and keyword combinations (with Boolean connections) included: cognitive control, executive function, task switching, working memory, inhibitory control, impulsivity, emotion control, set-shifting, emotion regulation, self control, effortful control, self regulation, parenting, and attachment. The reference lists for articles that fit inclusion criteria were reviewed to identify articles that did not appear in the initial searches. Only peer reviewed, English-language articles were eligible for inclusion. Thirty-six articles were identified, reviewed, and given a methodological quality score (MQS). Table 3.1 includes the MQS criteria. Scores ranged from 6 to 14 points (out of a possible maximum score of 18).

The 36 articles included 16 studies of maternal ADHD, 9 studies of emotion control, and the remaining 11 studies were of multiple or individual ECCC components such as working memory, inhibitory control, etc. A variety of instruments were used to measure maternal ECCC; there was very little consistency across studies in its measurement. Of the 36 studies given an MQS, only 2 studies measured ECCC using both self-report and tasks. Another 7 studies used only tasks/observation measures of ECCC (including one study that utilized functional brain imaging). The remaining 27 studies relied on self-report (occasionally combined with the report of a family member) of the mother’s ECCC. In terms of outcomes, both observation and self-report measures of parenting and child outcomes were used in eight studies, four
used observation only, and the remainder used self-report only. See Table 3.2 for a complete listing of empirical studies that measured maternal ECCc and parenting.

In order to develop a more complete intergenerational conceptual framework and to better understand the implications of maternal ECCc on parenting, I also searched the literature on the development of ECCcs, and searched for review articles on maternal ECCc and parenting, empirical articles on adult ECCc and household and relationship management, and key articles on the plasticity of ECCcs in adults. I did not assign these articles an MQS, but the articles were critically reviewed in order to fully synthesize current knowledge for the conceptual framework and to identify gaps in the literature and directions for research.

Figure 3.1, an intergenerational conceptual model of maternal ECCcs and parenting, is the roadmap for the remainder of this article, and I will be referring back to it to clarify major points. It was developed to pictorially depict the review of literature on maternal ECCc and parenting synthesized below.

STATE OF THE SCIENCE: MATERNAL ECCC AND PARENTING

Information for this section came from the review of literature regarding maternal ECCc and parenting/child outcomes. The section is organized by parenting and child outcomes (See figure 3.1 for a depiction of the relationship of maternal ECCc to parenting and child outcomes). It is likely that the age of the child influences how maternal ECCc impacts parenting and child outcomes. Several studies covered a
wide child’s age range of children, but child’s age was not a significant predictor in these studies.

**Child Maltreatment**

Child maltreatment, including abuse and neglect, is an extreme form of negative parenting. Low emotion control, high impulsivity, low attention control (see Lu & Lung, 2012), and poor decision-making put a woman at greater risk for maltreating her children of all ages. In a study of moms with children 5-14 years, Skowron et al (2010; MQS: 6) found that, after controlling for family SES, mothers who were highly emotionally reactive or distant were at higher risk for engaging in child maltreatment (see also Skowron and Platt, 2005). The reverse was also true; mothers scored low on child maltreatment risk if they were less reactive or distant.

Fontaine and Nolin (2012; MQS: 9) conducted a study of ‘hot’ executive functioning in parents who had been accused of child abuse or neglect and compared them to a control group of parents. The researchers found a significant difference in decision-making ability between parents who had been accused of child abuse and the control group. Both of these studies were cross-sectional and neither addressed how contextual factors such as family SES and home or neighborhood environmental conditions mediated or moderated these relationships.

**Negative Parenting**

In the maternal ECCC and parenting literature, negative parenting (used generally to refer to parenting behaviors that are harsh, punitive, inconsistent, and indulgent) is
one of the most studied outcomes. Relationships between low maternal ECCC and high scores on negative parenting practices such as harsh and rigid discipline have been found in studies specifically looking at maternal emotion control, effortful control, executive functioning, and inattentive ADHD. Lower maternal ECCC is associated with more ineffective discipline strategies (Lorber & O’Leary, 2005; MQS: 9; Lorber, 2012; MQS: 8; Chen & Johnston, 2007; MQS: 10; Deater-Deckard et al., 2010; MQS: 12; Deater-Deckard et al., 2012a; MQS: 10; Babinski et al., 2012; MQS: 11; Banks et al., 2008; MQS: 6; Harvey et al., 2003; MQS: 11; Mokrova et al., 2010; MQS: 10; Murray & Johnston, 2006; MQS: 7), a more authoritarian parenting style (Martini et al., 2004; MQS: 8), less maternal involvement (Boutwell & Beaver, 2010; MQS: 14; Chronis-Tuscano et al., 2008b; MQS: 10; Mokrova et al., 2010; MQS: 10; Chen & Johnston, 2007; MQS: 10), negative reactions to children’s emotions (Valiente et al., 2007; MQS: 9), and general negative parenting (Chronis-Tuscano et al., 2008b; 2011; MQS: 11). Household chaos appears to be a mediator and moderator in the relationship between maternal ECCC and negative parenting (see Deater-Deckard et al., 2012a; Valiente et al., 2007; Mokrova et al., 2010). The relationship between low maternal ECCC and increased negative parenting held true in studies in early childhood, middle childhood, and adolescence.

Of interest in the body of studies that include measures of negative parenting are two that assessed the impact of treatment (5 weeks of OROS Methylphenidate treatment) on maternal ADHD symptoms and parenting. Chronis-Tuscano et al (2008a, MQS: 8; 2010, MQS: 10) randomly assigned 23 mothers with ADHD of
children 6-12 years old to receive treatment or to be in a no-treatment control group. In the 2008 study, treatment effectively reduced ADHD symptoms and mothers who received the treatment also reported using less corporal punishment (d=0.42) and inconsistent discipline (0.71) at the follow-up compared to baseline. Medium to large medication effects were found for improvements in self-reported positive parenting. However, while the parent’s perception of their parenting improved after ADHD treatment in the 2008 study, in a 2010 study which incorporated observational parenting measures, treatment reduced parent ADHD symptoms but was not significantly related to changes in observed parenting behavior.

Of the studies that included measures of negative parenting, 10 included both observational and self-report measures of parenting which is ideal for measuring parenting. However, observational periods for these studies were short (in general 15-30 minutes), and most studies were cross-sectional; when they were longitudinal the follow-up periods provided only a short-term assessment and did not address long-term trends.

**Positive Parenting**

There were fewer studies to draw from that included measures of positive parenting (used generally to refer to parenting behaviors that are warm, nurturing, involved, and balance the need for structure and monitoring with sensitivity and autonomy) attributes compared to negative parenting, but a range of positive parenting studies
included measures of parental monitoring, sensitivity, involvement, and overall positive parenting.

In the early childhood period, higher maternal ECCC is associated with increased maternal sensitivity (Smith et al., 2007; MQS: 13; Gonzalez, Jenkins, Steiner, & Fleming, 2012; MQS: 10) and emotional warmth (Edel, Juckel, & Brune, 2010). Of note is a functional imaging (fMRI) study of mothers' ECCC and sensitivity to their toddlers. Compared to mothers who were coded as intrusive, sensitive mothers appeared to have better emotion regulation, decision-making, inhibitory control, and higher-level goal-directed behavior activation. These results were true for both depressed and non-depressed mothers (Musser et al., 2012).

Across the life course of childhood, higher maternal ECCC is associated with supportive responses to child’s negative emotion (Hughes & Gallone, 2010; Valiente et al., 2007), more affectional expression (Wietecha et al. 2012), and a higher sense of parenting confidence (Wietecha et al. 2012). Lower maternal ECCC is associated with less monitoring (Babinski et al., 2012; Murray & Johnston, 2006), less parental satisfaction (Watkins & Mash, 2009), and less general positive parenting (Psychogiou et al., 2007; Chronis-Tuscano et al., 2008b).

**Attachment and Bonding**

To my knowledge there are only two studies that assess the association between maternal ECCC and the mother-child relationship. Laurent and Ablow (2012; MQS:
10) conducted a fMRI study of maternal-infant attachment, controlling for maternal depression. In insecure-organized attachment relationships, there was diminished activity in areas of the mother’s cognitive circuits associated with emotion regulation and attending to sensory cues. For infants with anxious and avoidant attachment relationships, their mothers displayed less activation in areas of the brain linked with working memory, attention, emotion control, and general cognitive control. These two studies suggest that lower maternal ECCC is associated with unhealthy mother-infant attachment relationships; this is consistent with prior research of non-parent adults showing an association between poorer emotion regulation and an anxious attachment history (Wei, Vogel, Ku, Zakalik, 2005; Skowron & Dendy, 2004; Gillath, Bunge, Shaver, Wendelken & Mikulincer, 2005).

In the second parenting study, researchers measured executive functioning in moms with children ages birth to 52 weeks and asked the mothers to report their perception of their relationship with their infant. Maternal executive functioning and maternal bonding with the child were not associated (Turner, Wittkowski, & Hare, 2008; MQS: 7). However, the self-reported scores on bonding were highly skewed with little variance in positive bonding, and all of the participants had executive functioning within the typical range. These sampling and score distribution characteristics might have attenuated any potential links between mother-reported bonding and executive function.
**Child Outcomes**

A few studies have focused directly on children’s cognitive and behavioral adjustment outcomes. After controlling for household SES, mother’s better emotion regulation is positively associated with children’s stronger attention control skills (Samuelson, Krueger, & Wilson, 2012), and in violent communities, maternal emotion regulation is associated with fewer child internalizing and externalizing behaviors (Kliwer, Cunningham, Diehl, Parrish, Walker et al., 2004). Mothers with better emotion control appear to have children who are better at self-regulation themselves and who have better academic outcomes, even after controlling for household SES and distal and proximal stressors (Haskett, Stelter, Proffit, & Nice, 2012; Skowron, 2005). In contrast, mothers with ADHD are more likely to have children who show more conduct problems—regardless of the child’s own ADHD diagnosis status and family social class (Sonuga-Barke, Daley, & Thompson, 2002). The mechanism through which maternal ECCC impacts child outcomes was not tested in these studies, but parenting behavior, mother-child attachment, and the mother’s ability to provide routines and structure in the household and child’s life may be mediating variables through which maternal ECCC is associated with child outcomes. It should be noted that this relationship between maternal ECCC and child outcomes could be partially confounded by the heritability of ECCCs (Beaver et al., 2007; Friedman et al., 2008; Thompson et al. 2001) – heritability of ECCCs will be discussed later in this paper.
Maternal Household Management

A number of assets are needed to effectively manage a family and home in ways that positively influence the well-being of the children and the parents. This includes having the personal health and other resources needed to dedicate time and organization to the home, timely performance of household tasks and managing finances, creating household structure and routines, managing the health needs of family members, and forming and maintaining strong connections between family members. While there has been little research in this domain, it is logical—and there is some evidence—that maternal ECCC influences caregivers’ capacities for appropriately managing a home environment that is conducive to healthy child development (Waite & Ramsay, 2010; Weiss, Hechtman, & Weiss, 2000; Moffitt et al., 2011; Hoza, Johnston, Pillow & Ascough, 2006).

Family SES and household chaos appear to be important factors relating to maternal ECCC (see Figure 3.1 for a listing of individual, family, and neighborhood contextual factors that influence and are influenced by maternal ECCC). Deater-Deckard and colleagues (2012b; MQS: 11) found that maternal executive functioning and household chaos were negatively correlated in families with the most socioeconomic risks. Maternal ADHD symptoms have also been linked with more home chaos and family conflict and less family cohesion (Mokrova et al., 2010; Biederman, Faraone, & Monuteaux, 2002; MQS: 12). Chaos is posited to work through the mechanisms of stress and distraction to reduce the efficiency and effectiveness of prefrontal lobe regulatory functions (Lupien, McEwen, Gunnar, &
Heim, 2009; Wachs & Evans, 2010) so that even parents with normal to high ECCC may find that in the face of chaos and other stressors their ECCC capacity is diminished and their parenting quality compromised (Deater-Deckard et al., 2012a).

Prior studies on the relationship between maternal ECCC and chaos have been cross-sectional, which precludes the ability to assess causality. However, the relationship between household chaos and maternal ECCC is likely recursive. Poor planning, problem-solving, decision-making and other ECCCs increase chaos in a home; the chaos creates stressful events, which reduces the efficiency of the prefrontal processes, thereby impacting ECCC performance.

More broadly, lower ECCC has been linked with poorer relationship quality (for all types of relationships) and marital dissolution (Skowron, Stanley, & Shapiro, 2009; Skowron, 2000; Weiss et al., 2000)—relationship processes that cause or coincide with fewer positive parenting experiences and poorer child outcomes (Kendler, Shem, & MacLean, 1997; Ponnet et al., 2012; Carlson, Pilkauskas, McLanahan, & Brooks-Gunn, 2011; Loeber et al., 2000; Klausli & Owen, 2009).

**Limitations of Current Research**

The majority of studies included controlled for contextual factors such as family social status and maternal psychopathology in their analyses. Except as noted, however, these studies did not address how those personal and family-level factors mediate or moderate the association between maternal ECCC and parenting. An important next step of research is to better ‘situate’ maternal ECCCs in overall
family and individual contexts that influence effective parenting and household management. Additionally, none of the studies on maternal ADHD or maternal emotion regulation controlled for maternal fluid intelligence (such as through the PPVT), though studies addressing specific executive functions did. Assessing whether and how much failure to control for maternal IQ may bias results in studies of maternal ADHD or emotion regulation on parenting behaviors is an important next step.

**PLASTICITY OF ECCCs**

Of importance to the study of maternal ECCCs and ineffective and harsh parenting is the question, “What can we do about it?” From a policy and practice standpoint, understanding the development and mechanisms is important in order to ascertain when and how to intervene. Other relevant avenues include exploring the factors that compromise optimal ECCCs functioning in adults, examining the mutability of adult ECCCs, and determining whether there are promising and feasible methods for modifying adult ECCCs (see figure 3.1 for a list of factors that cause fluctuation or change in adult ECCCs).

**Development of Emotion and Cognitive Control Capacities**

The development of ECCCs is complex and there is some variability in development of the different components. These capacities are primarily housed in the prefrontal cortex (PFC), which develops over the first three decades of life (Niendam et al., 2012), although it is also true that emotional and cognitive regulatory processes are
dependent on highly integrated, complex interconnections throughout the brain. The development of ECCCs is a protracted process, but much of the development occurs during middle childhood, with especially significant gains seen at ages 6 years, 10 years, and adolescence (National Research Council & Institute of Medicine, 2000; Welsh, Pennington, & Groisser, 1991; Sarsour et al., 2011; Huizinga & Smidts, 2011). Deficits in ECCC are associated with psychological and developmental problems including autism, ADHD, and aggression (Matte-Gagne et al., 2011).

ECCC in childhood is predictive of ECCC in adults (Murray et al., 2006; Mandell & Ward, 2011). Higher order cognitive processes build on lower level processes with each stage of a child's development being crucial for the optimal development of ECCCs (Sheridan, Sarsour, Jutte, E'Esposito, & Boyce, 2012; Knudsen, Heckman, Cameron, & Shonkoff, 2006; see figure 3.1 for a visual of the stepwise progression of ECCCs throughout childhood). If brain circuits that support lower level processes do not fully develop during sensitive periods, then the development of higher order brain circuits will be compromised. As the child develops, brain circuits are more difficult to modify and improvement becomes increasingly difficult in adulthood but remains possible (Knudsen et al., 2006).

It appears that each ECCC component has a different developmental trajectory, but their development is synergistic. For example, the first leap in developing inhibitory control tends to occur between the ages of 5-8 years. Working memory improves linearly from preschool to adolescence and into adulthood. There is evidence that it
is the interaction between working memory and inhibitory control rather than each component separately that explains performance differences on tasks between ages. Inhibitory control and working memory are prerequisites to the development of attention control (see Best & Miller, 2010 for an in-depth review of the development of ECCCs components).

While there are different developmental trajectories for the various ECCCs components, brain imaging studies show that a superordinate cognitive control network that includes the dorsolateral prefrontal cortex, parietal cortex, and anterior cingulate cortex supports these components (Niendam et al., 2012). Neural communication between the different parts of the superordinate cognitive control network may be as or more important to optimal ECCCs performance as the functioning and structure of the individual brain areas (Niendam et al., 2012; Barbey, Colom, Solomon, Krueger, Forbes et al., 2012).

Genetics, the social environment, environmental toxins, and brain injury and disease all influence ECCCs development. The frontal lobe structure is the area of the brain under the most genetic control, and ECCCs have been found to be among the most heritable cognitive processes (Beaver et al., 2007; Friedman et al., 2008; Thompson et al 2001). Specific genes are instrumental in the performance of ECCCs (Blair & Diamond, 2008). While genes play a direct role in the development of ECCCs, there is some available evidence that one's genes impact how sensitive a person is to their environmental context. For example, individuals who are more sensitive to their
environment may benefit more from a nurturing, supportive context. If such individuals are exposed to environmental stressors like harsh parenting, family chaos, and low SES they are at increased genetic vulnerability for poor ECC function (Berry, Deater-Deckard, McCartney, Wang, & Petrill, 2013; Hughes, 2011).

Environmental factors that impact ECC development and performance are particularly important when there is genetic risk for lower or dysfunctional emotional and cognitive control. In early childhood, environmental factors influence brain and neurological development, including brain structure and function (De Bellis, 2005; Rutter & O’Connor, 2004). Predictable family schedules and organization, parental support, parent limit setting, and positive parent-child attachment have all been linked with higher ECC performance (Schroeder & Kelley, 2010; Bernier, Carlson, Deschenes, & Matte-Gagne, 2012; Horvath, 2007). There may be a particularly damaging relationship between childhood poverty and adult ECC (Sheridan et al., 2012; Noble, Norman, & Farah, 2005; Noble, McCandliss, & Farah, 2007; Evans & Schamberg, 2009; Sarsour, 2011; Hughes & Ensor, 2005; Wahler & Dumas, 1989). Less active and productive language environments (Hughes, 2011; Matte-Gagne et al., 2011) and higher stress and adversity (Sheridan et al., 2012; Evans & Schamberg, 2009) are hypotheses for why SES has such a profound impact on ECC. Parent education levels (Hughes, 2011; Sarsour, 2011) and family structures that result in low resources and limited parental involvement
(Sarsour, 2011) also appear to be important mechanisms for how family SES impacts ECCC development during childhood.

Because the prefrontal cortex is one of the last areas of the brain to develop, it is especially vulnerable to injury (Barbey et al., 2012; Thomas & Johnson, 2008), disease and psychopathology (Barrett & Fleming, 2011), environmental toxins (Eubig, Aguiar, & Schants, 2010), and drug use (Wass, Persutte, & Hobbins, 2001; Chen, Maier, Parnell, & West, 2003; Beaver et al., 2007; Sadowski & Parish, 2005; Crean, Crane, & Mason, 2011). Anything that interferes with its growth during the prenatal period and throughout childhood is likely to impact ECCC (Beaver et al., 2007; Diamond, Prevor, Callender, & Druin, 1997; Hughes, 2011). Premature birth and low birth weight has been associated with long-term ECCC deficits (Mulder, Pitchford, Hagger, & Marlow, 2009; Hughes, 2011) while increased birth weight within the normal range is associated with improved ECCC performance (Phua, Rifkin-Graboi, Saw, Meaney, & Qiu, 2012).

Individuals living in disadvantaged environments appear to be more likely to have low ECCC (Sheridan et al., 2012; Schroeder & Kelley, 2010). Both adversity reduction and enrichment (such as developing family schedules and routines) are important in creating environments that are optimal for the development of ECCC in normally developing children, especially for those growing up in disadvantaged communities (Sheridan et al., 2012; Schroeder & Kelley, 2010).
Importantly, although it is perhaps more difficult to modify ECCCs in adults, there is evidence of neural plasticity and neurogenesis in the frontal lobe of middle-age and older adults and even improvements to ECCC in response to experience (Carlson, Erickson, Kramer, Voss, Bolea, et al., 2009; Dahlin, Nyberg, Bachman, & Neely, 2008).

Intra-Individual Variability of ECCC

ECCC is not stable within an individual and different factors cause ECCC to fluctuate. An individual may appear to have ECCC deficits when they are suffering from extreme stress, sadness or loneliness, fatigue and sleep deprivation, or when they are not physically or nutritionally fit. Adele Diamond once noted that the “prefrontal cortex is the first to suffer, and suffer disproportionately, if something is not right in your life” (Diamond, 2013, p 153). These factors can have a more transient impact on ECCCs (e.g. fatigue) or the effects may be longer-term or even permanent (e.g. psychopathology, poor nutrition over an extended time, chronic stress), though the short-term and long-term impact of the various factors is still not fully known.

Fatigue is linked with impaired attention control (Engle & Kane, 2004; Horne, 2012). In the first few months of a child’s life when adults’ sleep disruptions are frequent, this can particularly be a challenge for parents as they strive to manage their own care giving thoughts, emotions and behaviors during a rewarding but stressful time in the family’s life (Kienhuis et al., 2010; Boksem, Meijman, & Lorist, 2005). Stress also influences ECCC. On the one hand, adults with normal to high ECCC are better at coping with stress (Bakker, Ormel, Verhulst, & Oldehinkel, 2011).
But when stress does arise, it has been shown to increase distractibility and reduce working memory and attention control (Gonzalez et al., 2012; Schoofs, Wolf, & Smeets, 2009; Luethi, Meier, & Sandi, 2009; Lupien et al., 2009; Alexander, Hillier, Smith, Tivarus, & Beversdorf, 2007). Adolescents’ prefrontal cortex functions may be especially sensitive to the effects of stress (Lupien et al., 2009), which may put adolescent parents at particular risk for impaired ECCC functioning in high-stress situations.

Other factors that are associated with variability in adult ECCC because they cause temporary or permanent damage to brain systems include iron deficiency (Blanton, Green, & Kretsch, 2013), high intake of saturated fats and sugar (Francis & Stevenson, 2013), substance abuse (Engle & Kane, 2004), maternal psychopathology including schizophrenia, depression, anxiety, and PTSD (Engle & Kane, 2004; Levens & Gotlib, 2010; Kanske & Kotz 2012; Psychogiou & Parry, 2013).

Aging has been suspected of decreasing ECCC presentation, but in a study published in 2009, Delaloye et al found that ECCCs might be less susceptible to aging than was originally thought. While the association between aging and a decline in ECCC is still unclear, any associated decline with ECCCs is likely only a factor in older parents (over 50 years; Delaloye et al., 2009). I found no studies that looked at the impact of ECCCs in parents older than 50 years compared to younger parents and how this impacted parenting. There is evidence, however, of changes in parenting cognitions and behaviors in parents younger than 30 years when ECCCs are still developing.
Several aspects of parenting (such as parenting knowledge and competence, sensitivity, structuring, and physical affection) improve significantly up until a mother is 30 years old, but after age 30 (until age 47 years) there is no association between maternal age and change in parenting practices (Bornstein et al., 2007).

**Can Adult ECCC be Modified?**

Currently, very little is known about the plasticity of ECCCs in adults other than that they are mutable to a degree. The extent to which it is feasible to change ECCC in adults on a large scale is not understood. Since the prefrontal cortex is developing especially during early childhood to adolescence, the most cost-effective time to intervene is in early childhood, with adolescence likely being the second most cost-effective time (Moffitt et al., 2011).

There is some evidence that cognitive behavioral training, and possibly mindfulness training (Bogels, Lehtonen, & Restifo, 2010; Bogels, Hellemans, Deursen, Romer, & Meulen, 2013; Sibinga et al., 2011), can improve adult ECCC (for reviews see Bogels et al., 2010; Diamond, 2013; Melby-Lervag & Hulme, 2013; Morrison & Chein, 2011; Shipstead, Redick, & Engle, 2012). Training is believed to be particularly beneficial in childhood, and most training experiments have been conducted on children. However, there have been successes with adults, and the predominant view that training is most effective in younger ages may be due to the paucity of published studies on older adults. For example, attention training for task-switching improved not only task-switching but the positive effects transferred to other ECCC tasks for
younger (18-26 years) and older (62-76 years) adults (Hughes, 2011; Karbach & Kray, 2009). Direct training of emotion control also can be successful, though it may work somewhat differently than other cognitive regulation capacities. Ochsner & Gross (2008) found that teaching adults to cognitively reappraise negative situations in more neutral terms was more effective than teaching adults to suppress negative emotions that over time can actually lead to increased emotional reactivity.

While there have been training successes, retraining neural systems is very effortful and often highly domain specific. Often initial training gains do not hold up in the long-term (Melby-Lervag & Hulme, 2013), and even with success in retraining one domain, it is difficult to generalize these gains to other domains and situations. Research on training ECCCs is still scarce and there are several methodological limitations in current studies (Diamond, 2013).

For adults with ADHD, treating the symptoms with medication has been shown to improve performance on executive functioning tasks (Faraone et al., 2005). However, whether through cognitive or behavioral training or pharmacological treatment, improved parenting skills may not necessarily follow improved ECCCs immediately due to habits that have been developed over time or poor parenting knowledge (Chronis-Tuscano et al., 2008a; 2010). Even in well-regulated parents, if they consistently implement harmful parenting strategies or hold on to harsh parenting attitudes and attributions that they believe are the best for child rearing,
these practices will not serve the child or the family well. Improving ECCCs alone is not sufficient for improving parenting, and parent skills training or other interventions may be necessary to improve parenting and ultimately child outcomes.

**IMPLICATIONS FOR PROGRAMS, POLICY, AND RESEARCH**

Interventions to enhance child and family well-being often focus on “high-risk” families. Although no epidemiologic studies are available of the distribution of ECCCs, it appears that mothers in high risk families are more likely to have ECCC deficits. Parents with deficits in planning, attention control, and other aspects of ECCC may benefit less from these interventions because they may be more difficult to enroll and engage in programs, more distracted during training, or they may be less likely to practice new behaviors at home. It follows that program outcomes may be substantially improved if deficits in ECCC are taken into account when designing recruitment and enrollment strategies, compliance standards, and implementation methods. Formal “diagnosis” of ECCC deficits is not necessary to the success of these programs, but being mindful that many parents have some deficits in their ability to control emotion, pay attention, plan, and retain information is essential to developing successful programs.

To my knowledge, there are only two empirical studies that have been conducted on parental ECCC and intervention uptake. In a parenting intervention study of 89 mothers and their 3-year-old children (Sonuga-Barke, Daley, & Thompson, 2002),
parent training had no effect on child outcomes immediately following the training or 15 weeks post-intervention for parents with high levels of ADHD symptoms compared to low levels. In another parenting intervention of 72 children with ADHD and their parents, some of whom also had ADHD (Harvey et al., 2003), the investigators found that parents without ADHD were better able to incorporate the positive parenting skills learned in the training.

While these studies were both specific to ADHD, they can help inform our understanding of parent training uptake among parents with other ECCC deficits. Both of these studies highlight that it is critical to design parenting interventions that maintain the attention of highly distractible parents and to instill strategies that help parents with ECCC deficits to follow-through on plans to implement the skills in “real life,” which is a challenge even for parents with average or high ECCC.

Some families may already have good parenting knowledge but live in such stressful circumstances that make it difficult for them to implement what they learn from parenting interventions (Wahler & Dumas, 1989). As discussed in more detail earlier, stress negatively impacts maternal ECCC, particularly by weakening working memory and increasing distractibility (Lupien et al., 2005; Luethi et al., 2009; Gonzalez et al., 2012). The capacity to hold relevant information in mind and manage multiple demands on attention are essential skills for a mother, but in stressful circumstances these skills are usually diminished. To be effective, an intervention must balance not only teaching essential parenting skills, but also help
parents to find ways to reduce stress in their lives so that they can better incorporate the positive parenting knowledge and skills they learn in these interventions.

Beyond interventions specific to parenting skills, recognition of the need some parents have for assistance in problem solving and planning is critical for all interventions designed to strengthen homes and families. For example, in medical and school settings parents may need added support to resolve logistical challenges (i.e. transportation, childcare, managing schedules) so they can attend appointments and manage medications. The millions of dollars spent on improving access to medical and other services (such as food stamps, Medicaid, etc) might be made more effective by reviewing and improving programs’ enrollment and compliance procedures to ensure that families are not excluded because they cannot navigate the complexities of these programs’ procedures.

Table 3.3 contains summary recommendations for program and policymakers as well as recommendations for research that will influence program and policy.

**Gaps in the Literature and Future Direction**

There are several gaps in the existing literature that are necessary to address in future research in order to move the study of parental ECCC forward and to enhance strategies for improving parenting. At the forefront of the discussion are issues on measurement of ECCCs and methodological issues in existing studies, consensus on
definitions between and across constructs, and the contexts in which studies have been conducted up to this point. Below I discuss each of these issues in more detail. In chapter 6, I discuss the degree to which aims 2 and 3 address each of these gaps.

Measurement

Measurement of ECCC presents a challenge for comparing and interpreting studies. Correlations between tasks and self-report instruments, or between different tasks, purportedly measuring the same construct, are generally modest (Toplak, West, & Stanovich, 2012; Decker et al., 2007; see Wostmann et al 2013 for an exception to this in the measurement of inhibitory control and Belendiuk, Clarke, Chronis, & Raggi, 2007 for a discussion of correlation in measurement of adult ADHD). Due to low correlations, interpreting results across studies that use different instruments produces tenuous conclusions. Part of the issue may be a lack of clarity about what is actually being measured by a given instrument (Decker, Hill, & Dean, 2007) and most tasks measure multiple components (Best & Miller, 2010; Barkley & Murphy, 2011). For example, it is possible that differences attributed to changes in age may sometimes merely reflect differences in the instrument used (Delaloye, Moy, Baudois, De Bilbao, Dubois et al., 2009; Best & Miller, 2010).

Most tasks used to measure ECCC are not ecologically based and may not measure how an individual’s ECCCs will operate in the “real world” (Torralva, Gleichgerrcht, Lischinksy, Roca, & Manes, 2013; Barkley & Murphy, 2011). The very nature of the majority of tasks used to measure ECCC may take some of the executive functioning
itself out of the task due to the very regulated way the tasks are administered (i.e. the assessor provides the structure, organization, and guidance for how to complete the task). Finally, ECC tasks measure not only executive functioning ability but also measure, to varying degrees, non-executive abilities, leading to a “portion-of-variance” problem (Daniels, Toth, & Jacoby, 2006). As ECCCs are arguably part of the broader intelligence construct, the portion-of-variance problem can be partially addressed by controlling for IQ (such as verbal ability), which some studies on ECC have failed to control for.

Methodological Issues

Beyond the measurement issues there are also several methodological shortcomings in the current literature base. Most studies have been cross-sectional and longitudinal studies are necessary to establish temporal order and to improve our understanding of possible changes over time. Sampling is another issue in most ECC and parenting studies. The majority of studies currently available use a convenience sampling approach. Randomization may not be possible or appropriate in many maternal ECC studies, but stratifying on such factors as family SES, neighborhood and household factors, maternal age, child gender, number of children, and other sociodemographic factors may be useful when randomization is not realistic.
Consensus on the Definition of ECCCs

Another current gap in the literature concerns the definition of ECCCs. I have chosen in this review to use a broad definition that encompasses several constructs, but there are nuanced differences that may be important to research and intervention science. The lack of consensus on definitions of ECCCs within and between fields creates chaos in the literature and unnecessary redundancy when research is being conducted across fields but using different names for essentially the same constructs. Additionally, research is needed to more fully answer the question as to whether ECCCs are a unified construct or a set of independent components (Best & Miller, 2010).

Context

Most ECC and parenting studies have been conducted in low to moderate risk communities. As SES appears to play a large role in the development and interaction of ECCCs on parenting, conducting research in high-risk communities is essential and should be a priority. While it is likely that some aspects of the relationship between maternal ECC and parenting are invariant across cultures and socioeconomic contexts, other aspects may very much be influenced by the context. Replication of studies with significant findings is necessary to come to more concrete conclusions and an understanding of how different contexts affect maternal ECC and how differences in samples are associated with the ECCC-parenting relationships.
An unexplored area of research involves investigating what individual, family, and community-level characteristics mediate the relationship between maternal ECC and parenting. Positive environments and individual characteristics may help to compensate for lower maternal ECC and help a mother engage in better parenting than she otherwise would. Some potential mediators include mother's temperament, couple relationship quality, family connectedness, religiosity, family routines, grandparent involvement, and social support. Not only may these variables mediate the relationship between maternal ECC and parenting, but they may have an important impact on the development and intergenerational transmission of ECCs. Additionally, it is important to understand the interplay between ECCs, attitudes, and behaviors; the role of stress and allostatic load on ECCs and parenting behavior; and how cognitions, emotions, and behaviors relate.

An additional aspect of theoretical development and research is the need to better ‘situate’ emotion regulation and cognitive control capacities in the overall processes and skills that comprise effective parenting and household management. Efforts to promote effective parenting can be advanced by understanding ECCs and how to address them in parenting education and interventions, but they are only one aspect of the complexities of knowledge, attitudes, skills, and supports needed for mothers to effectively parent their children and manage their households to promote family health. In the studies that were assessed in this review, the majority attempted to address the complexities of parenting by controlling for family SES and maternal and child psychopathology; significant associations were found both with and
without these controls. However, additional analyses need to be performed to understand how these factors may potentially moderate or mediate the relationship between maternal ECC and parenting.

In summary, this conceptual framework has significant potential to increase understanding of a powerful influence on parenting. The study of parental ECCs provides a range of opportunities for child psychology and parenting intervention research. A significant investment in this area is likely to pay off in terms of enhancing future parenting education and interventions and ultimately child outcomes.
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years. *Journal of Family Psychology: JFP : Journal of the Division of Family Psychology of the American Psychological Association (Division 43),* 23(1), 103.


Figure 3.1. Conceptual Model of the Multigenerational Impact of Maternal ECCC and Parenting

Factors that Cause ECCC to Fluctuate/Change in Adults
- Fatigue
- Sleep
- Stress & Allostatic Load
- Motivation & Rewards
- Substance Abuse
- Nutrition
- Psychopathology
- Medication for Psychopathology
- Injury & Disease
- Cognitive Behavioral Training

Factors that Impact Development of ECCC in Childhood
- Biological
- Genetic/Epigenetic
- Environment
- GxE
- Allostatic Load
- Substance Use
- Injury
- Psychopathology

Maternal Emotion and Cognitive Control Capacity

Parenting
- Parenting Style/Skills
- Attachment
- Home Environment
- Management of Home, Health, & Nutrition

Individual, Family, and Neighborhood Context
- SES
- Home Chaos
- Physical Environment
- Marital Relations
- Family Connectedness
- Family Beliefs/Practices
- Social Support
- Parent & Family Health
- Subjective Well-Being
- Risk-Taking

Parenting Attitudes
- Maternal Age
- Motivation to Parent
- Culture

Intergenerational Transmission of Parenting

Development of Emotion and Cognitive Control Capacities

Infancy
- Early Childhood
- Middle Childhood
- Adolescence
- Young Adulthood

Young Childhood
- Middle Childhood
- Adolescence
- Young Adulthood

Child Characteristics and Well-Being
### Table 3.1. Methodological Quality Score (MQS) Criteria

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<tr>
<th>MQS Criteria</th>
<th>Points</th>
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<tr>
<td><strong>Study Design - Assignment</strong></td>
<td>No Controls or Stratification (1 point); Stratified Sample or Non-randomized Control Group (2 points); Random Assignment (3 points)</td>
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<tr>
<td><strong>Study Design - Length</strong></td>
<td>Cross-sectional (1 point); Longitudinal: 2 time points (2 points); Longitudinal: &gt;2 time points (3 points)</td>
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<tr>
<td><strong>Sample Size</strong></td>
<td>&lt;30 (0 points) 30-100 (1 point); 100-300 (2 points); &gt;300 (3 points)</td>
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<td><strong>ECCC Measurement</strong></td>
<td>Self-report (1 point); Task/Observational (2 points); Combination Self-Report and Observation (3 points)</td>
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<td><strong>Parenting or Child Behavior</strong></td>
<td>Self-report (1 point); Task/Observational (2 points); Combination Self-Report and Observation (3 points)</td>
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<tr>
<td><strong>Data Analysis</strong></td>
<td>Univariate statistics/descriptive (0 points); Bivariate/ANOVA (1 point); Logistic Regression/ANCOVA (2 points); Multiple Linear Regression, SEM, MANCOVA (3 points)</td>
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<td><strong>Total</strong></td>
<td>Possible scores can range from 4-18 points</td>
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General Executive Functioning (EF) Measures (including inhibitory control, working memory, attention control)
<table>
<thead>
<tr>
<th>Article</th>
<th>MQS</th>
<th>Maternal ECCC Measured</th>
<th>Tool(s)</th>
<th>Parent/Child Outcomes Measured</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deater-Deckard et al., 2012a</td>
<td>10</td>
<td>Executive function (working memory, inhibitory control, attention control, problem solving)</td>
<td>Wisconsin Card Sort, Color-word Stroop, Tower of Hanoi, Backward Digit Span Task</td>
<td>Harsh parenting and child conduct problems</td>
<td>In calm households only, lower EF related to higher harsh parenting and child conduct problems; in high chaotic households, EF not significantly related to harsh parenting</td>
</tr>
<tr>
<td>Deater-Deckard et al., 2012b</td>
<td>11</td>
<td>Executive function (working memory, inhibitory control, attention control, problem solving)</td>
<td>Adult Temperament Questionnaire Short Form, Wisconsin Card Sort, Color-word Stroop, Tower of Hanoi, Backward Digit Span Task</td>
<td>Household chaos</td>
<td>Low maternal EF associated with high household chaos in families with high SES risk but not in families with low SES risk</td>
</tr>
<tr>
<td>Fontaine &amp; Nolin, 2012</td>
<td>9</td>
<td>Hot executive function (decision making with emotions; perspective-taking/empathy)</td>
<td>Iowa Gambling Task</td>
<td>Potential for abuse</td>
<td>Physical abuse group performed significantly lower on decision-making and perspective-taking than the control group; results for neglectful group were not significantly different from other two groups but showed a general trend to be “in-between” the abusers and control groups</td>
</tr>
<tr>
<td>Gonzalez et al., 2012</td>
<td>10</td>
<td>Attention control, spatial working memory</td>
<td>Attention control derived from Wisconsin Card Sorting Task; Spatial Working Memory Task</td>
<td>Maternal sensitivity</td>
<td>Early life experiences impact maternal sensitivity via the pathway of maternal working memory (but not via attention)</td>
</tr>
<tr>
<td>Musser et al., 2012</td>
<td>8</td>
<td>Emotion regulation, inhibitory control, goal-directed behavior, general ECCC</td>
<td>Functional imaging</td>
<td>Maternal sensitivity versus intrusiveness</td>
<td>Sensitive moms were more likely (than moms who were intrusive) to activate areas of the brain associated with ER, inhibitory control, decision-making, and other higher order</td>
</tr>
<tr>
<td>Article</td>
<td>MQS</td>
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<td>processes associated with goal directed behavior</td>
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<tr>
<td>Turner et al., 2008</td>
<td>7</td>
<td>Executive function</td>
<td>Hayling and Brixton Tests and Color Trails tests</td>
<td>Maternal bonding and recognition of infant cues</td>
<td>EF was not significantly correlated with bonding or recognition of infant emotion cues; maternal depression associated with lower EF</td>
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<tr>
<td></td>
<td></td>
<td>(inhibitory control, attention control, working memory)</td>
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<tr>
<td>Self-Control</td>
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<tr>
<td>Boutwell &amp; Beaver, 2010</td>
<td>14</td>
<td>Self-control</td>
<td>Abbreviated Dickman’s Impulsivity Scale</td>
<td>Child self-control; maternal involvement</td>
<td>Low maternal self-control associated with less maternal involvement and also low child self-control</td>
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<tr>
<td>Nofziger, 2008</td>
<td>11</td>
<td>Self-control</td>
<td>Mom’s smoking status and use of alcohol; difficulty maintaining stable job; difficulty maintaining stable relationships; engaging in early sex &amp; not using measures to prevent unwanted pregnancy</td>
<td>Parental supervision; parental punishment; child self-control</td>
<td>Relationship between mom’s self-control and more monitoring was marginally significant (p&lt;0.10); moms with low self-control more likely to ignore a tantrum, isolate, and take away privileges (but not related to spanking)</td>
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<tr>
<td>Effortful Control</td>
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<tr>
<td>Valiente et al., 2007</td>
<td>9</td>
<td>Effortful Control</td>
<td>Adult Temperament Questionnaire</td>
<td>Parent positive and negative reactions to child negative emotion</td>
<td>Parent effortful control positively related to their positive reactions and negatively related to their negative reactions; parent’s effortful control correlated with less household chaos</td>
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<tr>
<td>Attention Deficit and Hyperactivity Disorder (ADHD)</td>
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<tr>
<td>Babinski et al., 2012</td>
<td>11</td>
<td>Inattention and impulsivity/hyperactivity</td>
<td>Barkley Adult ADHD scale</td>
<td>Parent-adolescent conflict; parental monitoring, parental knowledge, consistent discipline, ineffective</td>
<td>Moms with ADHD (compared to moms without) reported more parent–adolescent conflict, less parental knowledge, monitoring, and</td>
</tr>
<tr>
<td>Article</td>
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<td>Maternal ECCC Measured</td>
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<tr>
<td>Banks et al., 2008</td>
<td>6</td>
<td>ADHD</td>
<td>ADHD Behavior Checklist for Adults and CAARS</td>
<td>Parent Self-Esteem (efficacy and dissatisfaction); locus of control measures (PLOC); lax discipline; overreactive discipline</td>
<td>When compared with the low ADHD group, mothers in the high ADHD group scored significantly lower on parenting efficacy and significantly higher on parenting dissatisfaction. On the PLOC scales, mothers in the high ADHD group scored higher (than low ADHD group) on negative parental efficacy, belief in fate/chance, and parent lacks control; mothers in the high ADHD group scored significantly higher on laxness and overreactivity compared to mothers in the low ADHD group.</td>
</tr>
<tr>
<td>Biederman et al., 2002</td>
<td>12</td>
<td>ADHD</td>
<td>SCID, K-SADS-E</td>
<td>Family cohesion, family conflict, family expression</td>
<td>Family cohesion was lower in families where the parents had ADHD compared to families with no ADHD; conflict was higher in families with parental ADHD; family expression not significant</td>
</tr>
<tr>
<td>Chronis-Tuscano et al., 2008</td>
<td>8</td>
<td>Inattention and impulsivity/hyperactivity</td>
<td>CAARS and CGI-S</td>
<td>Corporal punishment, inconsistent discipline, positive parenting</td>
<td>As ADHD symptoms decreased (with optimal dose of meds), corporal punishment and inconsistent discipline decreased; no association between decrease in ADHD symptoms and positive parenting</td>
</tr>
<tr>
<td>Chronis-Tuscano et al., 2008b</td>
<td>10</td>
<td>Inattention and impulsivity</td>
<td>CAARS</td>
<td>Positive parenting, involvement, inconsistent discipline, negative parenting</td>
<td>Self-report measures: maternal ADHD symptoms associated with lower levels of positive</td>
</tr>
<tr>
<td>Article</td>
<td>MQS</td>
<td>Maternal ECCC Measured</td>
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<tr>
<td>Chronis-Tuscano et al., 2010</td>
<td>10</td>
<td>ADHD</td>
<td>Structured Clinical Interview for DSM-IV (and verified by other collateral informants)</td>
<td>Positive and negative parenting</td>
<td>Medication reduced ADHD symptoms but no impact on parenting behaviors</td>
</tr>
<tr>
<td>Chronis-Tuscano et al., 2011</td>
<td>11</td>
<td>ADHD</td>
<td>CAARS and SCID and K-SADS and collateral informants</td>
<td>Negative parenting</td>
<td>Mothers with higher ADHD symptoms reported attenuated effects of parent training on children's disruptive behaviors symptoms; maternal ADHD predicted observed negative parenting during free play and homework; moms with ADHD had more difficulty in reducing negative parenting behaviors when enrolled in parent training</td>
</tr>
<tr>
<td>Harvey et al., 2003</td>
<td>11</td>
<td>Inattention &amp; Impulsivity</td>
<td>Adult Attention Deficit Disorders Evaluation Scale</td>
<td>Lax and overreactive parenting</td>
<td>Maternal inattention associated with lax parenting; moderate inattention linked with repetitive arguing behavior before parent training but largest decrease after training (high levels of inattention showed little change after parent training)</td>
</tr>
<tr>
<td>Mokrova et al., 2010</td>
<td>10</td>
<td>Attention, planning, problem solving, inhibitory control</td>
<td>Adult ADHD Rating Scale-IV</td>
<td>Monitoring, inconsistent discipline, parent involvement, and positive parenting</td>
<td>Maternal ADHD positively related to nonsupportive responsiveness &amp; inconsistent discipline, inversely</td>
</tr>
<tr>
<td>Article</td>
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<td>Maternal ECCC Measured</td>
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<tr>
<td>Murray &amp; Johnston, 2006</td>
<td>7</td>
<td>ADHD</td>
<td>CAARS-S: SV and interview</td>
<td>Parental monitoring, inconsistent discipline, and problem solving</td>
<td>Moms with ADHD (inattentive type and all types) monitored children less; moms were less consistent in discipline if had ADHD, and quality and planning of problem solving was lower for moms with ADHD on some measures; positive parenting did not differ by ADHD status</td>
</tr>
<tr>
<td>Ninowski et al., 2007</td>
<td>8</td>
<td>Inattention, impulsivity, overall ADHD</td>
<td>CAARS and ABCA</td>
<td>Prenatal maternal expectations, maternal self-efficacy in nurturing role;</td>
<td>Parental inattention and parental impulsivity were both correlated with less positive parent expectations; maternal self-efficacy negatively correlated with inattention and impulsivity</td>
</tr>
<tr>
<td>Psychogiou et al., 2007</td>
<td>9</td>
<td>ADHD</td>
<td>Adult ADHD Rating Scale</td>
<td>Positive involved parenting (PIP), negative parenting (NP)</td>
<td>PIP negatively correlated with maternal ADHD symptoms; NP positively correlated with ADHD symptoms</td>
</tr>
<tr>
<td>Psychogiou et al., 2008</td>
<td>12</td>
<td>ADHD</td>
<td>Adult ADHD Rating Scale</td>
<td>Negative parenting: emotion expressivity</td>
<td>Maternal ADHD associated with increased negative parenting and negative emotional expressivity; when both mother and child had ADHD, mother response to child with ADHD was more positive than when mother did not have ADHD</td>
</tr>
<tr>
<td>Sonuga-Barke et al., 2002</td>
<td>10</td>
<td>Inattention &amp; Impulsive</td>
<td>Adult AD/HD Rating Scale</td>
<td>Child ADHD and oppositional/defiance symptoms; child behavior and</td>
<td>Moms with lowest ADHD had highest satisfaction and efficacy at baseline; mothers with high ADHD</td>
</tr>
</tbody>
</table>
### Table 3.2. Studies Included of Maternal ECCC and Parenting

<table>
<thead>
<tr>
<th>Article</th>
<th>MQS</th>
<th>Maternal ECCC Measured</th>
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<th>Results</th>
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</thead>
<tbody>
<tr>
<td>Watkins and Mash, 2009</td>
<td>8</td>
<td>ADHD</td>
<td>CAARS</td>
<td>Maternal self-efficacy, parenting satisfaction, perceived parental impact, and maternal hostile-reactive behaviors</td>
<td>ADHD did not predict self-efficacy or social network size and support but did predict lower ratings of parent satisfaction (especially in inattention sub-types), lower perceived parental impact, and hostile reactive behaviors</td>
</tr>
<tr>
<td>Wietecha et al., 2012</td>
<td>13</td>
<td>ADHD</td>
<td>CAARS-INV: SV and CGI-ADHD-S</td>
<td>Parent involvement, positive parenting, poor monitoring/supervision, inconsistent discipline, corporal punishment</td>
<td>Among moms with ADHD receiving treatment (compared to controls), at 8 weeks of treatment found positive impact on display of parent affectional expression; parent sense of confidence was higher among moms receiving treatment compared to controls; found stress reduction in treatment group</td>
</tr>
</tbody>
</table>

- Emotional problems; Parental Sense of Competence
- Symptomology had more child problems at baseline; parent training had little to no effect on child outcomes in times 2 & 3 in moms with high levels of ADHD (but did positively affect child outcomes in mothers with low and moderate levels of ADHD)
Table 3.3. Summary Implications for Policy, Program, and Research

<table>
<thead>
<tr>
<th>Summary Implications for Policy (adapted from Beaver et al., 2007)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Recognize that brain function and structure may be partially responsible for stability of positive and negative parenting behavior over time. Policies that address parent knowledge and skills without also addressing a parent’s ability to plan, problem solve, hold pertinent information in short-term memory, control emotion, and other cognitive control skills will have limited success.</td>
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<tr>
<td>2) Keep program enrollment and overall procedures and any rewards systems simple, straight-forward, and consistent. Mothers with low ECCC will be the least likely to be able to navigate complex or inconsistent program enrollment procedures.</td>
</tr>
<tr>
<td>3) Rehabilitative treatment programs can positively impact cognitive functioning when coupled with parenting skills education. Cognitive behavioral therapies and mindfulness training may be the most effective.</td>
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<tr>
<td>4) Keep childhood poverty in mind in early childhood interventions. Poverty itself does not result in low ECCC, but genetic vulnerability is more pronounced in high-risk environments.</td>
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<table>
<thead>
<tr>
<th>Summary Implications for Parent Interventions</th>
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<tbody>
<tr>
<td>1) Integrate learning about factors that may impact the expression of ECCC such as couple relationship quality, co-parenting, and other family contextual factors including family communication, family chaos, and family roles.</td>
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<tr>
<td>2) Address factors that may impact day-to-day functioning of ECCC and by extension the uptake of the parent training. Such factors include stress, fatigue, nutrition, psychopathology, and substance use.</td>
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<tr>
<td>3) For parents with ADHD, treatment for ADHD plus participation in a behavioral parenting intervention is likely necessary to see improved parenting.</td>
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<tr>
<td>4) Ensure that trainings are “hands-on.” Parents who are easily distracted are more likely to stay engaged in hands-on classes that maintain their attention.</td>
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<tr>
<td>5) Include at least some components of cognitive-behavioral therapy or mindfulness training into the intervention.</td>
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<tr>
<td>6) Parent motivation and a rewards system for participating in parenting interventions may be a key to success in helping participants overcome the initial barriers of attendance and engagement that come with low ECCC.</td>
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<thead>
<tr>
<th>Summary Implications for Research</th>
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<tbody>
<tr>
<td>1) Measurement: Develop instruments to measure ECCC that are ecological and can measure ECCC across developmental periods in childhood.</td>
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<tr>
<td>2) Mechanisms: Assess the mechanisms for how ECCC impacts parenting including stress, allostatic load, psychopathology, and family/community contextual factors.</td>
</tr>
<tr>
<td>3) Methods: Replicate and conduct rigorous research on parental ECCC and parenting in high-risk communities.</td>
</tr>
<tr>
<td>4) Evaluate: Investigate the role of maternal ECCC in program uptake and program outcomes; evaluate the degree to which program strategies mitigate the effects of low maternal ECCC on program uptake.</td>
</tr>
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</table>
CHAPTER 4

MATERNAL EMOTION CONTROL AND EXECUTIVE FUNCTION ABILITY

ASSOCIATED WITH MOTHER’S ENGAGEMENT IN POSITIVE AND NEGATIVE PARENTING BEHAVIORS
ABSTRACT

Background

Parenting provides a critical foundation for lifelong health. Studies on maternal emotion control and on cognitive control capacities have shown that low maternal emotion and poor cognitive control capacities (ECCC) each negatively impact parenting behavior and child outcomes. In this study I look at the impact of both maternal emotion control and executive functions on positive and negative parenting and child behaviors, the mediating role of maternal social cognitions, and how household contextual factors influence these relationships.

Methods

152 mothers and their children 3-7 years old were included in the study. Mothers completed a questionnaire about their own behaviors and their child’s behavior. Maternal ECCC was operationalized as executive function (measured through tasks) and emotion control (maternal reported). Parenting and child behaviors were measured through observed mother-child dyad tasks and maternal reported measures. Structural Equation Modeling using Mplus version 7 was used to analyze the data.

Results

Maternal emotion control was significantly associated with less harsh parenting, maternal negativity, observed negative parenting, hostile attributions about child behavior, and authoritarian parenting attitudes, and was associated with more
maternal positivity; maternal executive function was significantly associated with more observed positive parenting and less authoritarian parenting attitudes. Negative parenting behaviors were linked with more negative child behavior. Maternal social cognitions mediated the relationship between maternal ECCC and child behaviors. Mothers with normal-to-high executive functioning and who also had authoritarian parenting attitudes were more likely to engage in negative parenting than mothers with low executive functioning. There was a complex relationship between chaos and SES with maternal ECCC.

**Conclusions**

The results of the study have practical application for the design of parenting interventions, policy, and research. Improving maternal emotion control, helping parents develop strategies to compensate for low executive functioning, and teaching parents about child development are important for helping parents develop positive parenting skills and have the potential to reduce child maltreatment.
BACKGROUND

Parenting plays a crucial role in the foundations of lifelong health (Bandura, 1997). Children do best when parents are warm and supportive, responsive, spend time with them, react to misbehavior with communication rather than harsh punishment, and monitor their children’s behavior (Amato & Fowler, 2002; Dumka et al, 2009). Parenting that is high on warmth, nurturing, consistent discipline, and monitoring (referred to generally in this paper as positive parenting) is linked to healthy outcomes among children including fewer behavioral problems, better mental health, and greater social competence (Amato & Fowler, 2002). On average, children do not fare as well when their parents are harsh and punitive or detached and neglectful (Waldfogel et al, 2010). Parenting that is harsh, punitive or low on monitoring and support (referred to generally in this paper as “negative parenting”) leads to high societal costs due to increased crime, substance abuse, poor school performance, and mental health problems. Ultimately, it undermines a child’s opportunities, resulting in inequalities in the next generation (McLanahan et al, 2010).

Many interventions have been implemented to improve positive parenting knowledge and skills. These programs, such as home visiting and parent skills education, have been successful in some families in improving parenting practices and reducing child maltreatment and problem behavior in young children (Gross et al, 2009; Prinz et al, 2009; Webster-Stratton, Rinaldi, and Reid, 2007; Sanders et al, 2008; Olds et al, 1997). However, even the most successful programs are not
effective with all parents (Wahler & Dumas, 1989; Duggan et al, 1999; Nievar, van Egeren, & Pollard, 2010; Sweet & Appelbaum, 2004).

Emerging evidence from various fields suggest that maternal emotion and cognitive control capacities (ECCCs) are positively predictive of warm and nurturing parenting practices and negatively associated with harsh parenting practices; ECCCs may even be important in predicting a parent’s success at learning new skills and implementing them in the home (Harvey et al., 2003; Sonuga-Barke, Daley, & Thompson, 2002). Research in this area is still limited and no one model has yet explained how emotion control and other cognitive control capacities similarly or differentially impact parenting attitudes and behaviors and child behaviors. In this paper, I explore the relationship of both maternal emotion control and maternal executive function to various positive and negative parenting behaviors. I also look at how contextual factors such as household chaos and family socioeconomic status (SES) modify the association between ECCCs and parenting behaviors, the differential role of parental attitudes on parenting behaviors in mothers with high and low executive functioning, and ultimately the relationship of maternal ECCC and parenting to child outcomes.

**Parenting**

Parenting is a demanding task. For example, in the first few months of a child’s life, sleep disruptions for the parents (especially the mother) are frequent. During this and other stressful times during the child’s life, parents are challenged to manage
their own caregiving thoughts, emotions and behaviors (Kienhuis et al, 2010; Boksem, Meijman, & Lorist, 2005). As the child progresses toward preschool age, mothers of typically developing children deal with misbehaviors on average 3-4 times an hour (Wahler & Dumas, 1989; Fawl, 1963). While controlling a child's behavior is at times necessary, it must be balanced with parental warmth, monitoring, support, and a recognition of the child's need for autonomy (Belsky, 1984). Parental support and control along with warm, nurturing caregiving is especially important during the preschool years. As a child develops, sensitivity to the child's capabilities and the developmental tasks he or she faces and avoiding harsh punishment are critical. (Creveling, Varela, Weems, & Corey, 2010; Waldfogel, Craigie, & Brooks-Gunn, 2010; Belsky, 1984).

**Emotion and Cognitive Control Capacities**

ECCCs refer to the ability to plan, make decisions, hold pertinent information in short-term memory, pay attention, avoid distractions, set priorities, regulate emotion, and control impulses. These processes are important for most activities people undertake such as learning to cut with scissors, riding a bicycle, pouring a glass of milk, or gaining admission into a social group (National Research Council & Institute of Medicine, 2000). ECCC is an umbrella term that generally includes planfulness, inhibitory control, working memory, critical thinking, emotion control, self-control, making connections, perspective taking, attention control, and more (National Research Council & Institute of Medicine, 2000; Moffitt, 2011). It is sometimes used synonymously with the term executive function.
There is debate as to whether emotion-focused capacities are aspects of executive function or are separate cognitive processes that are facilitated by executive functions (Daunic et al, 2012; Matte-Gagne & Bernier, 2011). Research has shown that both emotion generation and emotion response and regulation use some of the same parts of the brain that executive functions use (areas of the prefrontal cortex primarily) and conceptual frameworks show how inhibition, attention control, and working memory individually and collectively impact emotional response (Ochsner et al., 2009, 2012). The aim of this paper is not to settle the question of whether emotion control is an executive function, but both emotion control and executive functions are included as a part of the ECCC construct. In analyses for this paper, emotion control is kept separate from the executive function construct in part because it is difficult in assessments to tease apart emotion regulation (a process of the prefrontal cortex) from emotion generation (a process more of the amygdala) and also because emotion control is measured differently (self-report questionnaires) from executive functioning (measured through tasks).

**ECCCs and Parenting and Child Outcomes**

ECCCs are vital for successful parenting, allowing parents to be perceptive, responsive, and flexible. Parents call upon ECCCs as they plan and change behavior, respond appropriately to cues, regulate emotion in the face of stress and challenging child behavior, problem solve, and make decisions (Commonwealth Department of Family and Community Services, 2004; Kienhuis et al, 2010; Barrett & Flemming,
ECCCs are not static in an adult, and stress, fatigue, nutrition, disease, and injury can cause fluctuation and change in a person’s ECC (Diamond, 2013; Engle & Kane, 2004; Horne, 2012; Schoofs, Wolf, & Smeets, 2009; Luethi, Meier, & Sandi, 2009; Lupien et al, 2009; Alexander, Hillier, Smith, Tivarus, & Beversdorf, 2007). Thus, in situations when a parent is exhausted, her parenting may be less effective in large part due to temporarily compromised ECCs.

Having low ECCs does not mean that a mother will be a “bad” parent, but low emotion control, high impulsivity, low attention control, and poor decision-making have been shown to put a mother at greater risk for maltreating her children (Lu & Lung, 2012; Skowron et al, 2010; Skowron and Platt, 2005), engaging in less effective discipline strategies (Lorber & O’Leary, 2005; Lorber, 2012; Chen & Johnston, 2007; Deater-Deckard et al, 2010; Deater-Deckard et al, 2012a; Babinski et al, 2012; Banks et al, 2008; Harvey et al, 2003; Mokrova et al, 2010; Murray & Johnston, 2006), being less involved in her child’s life (Boutwell & Beaver, 2010; Chronis-Tuscano et al, 2008b; Mokrova et al, 2010; Chen & Johnston, 2007), monitoring her children less (Babinski et al, 2012; Murray & Johnston, 2006), and having more negative reactions to children’s emotions (Valiente et al, 2007).

While mothers with lower ECC tend to engage more often in negative parenting, there is also evidence that mothers with higher ECC engage more frequently in positive parenting such as increased maternal sensitivity (Smith et al, 2007; Gonzalez, Jenkins, Steiner, & Fleming, 2012) and emotional warmth (Edel, Juckel, &
Brune, 2010), more supportive responses to child’s negative emotion (Hughes & Gallone, 2010; Valiente et al, 2007), more affectional expression (Wietecha et al 2012), and a higher sense of parenting confidence (Wietecha et al 2012). In general, children whose mothers have higher ECCC have fewer internalizing and externalizing behaviors (Samuelson, Krueger, & Wilson, 2012), better executive control themselves (Samuelson, Krueger, & Wilson, 2012), and even better academic outcomes (Haskett, Stelter, Proffit, & Nice, 2012; Skowron, 2005) in comparison to children whose moms have lower ECCC. In contrast, lower maternal ECCC is associated with more child conduct problems (Sonuga-Barke, Daley, & Thompson, 2002; Deater-Deckard et al, 2012). It should be noted that ECCCs are highly heritable (Friedman et al, 2008; Miyake & Friedman, 2012); part of the familial associations seen in these studies can likely be attributed to the genetic transmission of ECCC.

**Role of Parenting Attitudes and Attributions**

Popular media includes a variety of messages, sometimes conflicting, on the best way to parent. Faced with conflicting media reports and opinions on “mommy blogs,” parents do not all agree on the most effective ways to raise a child. Even research can appear conflicting. For example, physical discipline such as spanking has been linked with more child problem behaviors in some populations but appears to be protective in other populations (Lansford, Deater-Deckard, Dodge, Bates, & Pettit, 2004; Lansford, Wagner, Bates, Dodge, & Pettit, 2012). Given the variety of messages on effective parenting as well as the various contextual and
child temperament factors that influence how parenting impacts child behavior, the most well-intentioned parents may have social cognitions (parenting attitudes and attributions) not conducive to their child’s optimal child development.

Parenting attitudes and attributions about the reason behind their child’s behavior are important because they are associated with actual parenting strategies and child behavior and development. For example, mothers who attribute ambiguous child behavior as threatening or hostile are more likely to engage in harsh punishment, which leads to child problem behaviors. However, when they are able to reappraise hostile attributions to more neutral attributions, their likelihood of engaging in harsh discipline decreases (Nix et al., 1999). Parenting attitudes have also been associated with parenting. In a longitudinal British National Cohort study, researchers found that authoritarian parenting attitudes were associated with increased risk for child conduct problems (Thompson, Hollis, & Dagger, 2003). A study of parents and children living in Appalachia demonstrated that parent attitudes on spanking was correlated with child behavioral problems but not with any other behavioral outcomes (Fish, Amerikaner, & Lucas, 2007).

To my knowledge, no study has looked at how parent ECCCs may impact the predictive power of parenting attitudes and attributions on their parenting behavior, nor how parenting attitudes mediate the association of parental ECCC on parenting. ECCCs help an individual engage in goal-directed behavior (Hughes, 2011). As such, it would seem that having higher ECCC would help a person act on
their attitudes and beliefs. For example, when encountering stressful child behavior, a mother with lower ECCC may be more likely to react to the situation rather than take the time to reflect and act on her parenting beliefs. A mother with higher ECCC would be more able to act based on her beliefs rather than reacting to the situation. If this hypothesis holds true, then maternal ECCC acts as a moderator in the association between parenting attitudes and beliefs.

Parenting social cognitions may play a mediating role between maternal ECCC and parenting and child behaviors. Mothers who are more emotionally reactive may be less able to reappraise their hostile attributions about child ambiguous behavior to neutral attributions, thereby leading to engaging in harsh, reactive discipline to correct the behavior. Similar to the impact of ECCCs on attributions, a mother who has lower ECCC may be less planful and thoughtful about her parenting attitudes. She may be less likely to consider alternative parenting philosophies to what she was raised with and less likely to reflect on how her parenting philosophies and accompanying actions impact her child’s behavior. As a result, she may be more likely to have authoritarian parenting attitudes, which in turn are likely to lead to inconsistent or harsh parenting practices.

**Role of Contextual Factors: SES and Chaos**

Family SES and household chaos may be important factors relating to maternal ECCC and parenting. For example, low maternal ECCCs has been linked to more home chaos and family conflict and less family cohesion (Mokrova et al, 2010;
Biederman, Faraone, & Monuteaux, 2002). Chaos impairs prefrontal lobe regulatory functions through the mechanism of stress and distraction (Lupien, McEwen, Gunnar, & Heim, 2009; Wachs & Evans, 2010). Adults with normal to high ECCC are better at coping with stress than parents with below average ECCC (Bakker, Ormel, Verhulst, & Oldehinkel, 2011), but in the face of chaos and other stressors even parents with the highest ECCC may find that their ECCC capacity is diminished and their parenting quality compromised due to increased distractibility and reduced working memory and attention control (Gonzalez et al, 2012; Schoofs, Wolf, & Smeets, 2009; Luethi, Meier, & Sandi, 2009; Lupien et al, 2009; Alexander, Hillier, Smith, Tivarus, & Beversdorf, 2007). SES in relation to maternal ECCC and parenting has been studied less than chaos, but the same stress mechanism may also be applicable to adults living in high-risk sociodemographic conditions. However, SES may have a greater direct impact on parenting attitudes. Some research has shown that low SES parents tend to view child development as “natural growth” versus the viewpoint of high SES parents who view the need for “concerted cultivation” in order for optimal child development to occur (Lareau, 2003).

**STUDY AIMS**

The primary aim of this paper is to explore the association between maternal ECCC and parenting attitudes and behaviors to address the following critical questions:

1) Does parenting behavior vary by maternal ECCC?
Hypothesis 1: There will be a direct association between maternal ECCC and parenting behavior. Parents with lower ECCC will engage in more negative parenting and in less positive parenting.

2) Do the contextual factors of household chaos and SES risks influence maternal ECCC and parenting behaviors?
   - Hypothesis 2: Higher levels of household chaos and SES risks will be correlated with lower maternal ECCC and associated with more negative parenting behaviors and fewer positive parenting behaviors.

3) Do parenting attitudes and beliefs mediate the association between maternal ECCC and parenting behaviors and between contextual factors (SES and Chaos) and parenting behaviors?
   - Hypothesis 3: Parenting attitudes and beliefs will partially mediate the relationship between maternal ECCC and parenting behaviors, and between contextual factors and parenting behaviors (with the mediating relationship being particularly strong between household SES and parenting behavior).

4) Do children have more behavioral difficulties if their mother has lower ECCC? Do parenting attitudes and behaviors mediate this relationship?
   - Hypothesis 4: Negative parenting behaviors will be positively associated with child behavioral problems. Positive parenting behaviors will be
negatively associated with child behavioral problems. There is likely to be some direct effect between maternal ECCC and child behaviors, such that higher maternal ECCC will be negatively associated with child conduct problems and negative affect, but this association will be largely mediated by parenting attitudes/beliefs and especially parenting behaviors.

5) Are parenting attitudes and attributions (i.e. parenting expectations) more closely associated with parenting behavior among mothers with higher ECCC compared to mothers with lower ECCC?

- Hypothesis 5: Among mothers with the lowest levels of ECCC, the relationship between maternal parenting attitudes and parenting behaviors will be weaker than among parents with above average ECCC.

This paper builds on previously published papers using these data (Deater-Deckard et al, 2012a;b). The respective roles of maternal emotion control and maternal executive functioning on parenting are assessed, self-report and observed measures of parent and child behaviors are included, and the relationship of parenting attitudes to parenting and child behaviors are analyzed in the context of maternal executive functioning. Additionally, the analytic approach used in this paper, structural equation modeling (SEM), is advantageous over traditional regression analyses because it requires fewer assumptions, accounts for measurement error and purifies point estimates and paths with betas, and simultaneously assesses multiple pathways (Li, 2011; Little, 2013).
METHODS

Data for this paper come from a study conducted in 2010-2011 through a NIH Exploratory/Developmental Research Grant Program, Parent R21, awarded to K. Deater-Deckard. The initial sample includes 152 mothers and their children, ages 3-7 years, living in rural and urban areas in Appalachia and Roanoke, Virginia, areas identified as underserved and underresourced for health services. The sample was ethnically and socioeconomically representative of the area. Each participant received an honorarium for participating. The majority of participants (n=112) were recruited in Roanoke through community agencies and flyers distributed to parents through preschools and schools or posted in common areas throughout the community and on the university web site. They were given a phone number to call with any questions about participating. An additional 60 mothers were recruited through an ongoing longitudinal study in Appalachia, of whom 49 agreed to participate. Of these 161 total individuals who agreed to participate and had a child in the target age range (3-7 years), nine did not complete all of the data collection required, making a total of 152 mothers and their children included in this study. This study has been described in greater detail previously (Deater-Deckard et al, 2012a, b).

In this moderate risk sample, 62% of participants were married, 68% were Caucasian, the mean maternal age was 32.8 years (range 21-49 years) and the mean child age was 57.3 months; 31% of mothers and 35% of fathers had received a high school diploma/GED or less, and 18% of fathers were unemployed. There were
some differences between the Roanoke group that was recruited through community flyers and the Appalachia group recruited through an ongoing study. In general, participants from the Appalachia ongoing study group had fewer socioeconomic risks and the children were younger (average age 33 months) compared to the more Urban Roanoke sample. Significant socioeconomic differences included that only 5% of fathers were unemployed, 19% of fathers had received a high school diploma/GED or less, and 16% of mothers reported that they were a single parent. Study “site” was included as a covariate in the analysis (1=Urban Roanoke; 2=Rural Appalachia).

Data Collection

An initial phone call was placed to those interested in participating in the study to confirm eligibility and to gain consent. The questionnaire was then mailed to each mother who was asked to complete it and bring it to her lab visit. A follow-up phone call by a member of the research team helped to assess the mother's reading level, and if necessary, to read the questions to the mother. The questionnaire contained basic demographic information about the mother, the child’s father (not included in this study), and the child as well as social cognitive measures.

Mothers came to the lab with their children to complete mother-child dyad tasks, maternal executive functioning tasks, the Peabody Picture Vocabulary Test (PPVT)-4 (Dunn & Dunn, 2007), and psychophysiological testing (EEG and ECG). This paper
highlights the results from the executive functioning tasks, mother/child dyad tasks, and the maternal report of the questionnaire.

Measures

Maternal ECCC

Emotion Control: Maternal emotion control was measured using the Emotion Control subscale of the Behavior Rating Inventory of Executive Function – Adult Version (BRIEF-A; Roth, Isquith, & Gioia, 2005). The 10-item, self-report Emotion Control subscale uses a 3-point Likert Scale (Never, Sometimes, Often). Sample items include, “I have angry outbursts” and “I overreact to small problems.” Each of the items was reverse coded so that higher scores indicate higher emotion control.

Executive Function: Maternal executive function was measured with four tasks typically used to measure adult executive functioning.

The Stroop Color-Word Task (administered by computer), is typically used as a measure of inhibitory or attention control. From a set of 20 color words, mothers were instructed to name the color of the ink. The color of the letters and the actual word written were either congruent (e.g. “blue” written in blue ink) or incongruent (e.g. “blue” written in red ink). An initial reading trial in which participants read the ink color of a series of Xs preceded the actual testing. Scores were calculated as the average reaction time for correct responses (Mean: 1,667.27 milliseconds (ms); SD: 781.17 ms).
The Wisconsin Card Sorting Test (WCST; administered by computer) measures attention control. Mothers were shown four stimulus cards that had different colors, quantities, and shapes. They were instructed to match a stack of 128 (at the urban lab) or 64 (at the rural university lab) cards to the original stimulus cards. They were not told the rule they were to sort by (either by color, quantity or shape), but were instructed that the computer would tell them if they were right or wrong. Throughout the test, the matching rule changed several times, forcing the participant to deduce the new rule. Scores were calculated based on perseveration errors per 64 trials, which are the mistakes made by using the same incorrect matching rule even after receiving feedback from the computer that the rule was no longer correct (Mean: 6.67 errors, SD: 5.01 errors).

The computerized version of the Tower of Hanoi, measures mother's problem solving abilities, planning, and working memory. Mothers were instructed to move three disks of different sizes from peg 1 to peg 3 (on a 3-peg device) to make a stack identical to the stack at the start. They had to comply with two rules: only one disk could be moved each turn and larger disks could not be placed on smaller disks. Scores were calculated based on time to completion (mean: 38.48 seconds, SD: 16.57 seconds). They were given up to 60 seconds and those who did not finish were given a score of 60 seconds.
The backward digit span task is a measure of working memory. The experimenter read a series of single digit numbers (0-9) and the mother was instructed to repeat the numbers in reverse. A practice trial with two sets of two digits was conducted to ensure the mother understood the instructions. Following the trial, the task began with a four-digit sequence that the mother was asked to repeat in reverse. An additional digit was added in each successive trial. Mothers were given two chances to correctly recite the numbers in reverse. If she failed to do so after two chances then the task ended, and she was given the score of the last correct trial (mean: 5.09 digits, SD 2.17 digits).

The scores for the Stroop, WCST, and TOH were reverse coded; higher scores on each of the tasks represent better performance. Each of the scores was z-score standardized (mean=0; SD=1). Conceptually and theoretically these tasks go together as a measure of executive functioning (Best & Miller, 2010), however due to a low alpha on the four items, it was determined that a more valid approach would be to create a composite variable rather than using an average multi-item score. The scores for each of the tasks were divided broadly into thirds based on z-scores, the lowest scores receiving 0 points, the middle/average scores receiving 1 point, and the highest scores were given 2 points. The four category scores were then summed, for a final executive function score range of 0-8 points. Approximately one-fourth of mothers had either a low (0-2 points) or high (6-8 point) score, and the remaining half scored in the middle (3-5 points).
Parenting Measures

Five measures of parenting, 3 self-report and 2 observed, were included to assess different aspects of positive and negative parenting. Observed positive parenting and negative parenting were measured using four mother/child dyad tasks. For each of the tasks, observers used the Parent Child Interaction System (PARCHISY; Deater-Deckard, Pylas, and Petrill, 1997) to rate mothers on positive and negative content control, positive and negative affect, responsiveness, on-task, and verbalizations. Each of the measures was rated on a 7-point Likert scale (a score of 1 indicating that the behavior was not observed, a score of 7 indicating that the behavior was constantly or exclusively used); higher scores represented more observed behavior on that given measure (i.e. a score of 7 on the positive content control indicated greater positive content control; likewise a score of 7 on the negative content control indicated greater negative content control). Each of these tasks is described below:

1) Etch-A-Sketch, Square (Time: 5 minutes): In this task the experimenter provided the mother and child dyad with an etch-a-sketch and they were told to make a square. Each was assigned a dial and told that they could not touch each other’s dial. If they finished the square before the time was up, they were told to begin again. The experimenter left the room and watched the interaction from the control room.

2) Etch-A-Sketch, Smiley Face (Time: 1 minute): The same process was followed as above, but instead of a square the dyad was told to draw a smiley face.
Scores for this task were combined with the first task to create one Etch-A-Sketch score for each of the measures.

3) Puzzles (Time: 5 minutes): In this activity, the mother-child dyad was shown a difficult puzzle and asked to work together like they would at home to complete it. If they finished before the time was up they were to take the puzzle apart and restart it. The experimenter left the room after providing these instructions and watched from the control room.

4) Lego (Time 5 minutes): The mother-child dyad were shown a 3-dimensional model of a Lego structure. The experimenter told the mother and child that the mother would provide instructions to her child to construct the model with their own set of Legos. However, the mother was instructed not to touch the Legos, but could rotate the model for the child to refer to. The experimenter again left the room and watched from the control room.

**Observed Negative Parenting:** The Observed Negative Parenting global score was comprised of the negative content control (use of physical control of the child’s body, prohibiting the child from touching items used for the tasks, and use of criticism) and negative affect (measured by observing maternal rejection through frowning, cold/harsh voice) measures from each of the tasks. Each of the items had a possible score range of 1-7 points, with higher scores indicating more negative parenting.
**Observed Positive Parenting:** Positive affect (warmth), positive content control (use of praise, explanation, and open-ended questions), and responsiveness (parent responsiveness to child’s questions, comments, behaviors) from each task were in the observed positive parenting construct. Possible score ranges for each item were 1-7 points; higher scores indicate more positive parenting.

**Harsh Discipline:** The harsh discipline construct was created from the shame and verbal discipline subscales of the Discipline Scale (Lansford et al, 2010). The two scales combined include five items scored on a five-point scale ranging from 1 (never) to 5 (almost every day). Sample items include “How frequently do you argue or quarrel with your child?” and “How frequently do you tell your child s/he should be ashamed of her/himself?” Higher scores indicate more self-reported engagement in harsh discipline.

**Maternal Negativity and Positivity:** The maternal positivity and maternal negativity subscales were used from the Parent Feelings Questionnaire (a 24-item scale developed by Deater-Deckard, 2000). Sample items on the Parent Feelings Questionnaire include “I am usually affectionate with my child,” “I enjoy being my child’s parent,” “Every once in a while my child’s behavior can bring out the worst in me,” “Sometimes I find it difficult to be around my child.” Thirteen items made up the maternal negativity subscale (higher scores indicate greater negativity). The maternal positivity subscale was comprised of 11 items (higher score indicate greater positivity).
Parenting Attitudes/Beliefs

**Traditional Parenting Attitudes** were measured using the Parent Modernity Scale (Schaefer and Edgerton, 1985). This scale measures parental beliefs and includes two subscales: the traditional and authoritarian subscale and the progressive and democratic subscale. The traditional and authoritarian subscale is used in this analysis. Sample items (measured on a 4-point Likert scale, higher scores representing more authoritarian/traditional parenting) include “The most important thing to teach children is absolute obedience to whoever is in authority” and “Children should always obey their parents” and “Children will be bad unless they are taught what is right.”

**Hostile Attribution Bias** was measured using the Parenting Possibilities Questionnaire (Nix et al, 1999). The Parenting Possibilities Questionnaire includes nine scenarios that measure maternal internal and external attribution bias. Parents rated the likelihood of why a child behaved in a certain way in each scenario on a four-point scale (“probably not why this happened; not a good reason”, “a small chance this was the reason for what happened; an unlikely reason”, “could be why this happened; a good reason”, and “probably why this happened; a very good reason”). The following is an example of one of the scenarios: “You ask your child to help set the table and hand him a plate to take to the table. You hear a crash and you look. The plate is in pieces at your child’s feet. This probably happened because: A. He couldn’t quite put the plate on the table correctly. B. He didn’t like having to do the chore.” Higher scores indicate higher internal/hostile attribution bias.
Child Behavior Outcomes

Child Conduct Problems was measured using the 6-item Child Anger subscale from the Child Behavior Questionnaire, Short Form (CBQ; Putnam & Rothbart, 2006) and the 5-item Child Conduct Problems subscale from the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997). For the CBQ, mothers reported their child’s anger on a 7-point Likert scale ranging from “extremely untrue” to “extremely true.” Sample items included “Gets angry when told s/he has to go to bed” and “Has temper tantrums when s/he doesn’t get what s/he wants.” From the SDQ, mothers reported their child’s behavior using a 3-point Likert scale of not true, somewhat true, and certainly true. Sample items included “Often fights with other children or bullies them” and “Often loses temper.”

Child Negative Affect was measured based on observed child behavior from each of the mother-child dyad tasks. The following categories were included: child responsiveness (reversed scored so that higher scores indicate less responsiveness), noncompliance, negative affect, on-task (degree to which the child was persistent with the task; item was reversed scored so that higher scores indicated less interest and initiative), and activity level (reversed scored so that higher scores indicated more demonstrated lethargy or tiredness during the task). Higher scores indicate more negative affect.
Contextual Factors

Household Chaos was measured using the Confusion, Hubbub, and Order Scale (Matheny, Wachs, Ludwig, & Phillips, 1995). The six-item scale uses a 5-point Likert scale. Sample items included “It’s a real zoo in our home,” “You can’t hear yourself think in our home,” and “The atmosphere in our home is calm” (reverse scored). Higher scores indicate more chaos.

SES Risk: To measure SES risk a SES risk composite score was created. The following items were included in the risk measure: marital status, paternal education, maternal education, housing, and paternal unemployment. Items were counted as a risk if the mother was single and not living with the child’s father, if the father had a high school education or less, if the mother had a high school education or less, if the father was unemployed, and if the family did not live in a separate single-family home. Higher scores indicated more risks.

Other Covariates

Study site, maternal and child age, child gender, child developmental problems (“Has this child ever had any long-term health or developmental problems?”), and maternal score on the Peabody Picture Vocabulary Test (PPVT) were included as covariates. Maternal and child age, child gender, and child developmental problems were all based on mother report.
Statistical Analyses

Preliminary Analysis

Preliminary data analyses were conducted in Stata 12. For each measure, means, medians, score ranges, standard deviations (SDs), and the interquartile range (IQR) were calculated. Simple two-sample T-tests to compare means on baseline characteristics and key study variables between study sites were conducted. Pairwise correlations were run between covariates and key study variables. Tests for collinearity using side-by-side plots and the variance inflation factors (VIFs) were conducted on key study variables. Missing data for study variables was minimal (3% had more than 10%, but less than 20%, missing data).

Confirmatory Factor Analysis

Confirmatory Factor Analyses (CFA) were conducted separately on each study variable to set up the measurement model. All CFAs were performed in Mplus Version 7 (Muthe´n & Muthe´n, 2012) using full information maximum likelihood (FIML). Based on the results of the CFA, latent or manifest variables were created. Latent variables are constructs that cannot be directly observed but are measured based on variables that can be observed. Manifest variables can be directly measured (Little, 2013). Model fit was assessed for each latent variable. Latent variables with a CFI value ≥0.95 indicated good fit and any value less than 0.90 indicated poor fit. Likewise, for RMSEA, values ≤0.06 represented good model fit and up to 0.10 indicated acceptable fit (Little, 2013; Hu & Bentler, 1999). Manifest variables were created for CFA models below the minimum fit indices. Items with
factor loadings below 0.45 were dropped. The error terms on similar items were correlated to improve model fit, as indicated by the modification indices that Mplus produces. Cronbach alphas were computed for each measure after CFA was completed (see Table 4.1). The results of the confirmatory factor analyses are included in the Results section.

Model Building

The goal of model analyses was to have good model fit, maximize degrees of freedom, and to have adequate power to complete the analyses. Model fit was assessed using the comparative fit index (CFI) and root mean square error of approximation (RMSEA), values which are less sensitive to sample size when evaluating model fit than the $\chi^2$ test. CFI values $\geq 0.95$ indicate good fit and any value less than 0.90 indicate poor fit. Likewise, for RMSEA, values $\leq 0.06$ represent good model fit and up to 0.10 indicate acceptable fit (Little, 2013; Hu & Bentler, 1999). In order to ensure model fit, degrees of freedom, and adequate power, a series of four models were built that were linked to the proposed aims and hypotheses. Each model was estimated using mean and variance-adjusted weighted least squares (WLSMV) in Mplus Version 7 (Muthe´n & Muthe´n, 2012).

Missing data was dealt with using full information maximum likelihood (FIML). FIML provides unbiased parameter estimates and standard errors by using all available data to estimate a likelihood function for each subject. Separate models were analyzed for each of the parenting behavior measures.
Model 1: Maternal emotion control and executive function were included in the model as predictors of each parenting behavior.

Model 2: Household chaos and SES risk were added to model 1 as correlates of maternal emotion control and executive functioning and predictors of parenting behavior.
Model 3: The potential mediation of parental social cognitions (parenting attitudes and attributions) were first tested individually for each relationship (i.e. maternal emotion control -> maternal hostile attribution bias -> maternal harsh discipline). Multiple mediation was conducted by adding both intervening variables to model 2.

Model 4: Child behaviors (Conduct Problems and Negative Affect) were added to Model 3 as the final outcomes. When child behaviors were added to the models, household SES risks and household chaos were collinear with maternal ECCC. Rather than remove them completely from the models they were included as predictors of maternal emotion control and maternal executive function. The decision to keep them in the models in this capacity was made because they appeared to be salient variables in the relationship between maternal ECCC and parenting (based on model 2) and there is theoretical justification for these contextual factors as predictors of maternal ECCC (Deater-Deckard et al., 2012a;b; Mokrova et al., 2010). Both measures, through the mechanism of stress, have been shown to negatively impact maternal ECCC (Lupien, McEwen, Gunnar, & Heim,
2009; Wachs & Evans, 2010). The true relationship between household contextual factors and maternal ECC is likely recursive and I tested the models both by adding the contextual factors as predictors of maternal ECC and as predicted by maternal ECC. Model fit was similar but slightly better with chaos and SES risk as predictors of maternal emotion control and executive function rather than being predicted by maternal ECC. The main paths of interest in the model 4 figure have been bolded and the other paths marked with dashed lines.

**Hypothesis Testing**

Based on the four model steps explained above, final models were chosen. For mediation models, the paths leading to and from the intervening variable were tested to assess significance. For mediation to be present, both paths must be significant. Intervening effects with non-longitudinal data (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Iacobucci, Saldanha, & Deng, 2007) were tested using the Delta Method, which, similar to the Sobel Test, computes a z-score based
on the product-of-coefficients of the indirect effects (MacKinnon, 2008). Moderation (aim 5) was tested by splitting the sample based on the maternal executive function score. Mothers with a score of 0-3 (below average) on executive functioning were placed in the low executive functioning group (n=66), while mothers with a score of 4 or higher were placed in the normal/high executive function group (n=86). Due to power and sample size constraints, it was not possible to do comparisons on more extreme scores (i.e. comparing highest and lowest executive function scores). Moderation was considered to be present when notable differences were found between the high and low samples model results.

RESULTS

Preliminary Analyses

Item-level ranges, means, and standard deviations for all constructs are in Table 4.1.

As expected, there was a significant difference on mean SES risks between the two groups, with the rural Appalachia group having on average 0.66 risks and the urban Roanoke sample having an average of 1.59 risks (t=3.63, p<0.001). There were also significant differences on traditional parenting attitudes (2.39 for the rural sample and 2.60 for the urban sample; t=2.15, p=0.03) and observed child negative affect (-0.18 for the rural sample and 0.47 for the urban sample; t=4.84, p<0.001). The difference in traditional parenting attitudes means was expected given the difference in SES between the groups; consistent with current literature, families with lower SES also tend to have more authoritarian parenting attitudes (Lareau,
2003). It is possible that the differences in means on observed child negative affect may have been largely due to differences in ages of the child, with the younger children (rural group) less responsive and less engaged due to differences in developmental level. There were no significant differences in means of maternal ECCC and parenting behaviors between the urban Roanoke sample and rural Appalachian sample.

**Confirmatory Factor Analyses**

**Maternal ECCC:** For *Emotion Control*, a latent variable with 10 items as indicators fit the data adequately (RMSEA of 0.070 and CFI of 0.961). No items were dropped and no error terms were correlated. In CFA for the *Executive Function* construct, factor loadings were low for three of the four items. A manifest variable was created using a composite score as described in the Measures section.

**Parenting:** When loading 6 items onto the *Observed Negative Parenting* latent variable, one item was dropped due to a low factor loading. Based on the modification indices, one residual on similar items was correlated. The final latent variable with five items as indicators had good model fit (RMSEA: 0.042; CFI: 0.996). The *Observed Positive Parenting* latent variable with 9 items and six correlated error terms on similar items fit the data moderately well (RMSEA: 0.082; CFI: 0.958). CFA of the *Harsh Parenting* latent variable with five items and one correlated residual yielded adequate model (RMSEA: 0.086; CFI: 0.977). For *Maternal Negativity*, a latent variable with 13 items yielded adequate model fit when one residual was
correlated for the latent variable (RMSEA: 0.085, CFI: 0.914). The original intent was to create a latent variable for *Maternal Positivity*. During CFA of the 11 items on the latent variable, three items with low factor loadings were dropped and model fit was adequate. Due to low counts on some item categories because most parents did not endorse the most negative responses, some item responses were combined. However, in the larger structural models (described below) model fit was low; model fit improved when a manifest variable comprised of the average scale score for the 8 items for maternal positivity was used, so in the final models, a manifest variable was used.

**Maternal Social Cognitions:** Due to the large number of items in this *Traditional Parenting Attitudes* scale, to ensure adequate power in the final models, the minimum factor loading threshold for this measure was 0.50. During CFA, the 22-item traditional parenting attitudes subscale was reduced to 13 items due to low factor loadings for 9 items. Two residuals on similar items were allowed to be correlated in the latent variable, which yielded adequate model fit (RMSEA: 0.084; CFI: 0.918). When loading 9 items onto the *Hostile Attribution Bias* latent variable, three items were dropped due to low factor loadings. The remaining 6 items, with one correlated residual on similar scenarios, had adequate model fit for the latent variable (RMSEA: 0.093; CFI: 0.955).

**Child Behaviors:** In CFA of the 11 items indicators for the *Child Conduct Problems* latent variable, three items were dropped due to low loadings and the final latent
variable included 8 items. Model fit was adequate (RMSEA: 0.095; CFI: 0.930). Due to the large number of items for the Child Negative Affect construct, average scores from each of the tasks for the following categories were calculated: child responsiveness, noncompliance, negative affect, on-task, and activity level. The five scores were then standardized and those standardized scores were used in CFA to assess model fit. Model fit for the 5-item latent variable was adequate for the RMSEA and good for the CFI once one residual was correlated (RMSEA: 0.061; CFI: 0.994).

**Household Contextual Factors:** When loading 6 items onto the Household Chaos latent variable, three items were dropped due to low factor loadings during CFA. Fit could not be assessed for this latent variable because only three items were included. The original intent was to create a SES Risk latent variable, but factor loadings for the five items and model fit were low. A risk composite score was created as described in the measures section. A family could have between 0 and 5 risks, with the mean number of risks being 1.3.

**Model Building**

Each step, based on the 4-step model plan, was conducted according to the data analysis plan. For every model, I looked at the factor loadings, standard errors and p-values, along with the model fit, residual variances, and modification indices. In each of the models, maternal and child age, child gender, child developmental problems, maternal PPVT, and study site were included as model controls, with regression paths going to the left-most predictors in the models (i.e. SES risk and...
household chaos in model 4). Model fit was adequate or good in each of the four model steps. Models from step 4 were selected as the final models because these models answered questions for each of the aims and fit was good for the RMSEA and adequate for the CFI. In the final models, non-significant paths were trimmed to create more parsimonious models. Model fit was slightly better in the more parsimonious models and these models are shown in the results.

**Hypothesis Testing**

Bivariate analyses were conducted using SEM methods with two variables (latent or manifest) at a time. Table 4.2 includes the results of the bivariate analyses. Figures 4.1-4.5 include the final model standardized results for each of the five parenting behavior models with all non-significant paths trimmed. In three of the models, Child Negative Affect is not included in the figures because there were no significant paths related to it. For each of the models, maternal PPVT, maternal and child age, child sex and developmental problems, and study site were included as covariates, but are not shown in the figures. Model fit was good based on the RMSEA and adequate based on the CFI in each of the models.

*Maternal ECC C and Parenting Behavior (Aim 1)*

The goal for aim A was to assess the relationship of both maternal executive function and emotion control to parenting when adjusting for model covariates (maternal and child age, child gender, child developmental problems, and maternal PPVT).
Maternal self-report of emotion control was significantly inversely related to harsh discipline (-0.640; p<0.001), maternal negativity (-0.592; p<0.001), and negative observed parenting (-0.181; p<0.05), and positively related to maternal positivity (0.265; p<0.001). Maternal executive functioning was positively related to observed positive parenting (0.575; p<0.01). Overall, high maternal emotion control was especially associated with maternal-reported parenting behaviors while high executive function was associated with observed parenting behaviors.

The Role of Contextual Factors: SES Risk and Household Chaos (Aim 2)

The goal of aim 2 was to assess the influence of household chaos and SES risks on maternal ECCC and parenting behaviors. The original intent was to place household chaos and SES risk in the model as variables correlated with maternal emotion control and executive function. Due to collinearity they were moved to be “predictors” of maternal ECCC in the final models. They were kept in the models because in phase 3 of the model building, chaos and SES risk were salient factors in the models.

In the final models, SES risk was consistently inversely associated with both maternal executive function and emotion control. Chaos was inversely associated with maternal emotion control in all of the models, but it was positively associated with maternal executive function in three of the models (harsh discipline, observed negative parenting, and maternal positivity; it was not significantly associated with
maternal executive function in the maternal negativity and observed positive parenting models).

**Parenting Social Cognitions (Aim 3)**

The goal for aim 3 was to assess whether parenting attitudes and beliefs mediate the association between maternal ECCC and parenting behaviors and between contextual factors (SES and Chaos) and parenting behaviors. Both simple mediation and multiple mediation model tests were conducted. The benefit of conducting multiple mediation model tests is that it allows the researcher to assess the collective and relative indirect effects, and it reduces the chance of omitted variable bias, thereby reducing the chance of biased parameter estimates (Preacher & Hayes, 2008). Neither hostile attribution bias nor traditional parenting attitudes mediated the relationship between maternal ECCC and parenting behaviors in simple or multiple mediation model tests. In simple mediation analyses (i.e. SES risk -> hostile attribution bias -> harsh discipline), however, hostile attribution bias did mediate the relationship between SES risks and harsh discipline (Model indirect: 2.05, p=0.040) and between SES risks and maternal negativity (Model indirect: 2.07, p=0.038). My hypothesis that maternal parenting attitudes and beliefs would mediate the association between maternal ECCC and parenting behaviors was not validated in this sample. My hypothesis that maternal attitudes and behaviors would mediate the relationship between contextual factors (SES risks and household chaos) was only partially validated.
Child Negative Behavior (Aim 4)

The purpose of aim 4 was to assess if children have more behavioral problems if their mother has lower ECCC and whether parenting behaviors and social cognitions mediate the relationship between maternal ECCC and child outcomes.

Maternal emotion control, but not maternal executive function, was directly negatively associated with child conduct problems in four of the five models – meaning that higher self-reported maternal emotion control was associated with fewer maternal reported child conduct problems. Neither maternal emotion control or executive function was significantly associated with child negative affect in these models. In all five of the models, parenting behaviors were significantly associated with child conduct problems in the expected direction, with harsh discipline, maternal negativity, and observed negative parenting positively associated with conduct problems and maternal positivity and observed positive parenting inversely associated with conduct problems. Only the two observed parenting behaviors were significantly associated with observed child negative affect. Both maternal hostile attribution bias and traditional parenting attitudes were significantly positively associated with child conduct problems, but not with child negative affect.

While maternal executive function was not directly associated with child conduct problems, traditional parenting attitudes did mediate the relationship between maternal executive function and child conduct problems in all five models (harsh
discipline model: 3.49, p<0.001; maternal negativity model: 2.97; p=0.003; observed negative parenting model: 3.28, p=0.001; maternal positivity model: 3.28, p=0.001; observed positive parenting model: 2.06, p=0.04). Traditional parenting attitudes were moderately significant (p<0.10) in mediating the association between maternal emotion control and child conduct problems in the harsh discipline, maternal positivity, and observed negative parenting models.

Hostile attribution bias mediated the relationship between maternal emotion control and child conduct problems in all five models (harsh discipline model: 3.55, p<0.001; maternal negativity model: 3.35, p=0.001; observed negative parenting model: 3.37, p=0.001; maternal positivity model: 3.34, p=0.001; observed positive parenting model: 3.35, p=0.001).

Parenting behaviors mediated the association between maternal ECCC and child behaviors. Harsh discipline (6.69, p<0.001), maternal negativity (3.29, p=0.001), observed negative parenting (2.01, p=0.044), and maternal positivity (2.34, p=0.019) mediated the association between maternal emotion control and child conduct problems. Observed positive parenting mediated the relationship between maternal executive function and child conduct problems (1.76; p=0.079) and child negative affect (2.65; p=0.008).
Maternal Executive Function as a Moderator (Aim 5)

For Aim 5, the purpose was to assess whether parenting attitudes and attributions (i.e. parenting expectations) were more closely associated with parenting behavior among mothers with higher ECCC compared to mothers with lower ECCC. A trimmed model, assessing the bivariate association between maternal hostile attribution biases and parenting behavior and between traditional/authoritarian parenting attitudes and parenting behavior, was used to test moderation due to a reduction in sample size and power that came with splitting the sample into low and average/high maternal executive function. Due to power and sample size constraints, it was also not possible to do comparisons on more extreme scores (i.e. comparing highest and lowest executive function scores). The complete results of this analysis are shown in table 4.3. There was a stronger positive association between negative parenting attitudes and beliefs and negative parenting behaviors in the high executive functioning group compared to the low executive functioning group. This was consistent with my hypothesis that parents with higher executive function would be more able to parent as they wished, even if those parenting expectations were negative. However, there was a stronger negative association between maternal traditional attitudes/hostile attributions and positive parenting outcomes among mothers with lower executive functioning compared to mothers with higher executive functioning, which was counter to my hypothesis.
DISCUSSION

The results clearly indicate that maternal emotion and cognitive control capacity (ECCC), operationalized as maternal emotion control and executive function, are related in predictable and powerful ways to parenting attitudes and behaviors and child behaviors, and household chaos and socioeconomic risk (SES risk) are salient factors in this relationship. Parental executive functioning may serve as an important characteristic for explaining the degree to which parenting attitudes impact behavior: Mothers with normal-to-high executive functioning are more able to live up to their parenting expectations, measured in this paper by traditional parenting attitudes and attribution bias.

My hypotheses were partially, but not fully met, as explained in further detail below. The application of these study results to intervention work and further research is also discussed.

Maternal ECCC and Parenting Behavior

Maternal self-report of emotion control, and to a lesser extent maternal executive function based on performance on tasks, are important in predicting mothers’ parenting behavior when their children are 3-7 years of age. Since this was a cross-sectional study, causality cannot be inferred, and the term “predict” is used loosely to connote a relationship that is thought to be causal but that cannot be determined in this study. As hypothesized, higher maternal ECCC is associated with engaging in more positive parenting behaviors and fewer negative parenting behaviors.
Maternal emotion control was the most consistently associated with parenting behavior across models in predicting all of the parenting measures studied except for observed positive parenting; its association was largest on self-reported parenting behaviors. Maternal executive function was only directly associated with observed positive parenting in this study.

The results infer that maternal emotion control is in general more important in the association with parenting behaviors than maternal executive functioning. The stronger relationship of maternal emotion control may be partly a result of shared methods bias (variance attributed to the measurement method that the variables have in common rather than to the constructs themselves). Maternal report of emotion control was most strongly associated with parenting behaviors that were also maternal reported while maternal executive function (which was measured through tasks) was associated with an observed parenting measure. However, maternal emotion control, and not executive function, was significantly associated with observed negative parenting, suggesting that shared methods bias is only a partial contributor to the results. Previous studies do little to help in interpreting these results as only one other parenting study has looked at both maternal emotion control and executive functioning measures. Musser and colleagues (2012) conducted a functional imaging study and found that moms who were sensitive to their children’s needs were more likely to activate areas of the brain associated with emotion regulation and executive functioning than were less sensitive moms. While the outcomes measured and the methods used were different than the current
study, Musser’s results are in line with the results of this study in showing that both maternal emotion control and executive functions matter when it comes to parenting. Other studies (Lorber & O’Leary, 2005; Lorber, 2012; Chen & Johnston, 2007; Deater-Deckard et al, 2010; Deater-Deckard et al, 2012a; Babinski et al, 2012; Banks et al, 2008; Harvey et al, 2003; Mokrova et al, 2010; Murray & Johnston, 2006) have shown an association between various aspects of maternal ECCC and parenting, but did not include both maternal emotion control and executive function. The results of this current study add to our body of knowledge by addressing the individual association of emotion control and executive functioning to multiple positive and negative parenting behaviors.

Based on the results of this study, it appears that improving maternal emotion control has the potential to reduce the probability of child abuse and negative parent behavior in general, while both emotion control and executive function are important for increasing positive parenting behaviors. There is logic behind these results. A mother who is unable to control her emotions will be more reactive in the face of challenging child behavior and stressful home situations and thus less able to control her impulses. One would also conclude, although this study was not designed to test this, that without the executive functioning skills to planfully decide on alternative discipline strategies and to inhibit prepotent responses, a mother would be more likely to engage in more harsh discipline. On the other hand, to engage in positive parenting, a parent not only needs to prevent negative action, but also must consciously engage in positive action. A mother’s ability to actively engage
in positive parenting would be hindered if she is not good at problem solving, planning, and holding relevant information about her child’s needs in her short-term memory.

**The Role of Contextual Factors**

The role of SES risks and household chaos is not entirely clear based on these analyses, but these contextual factors do appear to be salient factors in the relationship between maternal ECCC and parenting and child outcomes. In bivariate analyses, chaos was more often associated with parenting behaviors and SES risks was associated with parenting attitudes and attributions. This relationship was expected, because the stress associated with a chaotic environment would likely influence behavior while previous studies show a link between SES and parenting attitudes (Lareau, 2003; Mokrova, O’Brian, Calkins, Leerkes, & Marcovitch, 2012). In the phase 2 models, which included maternal ECCC, SES risk, and household chaos all as predictors of parenting behaviors, contextual factors generally strengthened the relationship between maternal ECCC and parenting (compared to phase 1 models), and were directly associated with some parenting outcomes (results not shown in this paper, but are available from the author). However, in the final models household chaos and SES risk were collinear with maternal ECCC and had to be moved to be predictors of maternal ECCC and the direct association between SES risk and household chaos and parenting could not be directly assessed due to sample size and power limitations. This suggests that these contextual factors are so
closely linked with maternal ECCC that it is difficult if not impossible to delineate the independent effects of each on parenting and child outcomes.

Higher household chaos was associated with lower emotion control as would be expected, but unexpectedly, higher executive function was correlated with more home chaos. This finding is not consistent with other research showing a negative relationship between maternal executive function and household chaos (Mokrova et al, 2010; Deater-Deckard et al, 2012; Biederman, Faraone, & Monuteaux, 2002). The original chaos scale was comprised of six items, but in this study three of these items were dropped due to low factor loadings. The change in the scale may have impacted the relationship between maternal executive function and chaos. In contrast, the relationship between the three-item chaos latent variable and emotion control was as predicted. Another possible explanation for why high household chaos was positively associated with higher maternal executive function is that mothers who were more used to coping with stress and distractions in their home environment were better able to manage the stress associated with taking the executive functioning tasks and performed better as a result.

SES risk was negatively associated with maternal ECCC, consistent with other studies (Deater-Deckard et al, 2012; Sheridan et al, 2012; Noble, Norman, & Farah, 2005; Noble, McCandliss, & Farah, 2007; Evans & Schamberg, 2009; Sarsour, 2011; Hughes & Ensor, 2005; Wahler & Dumas, 1989). Based on the negative relationship between SES risks and maternal ECCC, it appears that low-income parents are more
likely to have lower ECCC on average than higher income parents, and, as a result are less likely to participate in positive parenting. Programs that are geared toward low-income parents should especially take ECCC into account in order to better tailor interventions to the needs of the families who may struggle with planning, problem-solving, decision-making, emotion control, and other components of ECCCs.

The Role of Maternal Social Cognitions

While parenting attitudes and attributions about their child were related to both maternal ECCC and some parenting behaviors in bivariate analyses, they failed to mediate the relationship between maternal ECCC and parenting like I had hypothesized. One potential explanation for the failure to find a significant mediating relationship is that the attitudes in the Parent Modernity Scale used to measure traditional parenting attitudes were more general to parenting, and not specific to each parenting outcome. Attitudes that are specific to a behavior are more likely to predict behavior (Ajzen & Fishbein, 1977). However, both hostile attribution bias and traditional parenting attitudes were consistently negatively related to child conduct problems in this study. This relationship between parenting attitudes/attributions and child behavior suggests that these parenting attitudes and attributions are associated with some aspect(s) of parenting behavior that were not measured in this study or are a proxy measure for how a mother relates to her child. It is possible that parenting attributions, and to a lesser degree authoritarian attitudes, are proxy measures for the maternal-child attachment relationship. I
found no direct research on maternal hostile attributions and maternal-child attachment, but some research on adolescents suggests that attribution bias is linked to insecure attachment (Shumaker, Deutsch, & Brenninkmeyer, 2009).

**Child Behavior**

Ultimately the study of parenting is important because of the impact that it has on children. Maternal emotion control is directly associated with child behavior, but the primary mechanism through which it is associated with child behavior is through parenting social cognitions and behaviors. The results in this study are consistent with the results of other research that show that maternal ECCC is associated with child outcomes (Samuelson, Krueger, & Wilson, 2012; Haskett, Stelter, Proffit, & Nice, 2012; Skowron, 2005; Sonuga-Barke, Daley, & Thompson, 2002). An alternative explanation to the “causal” relationship of maternal ECCC on child conduct problems is the heritability of ECCC (Beaver et al, 2007). Mothers who have lower ECCC may also have children who struggle with self-regulation, which may manifest itself in part in child conduct problems. This is not likely the full explanation in this study given that parenting attitudes and behaviors were more closely tied to child behaviors than parental ECCC, but heritability should be considered in studies of maternal ECCC and child outcomes because ECCC are one of the most heritable cognitive capacities (Friedman et al, 2008). More research to determine the mechanism through which social cognitions may impact child behavior is needed as these social cognitions may merely reflect other parenting behaviors not studied or the attachment relationship.
The Moderating Role of Executive Functioning

An important result of this study is the role that maternal executive function had in moderating the relationship between parenting attitudes and parenting behavior. Higher maternal emotion control and executive function were significantly negatively associated with hostile attributions and authoritarian parenting attitudes. However, when mothers with average (or better) executive functioning had negative parenting attitudes and attributions, they were much more likely to act on them compared to mothers with below average executive functioning. Mothers with below average executive functioning were less likely to engage in positive parenting when their parenting social cognitions were more authoritarian or hostile. One interpretation of these results is that mothers who have average (or better) executive functioning and who also have more negative parenting attitudes or hostile attribution biases may engage in harsh discipline or negative observed parenting purposefully in order to teach their children what the parent perceives as appropriate child behavior, especially when the parent perceives hostile intentions on the part of the child. In this case, engaging in negative parenting may actually be very planful, even if harmful to the child and not the most effective way to aid in child development. On the other hand, mothers with below average executive functioning (compared to mothers with average executive functioning) may be even more likely to withhold positive parenting when they have authoritarian parenting attitudes or hostile attributions about the child's intentions. The act of withholding positive parenting is not likely planful, but rather a failure to act positively. The take-away message may be that normal-to-high maternal executive functioning
predicts doing something about child behavior based on one’s attitudes while one could say that low executive functioning predicts not “doing parenting.” These results are important to research in that they show that maternal executive function is a mechanism for how parenting attitudes and beliefs impact parenting behavior.

This finding is important to policy and practice work, especially as it relates to child abuse. If parents with high executive function are also the most likely to engage in harsh parenting if they have authoritarian parenting attitudes or hostile attributions then they may also be the most likely to engage in child maltreatment. However, this study cannot test that hypothesis. Moreover, mothers with good executive function are likely to be able to limit their harsh parenting and not resort to maltreatment. Further research is necessary to better understand these relationships. The act of engaging in negative parenting is not necessarily extreme enough to be termed child maltreatment, and further research that assesses different degrees of “negative” parenting behavior (i.e. behaviors associated with child abuse compared to more moderate forms of negative parenting) would be useful in better understanding the moderating role of maternal executive functioning. In terms of intervention work, however, whether the parent is engaged in what could be legally determined as child maltreatment or are simply engaged in ineffective parenting, neither is generally healthy for the child’s development.
Application to Intervention and Policy

The results point to the importance of taking maternal ECCC into account when designing and implementing parenting interventions and policies. Table 4.4 includes a summary list of important facts pertinent to maternal ECCC and parenting interventions and suggested application to intervention. If the goal of an intervention is to reduce harsh, reactive parenting, a mother's ability to regulate her emotions must be addressed. Mothers with average or high executive functioning and who also have attitudes and attributions that support ineffective or harmful parenting behaviors may be the most likely to carry out harsh parenting practices. Given this, these parents may gain the most from interventions that address attitudes and educate mothers on child development. If attitudes can be changed in this group, it is likely to directly reduce harsh, reactive parenting.

For interventions focused on increasing positive parenting, maternal executive function and emotion control must be taken into consideration. Some studies have shown that mothers with lower ECCC are less likely to develop positive parenting skills from parent skills education programs (Harvey et al, 2003; Sonuga-Barke, Daley, & Thompson, 2002). As programs that target low-income parents are more likely to involve parents with lower ECCC, it is essential to develop interventions that will maintain the attention of easily distracted parents and to teach parents strategies to help compensate for lower ECCC. For example, fatigue, stress, poor nutrition, and loneliness impair an individual’s ECCC (Diamond, 2013). Helping parents to mitigate these factors will both directly positively impact parenting and
also maximize their emotion and cognitive control capacity. Additionally, obtaining treatment for adult ADHD, depression, or other mental illness can improve executive functioning (Chronis-Tuscano et al, 2008a; 2008b; Engle & Kane, 2004; Levens & Gotlib, 2010; Kanske & Kotz 2012).

**Limitations and Strengths**

Like all studies, there are limitations in the current study. This study is not generalizable to parenting of children in different age groups as it is focused on children 3-7 years old. However, neither this study, nor other studies of maternal ECCC and parenting have shown child age to be a significant covariate (Biederman, Faraone, Monuteaux, 2002; Kliwer et al, 2004). Additionally, the study was conducted on a moderate-risk sample in the Appalachian region and may not be generalizable to higher or lower risk samples and other regions. To address these limitations in generalizability, the study needs to be replicated in other populations and across parents of children in different age groups. This study was cross-sectional and causality cannot be determined, although several causal relationships can be discussed based on current theory and available research. There is likely reciprocity between some variables that were not tested in this study (such as the impact of child behavior on parenting and the recursive relationship of contextual factors and maternal ECCC; see Roche, Ghazarian, Little, Leventhal, 2011). The sample size, and associated power limitations, precluded me from running some analyses. Separate models for each parenting behavior had to be assessed, rather than combining all of the parenting variables into one model, in order to have
adequate power. I was also limited, due to the sample size, in how to split the sample when testing for moderation; it is possible that “fence sitters” muddied and underestimated the true results. The observation period for the mother-child dyad tasks was short in time, allowing for only about 15 minutes of combined observation for the observed parenting variables and child negative affect. As such, only global positive and negative parenting scores could be computed. Finally, some of the variation in results between emotion control and executive function and parenting and child behaviors (as well as the direct effect of parenting on child behaviors) may be due to a methods effect since emotion control was based on maternal self-report and executive function was based on tasks. For example, the associations between maternal emotion control and maternal-reported parenting and child behaviors may appear to be stronger than they really are due to the shared method of maternal report.

There were also several strengths to the study. Both observed and self-reported parenting and child behavior were included in the study. Unlike most previous studies of maternal executive function and parenting, the executive function measure in this study was comprised of tasks, which are typically seen as the preferred way for measuring executive functioning. I was also able to look at both maternal emotion control and maternal executive functions and see the comparative relationship of each on parenting and child outcomes. This will add value to future intervention, policy, and research work. And finally, structural equation modeling with latent variable analysis has not previously been conducted in a study of
maternal ECCC and parenting. This method helps to address the concerns of measurement error and provides results from a more rigorous analytic method to move the field of maternal ECCC and parenting forward.

CONCLUSION

Higher maternal ECCC is associated with reduced harsh, reactive parenting and increased positive parenting behaviors. Negative parenting behaviors are linked with increased child conduct problems and negative affect. Household contextual factors are salient in maternal ECCC and have an impact on parenting behaviors, with increased chaos and SES risks leading to poorer parenting and child behaviors. These results are consistent with and build upon prior research. This is the first study of its kind to address both maternal emotion control and executive functions and their individual impact on both observed and self-reported positive and negative parenting behaviors. The results are valuable for parenting policies and interventions. Future research can build on the methods used, while a longitudinal study is necessary to establish causality.
REFERENCES


Figure 4.1. Harsh Discipline Model. Non-significant paths trimmed
Model Fit: RMSEA: 0.032; CFI: 0.937

Model adjusted for the following baseline covariates: Study Site, Maternal and child age, child gender, maternal PPVT, child developmental problems. Path coefficients are standardized.
*p<0.05, **p<0.01, ***p<0.001
Figure 4.2. Maternal Negativity Model. Non-significant paths trimmed
Model Fit: RMSEA: 0.033; CFI: 0.927

Model adjusted for the following baseline covariates: Study Site, Maternal and child age, child gender, maternal PPVT, child developmental problems. Path coefficients are standardized.

*p<0.05, **p<0.01, ***p<0.001
Figure 4.3. Observed Negative Parenting Model. Non-significant paths trimmed
Model Fit: RMSEA: 0.034; CFI: 0.924

Model adjusted for the following baseline covariates: Study Site, Maternal and child age, child gender, maternal PPVT, child developmental problems. Path coefficients are standardized.
*p<0.05, **p<0.01, ***p<0.001
Figure 4.4. Maternal Positivity Model. Non-significant paths trimmed
Model Fit: RMSEA: 0.033; CFI: 0.937

Model adjusted for the following baseline covariates: Study Site, Maternal and child age, child gender, maternal PPVT, child developmental problems. Path coefficients are standardized.
*p<0.05, **p<0.01, ***p<0.001
Figure 4.5. Observed Positive Parenting Model. Non-significant paths trimmed
Model Fit: RMSEA: 0.033; CFI: 0.916

Model adjusted for the following baseline covariates: Study Site, Maternal and child age, child gender, maternal PPVT, child developmental problems. Path coefficients are standardized.
*p<0.05, **p<0.01, ***p<0.001
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<th>Variable</th>
<th>Construct Reliability(α)</th>
<th>Range</th>
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<th>SDs</th>
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<td><strong>VIII. Maternal Negativity</strong></td>
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*p<0.10; *sig at <0.05; **sig at less than 0.01; ***sig at less than 0.001; all betas are standardized
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<td>VI. Hostile Attribution Bias</td>
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<td>-0.239*</td>
<td>0.488***</td>
<td>0.030</td>
</tr>
<tr>
<td>VII. Harsh Discipline</td>
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<td>-0.201*</td>
<td>0.552***</td>
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<tr>
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<td>-0.080</td>
<td>0.433***</td>
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<tr>
<td>XI. Observed Negative Parenting</td>
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<td>-0.213*</td>
<td>0.290**</td>
<td>0.437***</td>
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<td>-0.360***</td>
<td>-0.022</td>
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<tr>
<td>XI. Observed Positive Parenting</td>
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<td>-0.328***</td>
<td>-0.203*</td>
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<tr>
<td>XII. Child Conduct Problems</td>
<td>--</td>
<td>0.262**</td>
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<tr>
<td>XIII. Child Negative Affect</td>
<td>--</td>
<td>--</td>
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</table>

^p<0.10; *sig at <0.05; **sig at less than 0.01; ***sig at less than 0.001; all betas are standardized
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<th></th>
<th>Total Sample</th>
<th>Lower&lt;sup&gt;a&lt;/sup&gt; EF&lt;sup&gt;b&lt;/sup&gt; (N=66)</th>
<th>Higher&lt;sup&gt;c&lt;/sup&gt; EF (N=86)</th>
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<td>0.233*</td>
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<td>-0.502*</td>
<td>-0.467***</td>
<td>-0.424***</td>
</tr>
</tbody>
</table>

*<sup>s</sup>ig at <0.05; **<sup>s</sup>ig at less than 0.01; ***<sup>s</sup>ig at less than 0.001; all betas are standardized
<sup>a</sup>The lower EF sample included mothers with a score of 0-3 on the Executive Function Composite measure; The Higher EF sample included mothers with scores 4-8 on the Executive Function Composite
<sup>b</sup>EF: Executive Functioning
<sup>c</sup>HAB: Hostile Attribution Bias
<sup>d</sup>TPA: Traditional Parenting Attitudes
## Table 4.4. Application to Intervention

**Facts to Know:**

1. Maternal ECCC impacts parenting behavior and child development
2. Low maternal emotion control can particularly lead to negative parenting
3. Household chaos and SES risk are salient factors in parenting behavior. Parents with more socioeconomic risks are more likely to have lower maternal ECCC.
4. Mothers with normal-to-high executive functioning are most likely to parent in ways that are consistent with their attitudes and beliefs about parenting and child behavior. If they have harmful parenting attitudes and hostile attributions they are likely to engage in harsh parenting. However, if harmful attitudes can be changed they might also be the most amenable to interventions aimed at reducing negative parenting and child maltreatment.

**What to Do:**

1. Ensure that parents involved in parenting lessons are able to attend and use the information.
2. Teach parents about child development and positive parenting practices
3. Help parents understand that their emotional control impacts their parenting and that they can develop strategies to regulate their emotions
4. Assist parents to identify and reduce chaos in their home environment
5. Teach strategies to compensate for lower executive function, including reducing fatigue, stress, poor nutrition, loneliness, and assist parents to get treatment for depression, ADHD, and other mental illness
CHAPTER 5

MATERNAL EMOTION REGULATION, PARENTING, AND ADOLESCENT BEHAVIORS: THE MEDIATING ROLE OF FAMILY PROCESSES
ABSTRACT

Background
Adolescents increasingly seek autonomy from their parents, but parenting and family processes (family functioning and monitoring) continue to be important factors in predicting their behavior. Prior research has shown that poor maternal emotion regulation is associated with increased risk for child maltreatment while higher maternal emotion regulation is associated with nurturing, supportive parenting. This study addresses how maternal emotion regulation predicts a mom’s engagement in four parenting dimensions and how parenting and family processes mediate the relationships between maternal emotion regulation and adolescent behaviors.

Methods
479 adolescents (baseline age 10-13 years) and their mothers participated in the Flourishing Families Project, a longitudinal study with annual assessments over a 5-year period. Variables included mothers’ reports of their own emotion reactivity and distancing; family functioning and monitoring; and four dimensions of parenting: Connection, Regulation (reasoning and induction), Indulgence, and Verbal-Punitive. Adolescents reported on their prosocial, internalizing, and aggressive behaviors. Structural equation modeling was used for hypothesis testing to analyze all model paths.

Results
Lower baseline maternal emotion regulation was predictive of less connection and regulation parenting and more indulgent and verbal-punitive parenting both directly and
indirectly through family functioning and monitoring. Higher maternal report of family functioning was predictive of less verbal-punitive parenting and adolescent report of child aggression and with more connection parenting and adolescent prosocial behaviors. Family monitoring was predictive of higher connection and regulation parenting and lower indulgent parenting.

**Conclusion**

Maternal emotion regulation and family processes significantly predict a mother’s parenting of her adolescent child. Poor family processes intensify the relationship between low maternal emotion regulation and unhealthy parenting and adolescent behaviors whereas healthy family processes can ameliorate the negative impact of low emotion regulation on parenting and adolescent behaviors.
BACKGROUND

From “tiger moms” to “dolphin dads,” the best way to parent is a hotly debated topic in the media, on so-called “mommy blogs,” and even in research. Parenting plays an especially important role in child outcomes, and almost all parents are deeply invested in seeing their children succeed. However, the ability to parent well is more than just having the right information, and, based on national child maltreatment statistics, many parents struggle to engage in optimal, or even “good enough,” parenting (Finkelhor, Ormrod, & Hamby, 2009; U.S. DHHS, ACF, ACYF, & Children’s Bureau, 2011; United States Government Accountability Office, 2011). As a result, there is a proliferation of parent help guides and federally and privately-funded home visiting, parent skills training, and other parenting programs have been developed to help parents gain the necessary knowledge and skills to be successful parents. Several of these programs have been demonstrated to be effective (Gross, Garvey, Julion, Fogg, Tucker, et al., 2009; Prinz, Sanders, Shapiro, Whitaker, Lutzker, 2009; Webster-Stratton, Rinaldi, and Reid, 2007), but even the most successful programs do not succeed with all parents.

The gap between the desire to parent well and actual parenting behaviors may be explained in part by parental emotion and cognitive control processes. This paper, which focuses on maternal emotion regulation and the parenting of adolescents, is the third in a series of three dissertation papers that address maternal emotion and cognitive control processes and their impact on parenting. This paper builds on and extends previous research on maternal emotion regulation and parenting because it is longitudinal, addresses both over- and under- maternal emotion regulation, and investigates the
intervening role of family-level processes. In this paper family processes are operationalized as family functioning and family monitoring, and refer to how family members relate, interact and communicate with one other. I have chosen to focus on mothers rather than fathers because the majority of research on parental emotion regulation and caregiving has focused on the mother. Thus the longitudinal results and potential mediation of family processes can build upon prior research. Some of the results discussed in this paper may also be applicable to fathers.

**Importance of Parenting During Adolescence**

Adolescence is a transitional period during which individuals test their boundaries, engage in risk taking, experience greater concern with social acceptance, and develop more independent decision-making (Crittenden and Dallos, 2009; Del Guidice et al, 2011). Prevalence of substance abuse, delinquency, other risky behaviors, and depression rise during adolescence (National Research Council, 2009). Deviant peer group formation, family poverty, and family conflict are important environmental risk factors that affect adolescence, but some have argued that the strongest predictor of juvenile delinquency is ineffective parenting (Kumpfer & Alvarado, 2003; Bogenschneider, 2006).

Parenting plays a crucial role in the foundations of lifelong health (Bandura, 1997). Children of all ages do best when parents are warm and supportive, responsive, spend time with their children, expect their children to follow rules, react to
misbehavior with limit-setting rather than harsh punishment, and monitor their children’s behavior (Amato & Fowler, 2002; Dumka et al, 2009).

Poor parenting has high societal costs by undermining a child’s self-regulatory processes, adaptability and functioning, potentially reducing adult competence in ways that result in a social downward trajectory and ultimately increasing inequalities that can extend into the next generation. Conversely, parenting high on monitoring and warmth results in positive adolescent behaviors (Waldfogel et al, 2010; McLanahan et al, 2010). For example, parental monitoring is associated with adolescent male civic engagement while parental warmth is related to civic engagement among adolescent females (Bebiroglu, Geldhof, Pinderhughes, Phelps, & Lerner, 2013). Sensitive parenting in early and middle childhood is predictive of fewer internalizing problems in adolescence (Voort, Linting, Juffer, Bakermans, Schoenmaker, et al., 2013). Maternal involvement and monitoring reduces the likelihood adolescent aggression (Pugh & Farrell, 2009). Permissive parenting, on the other hand, has been associated with both positive and negative child outcomes. In some cultures, permissive and authoritative parenting result in fewer adolescent depressive symptoms (Lipps, Lowe, Gibson, Halliday, & Morris, 2012). One study found that parental permissiveness was related to reduced adolescent stress, higher life satisfaction, but also to unhealthy eating behaviors (Coccia, Darling, Rehm, Cui, & Sathe, 2013). In another study, indulgent parenting (compared to authoritative parenting) was found to increase the risk of adolescent school drop out (Blondal & Adalbjarnardottir, 2009). Punitive discipline has been linked with delinquency in
adolescent boys and depressive symptoms in adolescent girls (Roche, Ghazarian, Little, & Leventhal, 2011).

**Emotion Regulation**

Emotion regulation involves both automatic and effortful up- and down-regulation of positive and negative emotions (DeSteno, Gross, & Kubzansky, 2013). While multiple definitions of emotion regulation exist, a useful definition is:

> The ability to respond to the ongoing demands of experience with the range of emotions in a manner that is socially tolerable and sufficiently flexible to permit spontaneous reactions as well as the ability to delay spontaneous reactions as needed (Cole, Michel, & Tedi, 2004).

Emotions help to narrow down and prioritize cognitive process options (Lemerise and Arsenion 2000). For example, emotions help an individual to organize, monitor, and adjust attention, memory, and other internal processes in order to react appropriately based on the ebb and flow of the situation (Cole et al, 1994). Brain imaging studies have shown that the limbic system houses emotions, but “top-down” emotional regulation processes are more associated with areas of the prefrontal lobe where other cognitive control processes are housed (Ochsner and Gross 2008). Brain imaging studies appear to demonstrate that adults who struggle to regulate their emotions are not able to engage the needed prefrontal cortex
processes that make emotional appraisal and regulation effective (Ball, Ramsawh, Campbell-Sills, Paulus, & Stein, 2013).

Both over-regulation and under-regulation are aspects of emotion regulation. An individual who is under-regulated may react explosively, which can cause damage to interpersonal relationships (Gross & John, 2003) and may lead to attachment anxiety in adults (Wei et al, 2005). Over-regulation, which involves cutting-off or blunting emotional expression and experience, may conceal intense internal distress (Skowron, Stanley, & Shapiro, 2009; Cole et al, 1994) and has been linked to attachment avoidant behaviors in adults (Wei et al, 2005) and also interpersonal problems (Gross & John, 2003; Skowron, 2000).

Due to the importance that emotion regulation has on relationships, there are potentially significant ramifications of maternal emotion regulation on how a mother parents and ultimately on her relationship with her child as well as with his/her behavior. At a time when her child is seeking greater autonomy but still in need of warmth and monitoring, both maternal emotional overreacting and distancing could impact the warmth, monitoring, and discipline that a mother provides her adolescent child.

**Emotion Regulation, Parenting, and Child Behavior**

In the past decade, researchers have begun to look more carefully at the role of maternal emotion regulation on parenting and child outcomes. The majority of these
studies were cross-sectional and only a few included mothers of adolescent-age children. In a study using the Differentiation of Self Inventory, Skowron and colleagues (2010) found that both emotionally reactive and distant mothers of children ages 5-14 years were at higher risk for engaging in child maltreatment than mothers who were less emotionally reactive/distant. Higher emotion regulation, on the other hand, appeared to be protective against child maltreatment (see also Skowron and Platt, 2005). In a cross-sectional study that included both mothers and fathers of adolescents aged 10-18 years, mother’s emotion regulation was associated with supportive responses to their children’s emotions and also with maternal positive and negative expressiveness in bivariate analyses. These results, however, were not significant in multivariate regression analysis (Hughes & Gullone, 2010).

Maternal emotion regulation appears to be a protective factor for children living in high violence homes and communities. In an earlier study, Skowron (2005) studied 55 mother-child dyads (children 6-13 years of age) who lived in stressful family environments and in neighborhoods with high rates of violence. She found that children whose mothers had better emotion regulation performed better on math and verbal skills than children whose mothers were more emotionally reactive or distant. Children scored higher on aggression when their mother had low emotion regulation. In another study of 101 African American 9-13 year olds and their moms living in high violence communities, it was found that maternal emotion regulation at baseline was protective of child internalizing and externalizing problem
behaviors six months later (Klieworker, Cunningham, Diehl, Parrish, Walker et al., 2004). In a study of 47 mothers who had experienced inter-partner violence and their children, ages 7-16 years, who had witnessed the violence, maternal emotion regulation was positively associated with children’s stronger performance on attention control tasks (Samuelson, Krueger, & Wilson, 2012).

Among these studies that have been conducted, only the Kliewer et al (2004) was longitudinal, and it was only over a six-month period. Longitudinal studies are necessary to build upon this current knowledge base to better understand how maternal emotion regulation is associated with parenting and child outcomes.

**Role of Family-Level Factors**

While most studies tend to measure behaviors and outcomes in terms of individuals, adults and children function and develop within a family system that is comprised of individual member resources and collective activities and interactions between family members. Thus, the family system is both impacted by and impacts individual behavior. As just reviewed, a few studies have indicated a relationship between maternal emotion regulation and parenting and adolescent outcomes. However, less is known about how family processes may mediate this relationship. Studying family-level processes may be instructive in better understanding a mechanism through which individual emotion regulation ultimately impacts parenting and child behaviors.
The relationship between family processes and adolescent outcomes has been addressed in some studies. Family processes that are low on support and poor at mitigating stressful experiences have been linked to adolescent depression (Sheeber et al, 2001). Family monitoring is related to better adolescent emotion regulation, less substance use, and an achievement orientation (Anderson, Sabatelli, & Kosutic, 2007; Yan et al, 2008). Youth who perceive their family as cohesive have better anger regulation through the positively associated pathway of parental support (Houltberg, 2011). Higher levels of family cohesion have also been linked with better health-related quality of life in children 8-18 years (Moreira, Frontini, Bullinger, & Canavarro, 2013) as well as decreased adolescent aggression (Pugh & Farrell, 2009).

**STUDY AIMS**

The aims of the current study were two-fold:

1) Examine the longitudinal impact of maternal emotion regulation, specifically emotional reactivity and emotional distancing, on parenting dimensions and child internalizing, externalizing, and prosocial behaviors.

2) Test how the family-level factors of functioning and monitoring mediate the relationship between maternal emotion regulation and parenting.

My hypothesis was that both maternal emotional reactivity and distancing, but more especially emotional reactivity, would inversely impact positive parenting dimensions and adolescent prosocial behaviors. Additionally, maternal emotional
reactivity/distancing would be predictive of increased indulgent and punitive parenting and increased child internalizing behaviors and aggression. While maternal emotional reactivity and distancing would be negatively associated with family functioning and monitoring, these processes would mediate the association between maternal emotion regulation and parenting.

METHODS

Data for this paper come from the Flourishing Families Project, a six-year longitudinal study of the inner workings of family life and how families help children do well as they make the transition into adolescence and young adulthood. The project was conducted in Seattle, Washington and began in 2007 with annual follow-ups through the summer of 2012. This paper includes results from the first five years of the study. Participants included parents and their children who were aged 10-13 years old at baseline. Of the 500 families in the Flourishing Families Project, twenty-two families were dropped from the analyses for this study because the primary parent-reporter was the father, leaving a total sample of 478 families. At baseline, 70% of mothers reported that they were married, 60% of mothers had a bachelors degree or higher, and the average maternal age was 43.1 years. Of the children who participated in the study, 47% were male, and the average child age was 11.3 years.

Procedures

Study investigators recruited families using Polk Directories/InfoUSA, a purchased
national telephone survey database which included detailed information about each household in its database, including the ages of children living there. Census tracts that were socioeconomically and racially representative of the local school districts were selected and families living in those areas were randomly selected using the Polk Directory. All families who had a child between 10 and 13 years old and who lived in the selected census tracts were eligible to participate in the study.

A total of 692 eligible families were contacted of which 61% (423) agreed to participate. Since the Polk Directory was comprised of families who were included using telephone, magazine, and Internet subscription reports, lower SES families were underrepresented in this initial study sample. In order to more closely reflect the demographics of the area, 77 additional lower income families were recruited into the sample through referrals and flyers, which increased the diversity of the study sample. Among families who refused to participate, the most frequently cited reasons not to participate included lack of time and privacy concerns.

A multi-stage recruitment protocol was used to contact each family. In the first stage, a letter of introduction was sent to all families. Interviewers then made home visits and phone calls to confirm eligibility and gain consent to participate in the study. In the third stage, interviewers scheduled an appointment to come to the family's home to conduct the interviews. Interviews lasted on average 2.5 hours. Parents and children completed a questionnaire and participated in five-short videotaped discussions. Questionnaires were screened for missing answers upon
collection, which resulted in very little missing data. Participants were compensated $200 for their participation in each wave. The study has been further described previously (Padilla-Walker, Hardy, and Christensen, 2011).

**Measures**

All measures from the Flourishing Families Project were subjected to confirmatory factor analysis and modified as needed to provide the most precise measurements for these analyses, as described in the Analysis section below. Reliability estimates (Cronbach’s alpha) are reported in Table 5.1 for all measures.

*Maternal Emotion Regulation*

**Maternal Emotional Reactivity/Distancing** was measured using the emotional reactivity and emotional cut-off subscales of the Differentiation of Self Inventory (Skowron & Friedlander, 1998). Mothers reported their emotional reactivity (11-item subscale) and distancing (12-item Emotional Cut-off subscale) using a 6-point Likert scale ranging from 1 (*Not at all true for me*) to 6 (*Very true for me*). Higher scores indicate more maternal emotional reactivity and emotional distancing.

Sample questions from the Emotional Reactivity subscale include “*People have remarked that I am overly emotional*” and “*At times my feelings get the best of me and I have trouble thinking clearly.*” Sample items from the Emotional Cut-off subscale include “*When things go wrong, talking about them usually makes it worse*” and “*I have difficulty expressing my feelings to people I care for.*” Wave 1 maternal responses of these two variables were included as the primary predictors in the
data analysis.

Parenting Dimensions

Four parenting dimension subfactors (as detailed below) from the Parenting Styles and Dimensions Questionnaire-Short Version (PSDQ; Robinson, Mandleco, Olsen, & Hart, 2001) were included in this analysis. Mothers responded to how often they did each of the items based on a five-point Likert scale ranging from 1 (never) to 5 (always). Higher scores indicate that the dimension is more descriptive of how the mother parents. Wave 4 measures were the outcome variables of interest, but wave 3 was included to control for stability in parenting over time.

The **Connection Dimension Subfactor** is a measure of maternal warmth and support and includes five items. Sample items (with the stem, “How often do you do the following) include “Are responsive to my child’s feelings and needs” and “Give praise when my child is good.”

The **Regulation Dimension Subfactor** is a measure of parental reasoning and induction. Five items are included in this subscale. Sample items (with the stem, “How often do you do the following) include “Explain to my child how we feel about his/her good and bad behavior” and “Help our child to understand the impact of behavior by encouraging our child to talk about the consequences of his/her own actions.”
The **Indulgent Dimension Subfactor** is a measure of parent permissiveness and is composed of five items. Sample items (with the stem, “How often do you do the following) include “*Threaten our child with punishment more often than actually punishing our child*” and “*Give into my child when the he or she gets upset about something.*”

The **Verbal-Punitive Dimension Subfactor** is composed of a total of eight items from two subfactors: verbal-hostility dimension subfactor and non-reasoning/punitive dimension subfactor. Sample items (with the stem, “How often do you do the following) include “*Punish by taking privileges away from my child with little if any explanations*” and “*Yell or shout when my child misbehaves.*”

**Adolescent Behavior**

Three measures of adolescent behavior, based on adolescent self-report, were included in this study. The outcomes of interest were from wave 5 of the study. Wave 4 data were included to control for variation in behavior over time.

**Child Internalizing Behaviors** were measured using a 13-item child report of their depression and anxiety (Barber, Stolz, Olsen, & Maughn, 2005) using a 3-point Likert scale that ranged from 0 (*not true*) to 2 (*very true or often true*). Sample items include “*I cry a lot*” and “*I feel worthless or bad about myself.*” Higher scores represent higher internalizing problem behaviors.
**Child Aggression** was measured from items developed by Weinberger, Schwartz, and Davidson (1990). The scale included five items with response categories based on a 5-point Likert scale ranging from 1 (*does not describe me*) to 5 (*describes me very well*). Higher scores indicate higher child aggression. Sample items include “I lose my temper and ‘let people have it’ when I am angry” and “If someone tries to hurt me, I make sure that I get even with them.”

**Child Prosocial Behaviors** were measured from the Inventory of Strengths Scale (Peterson & Seligman, 2004). The scale included 9 items on a 5-point Likert scale with responses ranging from 1 (*not like me at all*) to 5 (*very much like me*). Higher scores indicate more generosity and kindness toward others. Sample items include “I voluntarily help my neighbors” and “I help people I don’t know, even if it is not easy for me.” During confirmatory factor analysis, one item was dropped due to a low factor loading.

**Potential Mediators**

**Family Functioning** was measured using the General Functioning subscale from the McMaster Family Assessment Device (FAD, Epstein, Baldwin, & Bishop, 1983). The scale included 12 items on a 4-point Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Mothers reported on how well each item described their family. Sample items include “We are able to make decisions about how to solve problems” and “Individuals are accepted for what they are.”
**Family Monitoring** was measured using the Monitoring subscale from the Family Implicit Rules Profile (Harper, Stoll, & Larsen, 2010). The scale includes 5 items for which mothers reported how well each item was true for their family on a 5-point Likert scale ranging from 1 (*never*) to 5 (*most of the time*). Sample items include “Check in with family members when you get home” and “Make sure family members know your friends.”

**Other Covariates**

Maternal and adolescent age, adolescent gender, maternal education (high school education or less, some college, and bachelors degree or higher), mom’s marital status (married versus not married), and sampling technique used (randomly recruited through the Polk Directory versus referral or community flyer recruitment) were included as potential covariates. All covariates were based on mother report.

**Statistical Analyses**

*Preliminary Analysis*

Preliminary data analyses were conducted in Stata 12. Means, medians, score ranges, and standard deviations (SDs) were computed. Simple two-sample T-tests were run to compare means on baseline characteristics and key study variables between those recruited through the Polk Telephone directories and those recruited through referrals and flyers. To check for collinearity, pairwise correlations were run between covariates, and the variance inflation factors (VIFs) were tested on key study variables. Missing data
for study variables was minimal (74% had no missing data over the five years and 89% had fewer than 10 missing variables over the 5 years; 51 families missed one or more waves of follow-up data). Attrition analyses to compare means were conducted using two-sample independent t-tests.

*Confirmatory Factor Analysis*

Confirmatory Factor Analyses (CFA) were conducted separately on each study variable to set up the measurement model. All CFAs were performed in Mplus Version 7 (Muthe´n & Muthe´n, 2012) using full information maximum likelihood (FIML). Based on the results of the CFA, latent or manifest variables were created. Latent variables are constructs that cannot be directly observed but are measured based on variables that can be observed. Manifest variables are observable and can be directly measured (Little, 2013). During CFA, items with factor loadings below 0.45 were dropped. Model fit was assessed for each latent variable. Latent variables with a CFI value ≥0.95 indicate good fit and any value less than 0.90 indicate poor fit. Likewise, for RMSEA, values ≤0.06 represent good model fit and up to 0.10 indicate acceptable fit (Little, 2013; Hu & Bentler, 1999). The error terms of similar error terms of items were correlated to improve model fit, as indicated by the modification indices that Mplus produces. Manifest variables were created for CFA models below the minimum fit indices. For each measure, fit and factor loadings were checked for all available waves (also referred to as lags or time points) in order to create a latent variable with the same number of items and correlated error terms at each time point; a manifest variable was created if adequate model fit could
not be obtained for all waves. Cronbach alphas were computed for each measure after CFA was completed (see Table 5.1). The results of the confirmatory factor analyses are included in the Results section.

Model Building

The goal of model analyses was to have good model fit, maximize degrees of freedom, and to have adequate power to complete the analyses. Model fit was assessed using the comparative fit index (CFI) and root mean square error of approximation (RMSEA), values which are less sensitive to sample size when evaluating model fit than the $\chi^2$ test. CFI values $\geq 0.95$ indicate good fit and any value less than 0.90 indicate poor fit. Likewise, for RMSEA, values $\leq 0.06$ represent good model fit and up to 0.10 indicate acceptable fit (Little, 2013; Hu & Bentler, 1999). Models were estimated using mean and variance-adjusted weighted least squares (WLSMV) in Mplus Version 7. Missing data was dealt with using full information maximum likelihood (FIML). FIML provides unbiased parameter estimates and standard errors by using all available data to estimate a likelihood function for each subject.

The analytic model is shown in Figure 5.1. All model paths that were tested are shown in this figure, with the primary paths of interest bolded. The most proximal prior time points (lags) for the key study variables were included in initial models to account for variation over time. A true cross-lag model was not possible because not all variables were measured in all waves of the study.
Due to collinearity between the connection and regulation parenting dimensions and also between the verbal-punitive and indulgent parenting dimensions, two separate models were analyzed: one that included connection and verbal-punitive parenting, and the other included regulation and indulgent parenting. These parenting dimension pairs were chosen because they roughly portray opposite ends of each parenting spectrum (warmth versus harshness in the connection and verbal-punitive model; reasoning and structure versus a lack of reasoning and structure in the regulation and indulgent model).

**Hypothesis Testing: Mediation**

The models in these analyses included potential mediators. The paths leading to and from the intervening variable were tested to assess significance. For mediation to be present, both paths must be significant. Intervening effects (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Iacobucci, Saldanha, & Deng, 2007) were tested using the Delta Method, which, similar to the Sobel Test, computes a z-score based on the product-of-coefficients of the indirect effects (MacKinnon, 2008). When testing mediation, the use of structural equation modeling (SEM) is advantageous over traditional regression analyses because it requires fewer assumptions, accounts for measurement error, and allows multiple mediation effects to be simultaneously tested (Li, 2011; Little, 2013).
RESULTS

Preliminary Analyses

Item-level ranges, means, and standard deviations for all constructs are in Table 5.1.

No significant differences on study background variables (maternal and child age, child gender, marital status, mother’s education status, and study sampling method) were found for those who completed all five waves (n=427) versus those who did not complete one or more waves (n=51). There were also no differences on means for key study variables (maternal emotion regulation, potential mediators, parenting dimensions, and child behaviors).

There were some significant differences in means on study background variables for those who were randomly sampled through the Polk Directory versus those recruited through referrals and flyer. Mothers who were randomly sampled were more likely at baseline to be married (t=7.15, p<0.001), have some college education (t=5.95, p<0.001), to be older (t=5.08, p<0.001; average age 43.7 years compared to 39.7 years for those recruited via referral or flyer), and there children were younger (t=2.00, p=0.046; 11.2 years compared to 11.5 years in the referral/flyer sample). These differences were expected as a lower socioeconomic status sample was targeted through the referrals and flyers sampling approach. These differences in socioeconomic status resulted in some mean differences on a few key study variables. Those who were randomly sampled reported higher mean family monitoring in wave 2 (t=4.65, p<0.001), lower verbal-punitive parenting (t=3.70,
p<0.001) and indulgent parenting (t=-3.28, p=0.001) in wave 4, and more child internalizing problems (t=2.49, p=0.013) and less child aggression (t=2.13, p=0.034) in wave 5 compared to those recruited through referrals and flyers. There were no significant mean differences on other key study variables (maternal emotional reactivity and distancing, family functioning, connection and regulation parenting, and child prosocial behaviors). The differences in family monitoring, parenting, and child behaviors were expected based on the differences in socioeconomic status between the two groups and is consistent with existing literature (Lareau, 2003; Saunders, Hume, Timperio, & Salmon, 2012; Slicker, 1998; Luthar, 2013). “Sampling method” (1=Polk Directory; 2=Referrals and Flyers) was included as a model covariate.

**Confirmatory Factor Analyses**

Confirmatory Factor Analyses (CFA) was conducted utilizing a structural equation model (SEM) framework with a measurement model in Mplus Version 7 (Muthe´n & Muthe´n, 2012). Based on the results of the CFA, latent or manifest variables were created. Latent variables are constructs that cannot be directly observed but are measured based on variables that can be observed. Manifest variables are observable and can be directly measured (Little, 2013). During CFA, items with factor loadings below 0.45 were dropped. Model fit was assessed for each latent variable. Latent variables with a CFI value ≥0.95 indicate good fit and any value less than 0.90 indicate poor fit. Likewise, for RMSEA, values ≤0.06 represent good model fit and up to 0.10 indicate acceptable fit (Little, 2013; Hu & Bentler, 1999). The error
terms of similar items were correlated to improve model fit, as indicated by the modification indices that Mplus produces. Manifest variables were created for CFA models below the minimum fit indices. For each measure, fit and factor loadings were checked for all available waves (also referred to as lags or time points) in order to create a latent variable with the same number of items and correlated error terms at each time point; a manifest variable was created if adequate model fit could not be obtained for all waves. Cronbach alphas were created for each measure after CFA was completed (see Table 2.3). All measures are listed below with a description of whether a manifest or latent variable was created.

**Maternal Emotion Regulation**: During CFA, a latent variable with 11 items as indicators was created for *Emotional Reactivity*. The final latent variable with seven correlated error terms yielded good fit (RMSEA of 0.062 and CFI of 0.971). For *Emotional Distancing*, 12 indicators were loaded onto the latent variable. Eight error terms on similar items were correlated and the final CFA yielded moderately good fit (RMSEA: 0.068, CFI: 0.961).

**Parenting Dimensions**: Latent variables were created for three of the four parenting measures. For *Connection Parenting*, a latent variable with five items fit the data well (RMSEA: 0.033, CFI: 0.995). When loading all five items onto the *Regulation Parenting* latent variable, with one correlated error term, model fit was good (RMSEA: 0.052, CFI: 0.995). For the *Indulgent Parenting* latent variable, all five items were loaded as indicators onto the latent variable during CFA. Based on the
modification indices, one error term on similar items was correlated and model fit was good (RMSEA: 0.021, 0.998). The original intent was to create latent variables for the verbal-hostility (alpha: 0.71) and punitive parenting (alpha: 0.70) dimensions. Model fit was tested separately for each dimension, however model fit was poor when they were separated and so the dimensions were combined and CFA conducted on the dimensions as a single latent variable with 8 items as indicators. The model fit for the combined dimensions was also inadequate (RMSEA: 0.167; CFI: 0.860), though factor loadings for 7 of the 8 items were above the minimum threshold. The decision was made to combine the two subscales into one manifest variable because the items from the two subscales loaded well onto the latent variable, had content validity as a single construct, and the alpha for the combined subscales was higher than for each subfactor separately (combined alpha: 0.75). The manifest variable, called Verbal-Punitive Parenting, was created by summing and averaging the eight items.

Child Behaviors: During CFA, 13 indicators were loaded onto the Child Internalizing Behaviors latent variable. Due to low factor loadings, three items were dropped. Based on modification indices, one error term was correlated on similar items. The final latent variable, with 10 items, fit the data well (RMSEA 0.056, CFI: 0.987). For the Child Aggression latent variable, five items were loaded as indicators; based on the modification indices, two error terms were correlated on similar items. The final latent variable yielded good model fit (RMSEA: 0.055, CFI: 0.999). During CFA of the Child Prosocial Behaviors latent variable, including 9 items as indicators,
one item was dropped due to a low factor loading. The final latent variable comprised of 8 items fit the data adequately (0.087, 0.974).

**Potential Mediators:** The CFA for the potential mediators included a latent variable for *Family Functioning* and for *Family Monitoring*. The 12-indicator *Family Functioning* latent variable fit the model well (RMSEA: 0.097, CFI: 0.968). Five indicators were loaded onto the *Family Monitoring* latent variable. One item was dropped due to low factor loadings. The final latent variable with four items had good model fit (RMSEA: 0.097, CFI: 0.990).

**Model Building**

In each of the models, the following baseline characteristics were controlled for: maternal and child age, child gender, maternal education, marital status, and sampling method. To control for these covariates, all wave 1 covariates (maternal emotional reactivity and distancing and family monitoring and functioning) were regressed on the model covariates. Model fit was adequate in both models (Connection and Verbal-Punitive model: RMSEA: 0.029, CFI: 0.906; Regulation and Indulgent model: RMSEA: 0.027, CFI: 0.911). When prior lags for parenting dimensions and child behaviors were removed, model fit for the CFI improved to more than 0.95 for both models (Connection and Verbal-Punitive model: RMSEA: 0.026, CFI: 0.951; Regulation and Indulgent model: RMSEA: 0.025, CFI: 0.953). The results were substantively similar to the models with all prior lags included and so the models with the lags removed were used (see Figure 5.2 for the “revised”
analytic model). There were numerous non-significant paths; non-significant paths were trimmed to create more parsimonious models. Model fit was slightly better in the more parsimonious models and these trimmed models are shown in the results (figures 5.3 and 5.4).

**Hypothesis Testing**

Bivariate analyses were conducted using SEM methods with two variables (latent or manifest) at a time. Table 5.2 includes the results of the bivariate analyses.

Figure 5.3 (RMSEA: 0.025; CFI: 0.957) and figure 5.4 (RMSEA: 0.024; CFI: 0.958) display the results of the final models. Of the covariates that were controlled for (not shown in figures 2 and 3), mothers who were not married reported significantly higher emotional distancing than their married counterparts (0.216; p<0.001; betas and p-values were similar in both models for all covariates). Mothers with a college degree reported higher family monitoring (0.197; p<0.001) and family functioning (0.114; p=0.046) than women who had less than a college degree. Older baseline maternal age was associated with higher maternal reported baseline family monitoring (0.162; p=0.006). Those who were recruited based on referral or flyer reported lower family monitoring (-0.125; p=0.045) than those randomly selected through Polk Directories. Child gender and baseline age were not significantly associated with any wave 1 variables.
Maternal Emotion Regulation and Parenting and Adolescent Behaviors (Aim 1)

The purpose of aim 1 was to examine the longitudinal impact of maternal emotion regulation, specifically emotional reactivity and emotional distancing, on parenting dimensions and child internalizing, externalizing, and prosocial behaviors.

Baseline maternal self-reported emotional reactivity was significantly positively predictive of wave 4 indulgent and verbal-punitive parenting (dimensions typically viewed as negative parenting), but was not significantly predictive of parenting dimensions typically associated with positive parenting (regulation and connection) or any of the child behaviors. Maternal self-reported emotional distancing was directly inversely predictive of regulation parenting, but was not directly associated with any of the other parenting domains or any of the child behaviors.

Higher maternal reported verbal-punitive parenting was predictive of higher child-reported child aggression. Wave 4 parenting was not directly significantly associated with either wave 5 child prosocial behaviors or internalizing behaviors, though child aggression was correlated with both child behaviors.

Family Processes as Potential Mediators (Aim 2)

The purpose of aim 2 was to test how the family-level processes of functioning and monitoring mediate the relationship between maternal emotion regulation and parenting.
Maternal emotional reactivity was negatively correlated with baseline family functioning, but was not directly predictive of wave 2 family functioning or monitoring. Maternal emotional distancing was directly negatively predictive of wave 2 family functioning and family monitoring. Higher family functioning was predictive of wave 4 higher connection and lower verbal-punitive parenting, and more child prosocial behaviors and lower child aggression in wave 5 (when adolescents were 15-18 years old). Higher family monitoring was significantly predictive of more regulation and connection parenting and less indulgent parenting in wave 4.

Family processes significantly mediated the relationship between baseline maternal emotional regulation and wave 4 maternal reported parenting and wave 5 child behaviors. Specifically, through the correlation between maternal reactivity and baseline family functioning, family functioning significantly mediated the relationship between wave 1 maternal emotion reactivity and wave 4 connection parenting (4.33; p<0.001), and verbal-punitive parenting (3.73; p<0.001). Combined, wave 2 family monitoring and family functioning mediated the relationship between maternal emotional distancing and all four parenting dimensions (Indulgent Parenting: 2.42; p=0.015; Regulation Parenting: -2.27; p=0.023; Connection Parenting: 3.95; p<0.001; Verbal-Punitive Parenting: 2.83; p=0.005). Family processes also mediated the relationship between maternal emotional distancing and child aggression (2.96; p=0.003) and maternal emotional distancing and child prosocial behaviors (2.01; p=0.045). Family functioning
mediated the relationship between maternal emotional reactivity and both child aggression (3.92, p<0.001) and child prosocial behaviors (2.22, p=0.026). Wave 4 verbal-punitive parenting mediated the relationship between wave 2 maternal reported family functioning and wave 5 child aggression (2.50; 0.012). No direct or indirect effects were found in the relationship between maternal emotion regulation and child internalizing behaviors.

**DISCUSSION**

Based on the results of this study, and consistent with the hypotheses, maternal emotion regulation is an important predictor of parenting and older adolescent behavior; family processes mediate these relationships. Mothers who are emotionally distant, younger, or who have less than a college education are less likely to report high levels of family monitoring and functioning. This has strong repercussions on their self-reported parenting such that they are *more* likely to utilize negative parenting practices and *less* likely to engage in positive parenting. Additionally, higher maternal emotional distancing, through family functioning, results in *more* adolescent-reported aggression and in *fewer* adolescent-reported prosocial behaviors. High self-reported maternal emotional reactivity is directly predictive of indulgent and verbal-punitive parenting behaviors and also negatively correlated with maternal-reported family functioning. Mother’s report of her emotion regulation, family functioning and monitoring, and parenting was not predictive of adolescent report of child internalizing behaviors.
Maternal Emotion Regulation and Parenting and Child Behaviors

The finding that maternal emotional reactivity and distancing negatively impact maternal-reported parenting behavior is consistent with other studies (Skowron et al., 2010; Skowron, 2005). The findings from this study are particularly powerful because the study is longitudinal over a five-year period and thus builds upon the work of previous cross-sectional studies.

There are differences on how maternal emotional reactivity and distancing each impact parenting and child behaviors. Maternal self-report of emotional reactivity appears to be especially directly predictive of maternal reported negative parenting and child-reported adolescent aggression. Baseline maternal emotional reactivity had a direct effect on verbal-punitive and indulgent parenting; verbal-punitive parenting was the only parenting dimension to directly affect child behaviors in these models. Skowron and colleagues (2010) found an association between maternal emotional reactivity and child maltreatment among parents of children ages 5-14 years. In the current study, verbal-punitive parenting was not a direct measure of child maltreatment, but it may indicate higher risk for engaging in child abuse (Skowron and Platt, 2005). Children in this study were 10-18 years of age. Previous research has shown that child maltreatment is higher in parents of older children (Finkelhor, Turner, Ormrod, & Hamby, 2009). Given this finding, the potential for being abused among adolescents in this sample whose mothers reported being highly reactive is of particular concern. Previous research has not looked at the relationship between emotional reactivity and indulgent parenting.
One possible explanation for this relationship is that when a mother overreacts to a situation involving her child, she may feel guilty and overcompensate for her reactivity by indulging the child.

Maternal emotional distancing, on the other hand, was only directly associated with regulation parenting. However, through family functioning and monitoring it was predictive of all four of the parenting behaviors and also child aggression and prosocial behaviors. The impact of maternal emotional distancing on parenting and child behavior appears to exert its effect by reducing how effectively the family works together. While no other research has looked at the role of both mom’s emotion regulation and her perception of family processes and how these impact parenting and child outcomes, the results are consistent with previous research on family processes that show that more family cohesion is linked with less adolescent aggression (Pugh & Farrell, 2009; Houlberg, 2011) and that more family monitoring is related to an adolescent achievement orientation (Anderson, Sabatelli, & Kosutic, 2007; Yan et al, 2008). An explanation for the relationship between maternal emotional distancing and family processes may be that a mother who distances herself emotionally may pull back from situations that may be potentially confrontational – such as monitoring who her children’s friends are or problem-solving challenging family situations – in an effort to conceal or avoid internal distress (Skowron, Stanley, & Shapiro, 2009; Cole et al, 1994).
Maternal self-report of emotion regulation, family processes, and parenting were not directly significantly predictive of adolescent internalizing behaviors. The lack of significance between parenting and child internalizing behaviors was surprising given that some previous studies have shown a relationship (Johnson & Greenberg, 2013; Voort, Linting, Juffer, Bakermans, Schoenmaker, et al., 2013). One possible explanation, which is a strength of this study, is the difference in reporters – mothers reported their own parenting practices while adolescents reported on their own behavior. Another possible explanation is that parenting is more predictive of adolescent internalizing behaviors in younger adolescents but less so in older adolescents. For this paper, child internalizing behaviors were included in the models at wave 5 when adolescents were 15-18 years of age. Consistent with this hypothesis, Galambos and colleagues (2003) found that among 6th graders, some parenting behaviors were predictive of child internalizing behaviors, but as these adolescents aged, parenting was no longer a significant predictor of internalizing behaviors.

In general, family functioning, more so than parenting behaviors, was more predictive of adolescent behaviors. Family functioning directly inversely predicted adolescent self-report of aggression and positively predicted prosocial behaviors in both models while only verbal-punitive parenting was associated with adolescent aggression. Previous research has shown that parenting is the strongest predictor of adolescent delinquency (Kumpfer & Alvarado, 2003), but this may be because other family processes have not largely been studied in adolescent delinquency research.
It is logical that the larger family functioning context impacts child aggression even more so than parenting does. It is also possible that because family functioning was a maternal-reported measure, that the measure is subject to the mom’s biases and may be partially indicative of another dimension of the mother’s parenting that was not directly measured in this study.

The Mediating Role of Family Functioning and Family Monitoring
The significant mediating role of family processes merits further discussion. Poor family processes intensify the impact of low maternal emotion regulation on poor parenting and problematic child behaviors. But the reverse is also true, healthy family functioning and monitoring can partially compensate for a mother’s low emotion regulation. When the collective family unit is unable to work together and does not know the whereabouts of one another it impacts a mother’s parenting behavior, probably because the ensuing disorganization intensifies the mother’s own poor emotion regulation skills. This is consistent with other research that has shown that household chaos, through the mechanism of stress and distraction, impairs prefrontal lobe regulatory functions and diminishes emotion and cognitive control processes (Lupien, McEwen, Gunnar, & Heim, 2009; Wachs & Evans, 2010). Conversely, a family that works together and has healthy monitoring routines may act as a soothing force on the mother’s lower emotion regulation and thereby minimize its negative impact on how she parents. Additionally, this more cohesive family environment can have a positive and direct impact on adolescent behavior.
A challenge for families in which the mother has lower emotion regulation is that her excessive or distancing reactions appear to reduce the family’s ability to problem solve, communicate, and work together. These results indicate that in families that overcome this challenge and still realize healthy family processes, it partially offsets the mother’s poor emotion regulation and results in better parenting and child behaviors than would be expected based on the mother’s emotion regulation alone. It should be noted that mothers were the reporters for their own emotion regulation and also family functioning and family monitoring. A key follow-up study would be to assess the emotion regulation of multiple family members and the individual and collective impact on family processes and its mediating role between maternal emotion regulation and parenting.

**Study Limitations and Next Steps**

This study was conducted in a typical working and middle class sample so that the results of the study may not generalize to higher-risk samples. Replicating this study and conducting this research in a high-risk sample are important next steps. The focus of the study was on mothers; father’s emotion regulation and parenting was not included in this analysis. The study of emotional regulation in fathers and its impact on parenting and child behaviors would be valuable as would be studying the comparative individual and combined impact of mother and father emotion regulation on family processes and the degree to which these family processes similarly mediate the relationship of mother and father emotion regulation and parenting.
All of the measures in this study were either maternal report (emotion regulation, family processes, and parenting) or adolescent-reported (child behaviors), which can result in reporter bias. While having a combination of observation and maternal and child report would have been optimal, bias was reduced to a degree by having the child, rather than his or her parent, report on adolescent behaviors. It should be noted, that generally studies on the congruence of parent versus child report of adolescent behavior show moderate agreement for internalizing disorders and low agreement for externalizing disorders (Hope, Adams, Reynolds, Powers, Perez et al., 1999). When using only one reporter is the option, adolescent report is the recommended method (Cantwell, Lewinsohn, Rohde, & Seeley, 1997).

Adolescent report of how the mother parents, maternal emotional regulation as well as the adolescent’s perception of family functioning and family monitoring would also be valuable analyses to perform. Adolescent report was available for some but not all of these variables. For the sake of consistency in the analysis as well as minimizing the number of items in the analysis to maximize the available power, only parent report was used for these variables. Further investigation of the congruence of parent versus child report, especially for the family-level variables, would be a highly valuable next step.

The benefit of structural equation modeling (SEM) is that it allows for multiple paths in a model to be analyzed simultaneously. However, any misspecification of the model impacts the validity of the results. The final models in this analysis were
specified based on theoretical assumptions from the literature and had good fit for both the RMSEA and CFI. Still, even though it was a longitudinal study where temporality could be assessed, not all variables were measured in all waves of the study, making it impossible to conduct a true cross-lag model. Additionally, no information was available on characteristics of the individual and family prior to the start of the study (which may have a large predictive power on some of the outcomes), so it was not possible to definitively test the temporal order established in the model. There is evidence of stability in emotion regulation over the life course (Mandell & Ward, 2011) and so it is likely that the order provided in the model is correct. Child behavior is also known to influence parenting (Abidin, 1992), but in the final models the recursive relationship was not shown. However, when prior parenting and child lags were included in the model, some wave 4 parenting and wave 4 child behaviors were significantly correlated. It should be noted that when the prior parenting and child behavior lags were removed, the direct effects on child behavior were substantively similar.

CONCLUSION

The results of this study highlight the importance of mothers’ emotional regulation and family processes on parenting and functioning of adolescents. Specifically, maternal emotion regulation impacts mother’s self-reported positive and negative parenting behaviors with their adolescent children, which in turn directly impacts child report of adolescent aggressive behavior in the expected direction. Family processes, including family monitoring and family functioning, mediate the
relationship between maternal emotion regulation and parenting, adolescent aggression, and adolescent prosocial behaviors. The results underscore that a mothers’ ability to manager her emotional reactions in common, everyday stressful parenting situations, and also her ability to attend to and connect with other family members, are important aspects of family life that could be meaningfully incorporated into parenting guides and programs. Further research that assesses father and child emotion regulation and its impact on family processes and parenting as well as obtaining reports from other reporters of maternal parental behavior will be useful to further understand the interworking of parental emotion regulation, family processes, and parenting.
REFERENCES


Figure 5.1. Analytic Model (controlling for model covariates—not shown)
Figure 5.2. Revised Analytic Model
Figure 5.3: Connection and Verbal-Punitive Parenting Model; Non-significant paths trimmed
RMSEA: 0.025; CFI: 0.957

Model adjusted for the following baseline covariates: Maternal and child age, child gender, maternal education, maternal marital status, and sampling strategy. Path coefficients are standardized.
*p<0.05, **p<0.01, ***p<0.001
Figure 5.4: Regulation and Indulgent Parenting Model; Non-significant paths trimmed
RMSEA: 0.024; CFI: 0.958

Model adjusted for the following baseline covariates: Maternal and child age, child gender, maternal education, maternal marital status, and sampling strategy. Path coefficients are standardized.
*p<0.05, **p<0.01, ***p<0.001
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<th>Variable</th>
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<td>0.89</td>
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Table 5.2. Bivariate Analyses (outcomes are listed as column headers, predictor variables as row headers)

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^p<0.10; *sig at <0.05; **sig at less than 0.01; ***sig at less than 0.001; all betas are standardized
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<th>X.</th>
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*p<0.10; *sig at <0.05; **sig at less than 0.01; ***sig at less than 0.001; all betas are standardized
CHAPTER 6

CONCLUSIONS AND IMPLICATIONS FOR RESEARCH, POLICY, AND PRACTICE
The underlying focus of this dissertation is to help explain why some parents engage in harsh, reactive parenting even though anecdotally virtually all parents want to be good parents. Some previous research has pointed to maternal emotion and cognitive control capacities (ECCCs) as one reason why some parents fail to engage in positive or even “good enough” parenting (Deater-Deckard et al, 2010; Gonzalez et al, 2012; Mokrova et al 2010; Skowron, Kozlowski, & Pincus, 2010). This dissertation builds on previous research on maternal ECCC and parenting through synthesizing available research into a cohesive framework, investigating how both maternal emotion regulation and executive functions are associated with parenting and child behaviors in early childhood and adolescence (including the longitudinal relationship of emotion regulation to parenting), and the mediating roles of social cognitions and family processes.

In the introductory chapter, three questions, that paralleled the aims, were listed that would be answered through this dissertation. The answers to those questions, based on the results of the literature review and empirical analyses, are summarized below. Additionally, this chapter contains a summary of recommendations for future research and how to apply the results to policy and practice.

**WHAT IS THE RELATIONSHIP OF MATERNAL ECCC TO POSITIVE AND NEGATIVE PARENTING AND CHILD BEHAVIOR?**

All three papers consistently showed a relationship between maternal emotion and cognitive control capacities (ECCCs) and parenting. Maternal ECCCs are positively
associated with parental warmth, regulation, responsiveness, and other practices typically associated with positive parenting. On the other hand, maternal ECCCs are inversely associated with harsh discipline, over-control, and punitive parenting practices (referred to generally as “negative parenting”) and child and adolescent conduct problems and aggression. The associations between both positive and negative parenting are important to note. Controlling one’s reactions may be enough to prevent engagement in harsh and inconsistent parenting. Positive parenting, on the other hand, is more than just not engaging in negative parenting but requires actively portraying and “doing” warmth, monitoring, responding, etc.

In chapter 3 (aim 1), the results of several studies that addressed the relationship between maternal ECCC and parenting and child behaviors were summarized and a cohesive conceptual framework was created based on the results of existing research. The synthesis of available literature on maternal ECCCs, parenting, and child outcomes indicates that household chaos and socioeconomic status appear to be important moderators in this association (Mokrova, O'Brien, Calkins, & Keane, 2010; Deater-Deckard et al., 2012a;b). Most research that has been published to date has been cross-sectional making it difficult to establish the temporal order necessary for indicating a causal relationship. Additionally, the available research provides little information on important mechanisms that mediate and/or moderate the relationship between maternal ECCCs and parenting/child behavior.
In chapters 4 and 5 (aims 2 and 3), the association of maternal ECCCs and parenting/child outcomes was further analyzed. For aim 2, which involved mothers and their children 3-7 years old, both maternal emotion control and executive functioning were associated with parenting and child behavior. Higher maternal self-report of emotion control was especially linked with lower engagement in negative parenting behaviors and fewer child conduct problems. It was also associated with lower self-report of hostile attribution bias and authoritarian parenting attitudes. Maternal executive functioning was strongly associated with less authoritarian parenting attitudes and more observed positive parenting.

The results of aim 3 (chapter 5) were focused on maternal emotion regulation, parenting, and adolescent behaviors. This study, unlike aim 2, was longitudinal making it possible to assess temporal relationships. Key findings for aim 3 indicate that self-reported maternal emotional reactivity is predictive of maternal-reported indulgent and verbal-punitive parenting behaviors, and these negative parenting behaviors mediate the relationship between maternal emotional reactivity and adolescent aggressive behaviors. Maternal emotional distancing was directly predictive of less regulation parenting and through family functioning and family monitoring predicted all four of the parenting outcomes studied as well as adolescent aggression and prosocial behaviors. Ultimately, both maternal emotional distancing and emotional reactivity are harmful to parenting and adolescent behaviors and also result in worse general family functioning and, in the case of maternal emotional distancing, in less family monitoring.
While different study samples were used for chapters 4 and 5, some of the results can be integrated. Both studies included measures of maternal emotion control (referred to as emotional reactivity in chapter 5). Better maternal emotion control was linked with lower maternal report of harsh, punitive discipline in both studies and higher engagement in positive parenting such as warmth and appropriate monitoring. Maternal emotion control was also associated with problematic child behaviors (child conduct problems in chapter 4 and adolescent aggression in chapter 5) in both studies. In chapter 4, maternal emotion control was directly inversely related to child conduct problems. In chapter 5, maternal reactivity was predictive of adolescent aggression indirectly (through verbal-punitive parenting and quality of family functioning). Harsh parenting was directly associated with child problem behaviors in both studies. These findings suggest that regardless of the child’s age, a mother’s ECCCs are linked with parenting quality and child behavior.

DO MOTHERS WITH LOWER ECCC VIEW GOOD PARENTING AND THE REASONS FOR CHILD MISBEHAVIOR DIFFERENTLY? IS THEIR ABILITY TO PARENT ACCORDING TO THEIR OWN BELIEFS IMPACTED BY THEIR ECCCS?

The answers to these questions are discussed further in chapter 4 (aim 2). Mothers with lower ECCC reported more traditional parenting practices and hostile attribution biases regarding child misbehavior. Maternal self-report of emotion control was especially associated with attitudes and attributions while maternal executive functioning was associated only with parenting attitudes. These social
cognitions mediated the role between maternal ECCC and child conduct problems. They did not, however, mediate the relationship between maternal ECCCs and parenting behaviors.

Of especial note was the finding that maternal executive functioning was a moderator of the relationship between maternal attributions and attitudes and parenting behaviors. There was a stronger relationship between social cognitions (hostile attributions about children’s ambiguous behavior and authoritarian parenting attitudes) and negative parenting behavior among mothers with average or better executive functioning compared to mothers with below average executive functioning. This indicates that mothers with higher executive functioning may be better able to act on their parenting beliefs, whether those beliefs are positive or negative. While mothers with lower ECCC were more likely to have unhealthy parenting attitudes and attributions than mothers with higher ECCC, they appeared to be less able to act on their parenting beliefs in this study.

**HOW DO FAMILY PROCESSES MEDIATE THE LONGITUDINAL RELATIONSHIP BETWEEN MATERNAL EMOTION REGULATION AND PARENTING AND ADOLESCENT BEHAVIOR?**

A key finding reported in chapter 5 (aim 3) was that family functioning and family monitoring do mediate the longitudinal association between maternal emotion regulation (especially emotional distancing) and parenting and adolescent behaviors. Maternal emotional distancing was especially predictive of lower
maternal reported family functioning and monitoring, while maternal emotional reactivity was correlated with family functioning. These healthy family processes (functioning and monitoring) were positively predictive of regulation and connection parenting and inversely predictive of indulgent and verbal-punitive parenting. Family functioning was also predictive of less adolescent-reported child aggression and more prosocial behaviors. These relationships were expected, but the significant findings do highlight that healthy family processes can partially compensate for lower maternal emotion regulation while low family functioning or monitoring are mechanisms for how low maternal emotional regulation negative impacts parenting.

GAPS IN THE LITERATURE

In chapter 3, several gaps in the literature were discussed. Some of these gaps were addressed in chapters 4 and 5. This section includes a discussion of the degree to which the identified gaps were addressed in the empirical aims of this dissertation.

Measurement of ECC

This dissertation did not directly address the ECC measurement issues. The ecological validity of the ECC tasks as well as the issue of low correlations between tasks purportedly assessing the same ECC component remain as gaps in the ECC field that need to be addressed. While measurement of ECC was not directly addressed in this dissertation, utilizing multiple tasks to measure executive functioning and also including both executive functioning and emotion control in the
same models as was done for aim 2 is a useful method for measuring ECCCs. One of the benefits of using multiple tasks is that maternal executive functioning was not based on a single item, but rather multiple components of ECCCs were incorporated into the composite measure. Using multiple tasks provides a more accurate assessment of a mom’s overall executive functioning than could have been done based on one or two tasks alone.

**Methodological Issues**

The study design for aim 3 (chapter 5) was longitudinal over a five-year period, with five waves of data. This partially addressed a gap in the literature in which most studies have been cross-sectional and the few longitudinal studies that have been published have been of a much shorter duration. However, aim 3 only measured maternal emotion regulation and not other components of ECCCs. Longitudinal studies of maternal executive functioning and parenting as well as longitudinal studies of parents of children in the early and middle childhood periods are necessary to move the field forward.

**Consensus on the Definition of ECCCs**

The purpose of this dissertation was not to solve the debate on the definition of ECCCs, and this issue remains an important area for the field to address. In general, through the literature review and the empirical analyses, the different constructs (executive functioning, emotion regulation, self control, self-regulation, and effortful control) have been linked with a mother’s parenting behavior, suggesting, at least to
a degree, a unifying cognitive function between the constructs that relates to parenting.

Context

The study sample for aim 2 was based on a moderate-risk sample while the study sample for aim 3 was low-risk. In both samples, a link between mom’s emotion regulation and parenting was found. Replicating the results in a high-risk population and conducting further research in high-risk communities remains an important gap in the literature.

Aims 2 and 3 did address some individual and family characteristics that mediate the relationship between mom’s ECCC and parenting/child behavior. For aim 2, maternal social cognitions were found to mediate the relationship between both maternal emotion control and executive functioning and child conduct problems. For aim 3, family functioning and family monitoring mediated the relationship between maternal emotion regulation and parenting and adolescent behaviors. Family processes were identified as a potential compensatory factor in families where the mom has low emotion regulation. Other individual, family, and community characteristics should be explored as potential mediators and moderators of maternal ECCC and parenting – as well as to better ‘situate’ maternal ECCC in the overall processes and skills that comprise effective parenting.
**Improving Maternal ECCCs**

The empirical aims in this dissertation did not address how to improve maternal ECC and limited research exists about the plasticity of adult ECC. However, there is some evidence that mindfulness and cognitive behavioral training can successfully improve adult ECC as well as some success has been demonstrated in retraining neural networks (Bogels, Lehtonen, & Restifo, 2010; Bogels, Hellemans, Deursen, Romer, & Meulen, 2013; Diamond, 2013). It is important for researchers to recognize and promote the concept of adult ECC plasticity rather than focusing on it as a static measure. Mothers with lower ECC are not “doomed” to engage in poor parenting and they can improve their ECC. Research that addresses adult ECC plasticity, including interventions that may help to improve ECCs and also interventions that teach skills to help mothers to compensate for lower ECC (such as stress coping skills) should be a research priority.

**IMPLICATIONS FOR PUBLIC HEALTH RESEARCH, POLICY AND PROGRAMS**

**Implications for Research**

Few studies have looked at the impact of maternal ECC on parenting and early childhood programs – including enrollment, participation, engagement, and general uptake of the program (Harvey, Danforth, Eberhardt, Ulaszek, & Friedman, 2003; Sonuga-Barke, Daley, & Thompson, 2002). A key next step is to investigate the degree to which maternal ECC impacts whether a mother will enroll in a program, show up and participate in the program, and apply what is taught in her household. This research has important direct implications for parenting programs such as
Another area of research is to better understand how stress and allostatic load moderate the relationship between maternal ECC and parenting. Research in high-risk urban populations may be most useful in addressing the role of stress. Previous research has suggested that the relationship between maternal ECC and parenting is strongest in calm households (Deater-Deckard, Wang, Chen & Bell, 2012). It is possible that the reason that relationship was weaker in more chaotic households is that the stress associated with household chaos at least temporarily impairs ECCs in all parents (Lupien, McEwen, Gunnar & Heim, 2009). If this is the case, then in high-risk neighborhoods where stress and chaos is the norm, all parents who are affected by this stress will likely have impaired ECCs. This has important ramifications for parenting. As such, research that further investigates the role of stress, parental ECC, and parenting is vital.

Another important area for research is to study how maternal ECCs impact the mother-child attachment relationship (Laurent & Ablow, 2012). In the results from chapter 4, hostile attribution biases mediated the relationship between maternal emotion control and child conduct problems, but not the relationship between ECC and parenting. One explanation for this is that hostile attributions
may reflect attachment issues more directly than parenting behaviors. Research that tests this hypothesis would be valuable.

Finally, further research on family processes and other **compensating individual and family characteristics** is important. More specifically, research that takes into account multiple reporters of family processes (rather than just maternal report) is essential in better understanding how family processes truly mediate the relationship between maternal emotion regulation and parenting. Another area of research is to understand how some families have better family processes even in the face of poor maternal ECCC. For example, if the father has better ECCC than the mother does that help regulate family processes?

**Implications for Policy and Programs**

While several recommendations for programs and policies could be made based on this research, I will focus on three key areas that seem to be of especial import.

*Parent Enrollment, Participation, and Engagement in Programs*

Many programs and policies focused on parenting and child outcomes focus on high-risk populations that generally have lower socioeconomic status. Research suggests (Hughes, 2011) that people living in higher-risk situations are more likely to have lower ECCCs. It is not necessary for programs to test a parent’s emotion and cognitive control capacity. However, being aware that lower ECCC impacts a person’s ability to plan, make decisions, problem-solve, pay attention, and hold
information in their short-term memory is important, especially for programs focused on high-risk populations. Parents with ECCC deficits may be more difficult to enroll, may attend or participate less, and may have more difficulty applying what they learn from these programs in every day life (Harvey, Danforth, Eberhardt, Ulaszek, & Friedman, 2003; Sonuga-Barke, Daley, & Thompson, 2002). It is therefore essential that programs take these potential deficits into account in the design of the program/policy and the rules (or “red tape) associated with enrolling and maintaining enrollment. Maternal ECCC should also be considered in order to develop effective strategies to engage parents and help them to apply the knowledge and skills taught.

Who to Target and Strategies

Many programs and policies applicable to parents and their children focus on knowledge and skill-building (such as Parent Skills Training and home visiting programs). These knowledge and skill-building programs are important and will likely be particularly successful with parents who have average or better ECCC. These parents will be more able to act on what they learn (see chapter 4 results). Knowledge and skill-building programs are especially helpful when parents have misconceptions and unhealthy attitudes. Parenting programs that teach about child development, for example, will be useful for assisting parents to understand different developmental stages and reasons for their children behavior as well as learning effective discipline strategies in the face of challenging child behavior. However, parents with below-average ECCC will likely have more difficulty acting
on the knowledge that they obtain. Programs that focus on increasing knowledge may be less effective among these parents. As such, similar to the previous recommendation, strategies to help these parents to actively incorporate the knowledge and skills learned are important.

At this stage in our understanding of adult ECCC, it is likely not a useful strategy to focus on improving a mother’s ECCC. While adult ECCCs are malleable, improving adult ECCCs is very effortful and usually domain-specific (Melby-Lervag & Hulme, 2013; Diamond, 2013). The exception to this is if the cause for lower maternal ECCC is psychopathology such as adult ADHD. Medication may be very effective at improving ECCC, but medication alone is not likely to improve parenting (Chronis-Tuscano et al., 2010). Combining appropriate provision of medication to treat adult ADHD with parent skills training is likely to have the largest positive impact on parenting and child behaviors.

Program strategies to help moms reduce factors that contribute to intra-individual fluctuation in ECCC may also be effective. For example, stress, fatigue, poor nutrition, substance abuse, and depression have been linked with temporary impairment of adult ECCCs (Engle & Kane, 2004; Horne, 2012; Bakker, Ormel, Verhulst, & Oldehinkel, 2011; Schoofs, Wolf, & Smeets, 2009; Luethi, Meier, & Sandi, 2009; Lupien et al, 2009; Alexander, Hillier, Smith, Tivarus, & Beversdorf, 2007; Blanton, Green, & Kretsch, 2013; Francis & Stevenson, 2013; Pe, Koval, & Kuppens, 2013). Helping moms and other family members to mitigate these factors is likely to
help mothers to function at their optimal ECCC level, which is likely to prove beneficial to parenting.

*Family-Focused Interventions*

Interventions focused on the family rather than on just one caregiver and the child will be more likely to be successful and have lasting impact on child health. Given that family processes mediate the relationship between maternal emotion regulation and parenting and child behaviors, involving several family members in an effort to strengthen health family processes will likely mitigate the negative impact of low maternal ECCC on parenting and child behaviors. Unfortunately, most programs are not family-centered; shifting our orientation in policy and practice to focus on families rather than on individuals may help to overcome the negative impact of low maternal ECCC on child outcomes, and will have a lasting benefit on parenting and child behaviors.

**CONCLUSION**

When it comes to parenting, maternal emotion and cognitive control capacities matter. Higher maternal ECCC helps a mom to engage in effective parenting strategies and reduce harsh, reactive parenting. Moms with low ECCC may be more challenged to engage in parenting strategies that promote child well-being because of difficulties regulating their emotions, planning, paying attention, inhibiting prepotent responses, and problem-solving. Their children are more likely to have conduct problems and less likely to engage in prosocial behaviors. Socioeconomic
risks and household chaos may exacerbate this relationship. Family processes, such as family functioning and monitoring, may help to compensate for low maternal ECCCs. Strategies that promote healthy family processes and reduce stress and fatigue, may be effective in improving parenting and ultimately child behaviors among moms with lower ECCCs.
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