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The goal of this study was to examine the extent to which maternal depressive symptoms is linked with later maternal sensitivity through maternal causal attributions about infant crying. The present study utilized a multi-method approach for examining parenting and maternal behaviors. In addition, the extent to which these paths were moderated by socioeconomic risk was also examined. Maternal depressive symptoms were examined prenatally and when infants were 6 months old, and maternal sensitivity was observed when infants were 1 and 2 years of age. Mothers reported causal attributions (negative, minimizing, and situational) about infant crying when infants were 6 months of age. In the final model, no direct links was found between maternal depressive symptoms and later maternal sensitivity, however, a positively associated link was found between maternal depressive symptoms and negative causal attributions. No significant pathways were found with situational or minimizing attributions and depressive symptoms, as well as no interaction effects were found with SES risk as a moderator, however SES risk was significantly associated with maternal sensitivity. Results suggest that SES risk and maternal depressive symptoms while parenting leave infants at risk for receiving insensitive caregiving when they are in distress.

EXAMINING PATHWAYS LINKING MATERNAL DEPRESSION TO MATERNAL
SENSITIVITY: ROLE OF MATERNAL CAUSAL ATTRIBUTIONS

by

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To my wonderful, sweet children Anja Corley and Kai Linton Norcross, you are forever my inspiration, and to my husband William Norcross, your patience and support has made this endeavor possible. Thanks to all three of you for always believing in me. Kai, my graduate school homework is finally finished! And to my parents Ingalill and Gunnar Linton. Thank you for teaching me the importance of hard work, and always encouraging me to follow my dreams.

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CHAPTER I

INTRODUCTION

An infant's early experiences with primary caregivers, often the infant's mother, are fundamental to healthy development (Bowlby, 1988; Brazelton & Greenspan, 2000). Specifically, infants who experience empathic, well-timed, and sensitive caregiving, particularly in response to their distress, are more likely to develop a secure attachment, better skills in emotion regulation, as well as social and behavioral competence (Crockenberg & McCluskey, 1986; Leerkes, Blankson, & O'Brien, 2009; McElwain & Booth-LaForce, 2006). Maternal sensitive caregiving is characterized by consistent behaviors of promptness, gentle handling, and appropriate responses towards infant cues. Relatively little is known about predictors of sensitive maternal behaviors in response to infant distress, as most research focuses on the consequences of parental behavior on child outcomes. Maternal causal attributions are cognitions that depend on inferences about the traits and motives of infants, the situational forces operating on infants, and importantly, the causes of infant behavior (Dix & Grusec, 1985). It is important to identify factors that influence maternal sensitivity to infant distress since there are long-term implications for a child's well-being. Such information has the potential to inform screening, prevention, and intervention efforts to promote sensitive interactions between infants and their caregivers (Demers, Bernier, Tarabulsy, & Provost, 2010; Laurent & Ablow, 2012).

Building upon the social-information processing perspective (Crick & Dodge, 1994), when mothers are confronted with infant crying, they must first notice the cry cue and then accurately perceive why the infant is crying in order to respond sensitively. Mothers with elevated depressive symptoms may form biased, negative appraisals about why their infant is crying by failing to integrate all relevant information. Thus, the goals of the present study are to examine the extent to which (a) maternal depressive symptoms interfere with mother's ability to accurately interpret infant distress (e.g. crying), leading to maladaptive causal attributions about why infants cry, which contributes to less maternal responsiveness toward infant distress; (b) socioeconomic risk, including lower maternal age and education, income-relative-to-needs, and the absence of a partner in the home, exacerbates the association between depressive symptoms and maladaptive attributions; and (c) these pathways are equivalent or vary for Black versus White mothers.

The model draws heavily from cognitive theories of depression and theories about parental cognition/attribution as detailed below. The social information processing model provides an overarching framework that allows for the integration of these perspectives. Specifically, according to the social information processing model (Crick & Dodge, 1994), social cognitions, including causal attributions, may either support or undermine the quality of mother-infant interactions. Elevated maternal depressive symptoms may influence cognitions, including causal attributions in response to infant cues, such as infant crying, which in turn may influence social behavior, including maternal sensitivity towards infant distress.

Maternal Depression as Predictor of Sensitivity to Distress

Maternal depression is a serious and common public health problem, affecting both mothers and their infants during pregnancy and throughout the postpartum period (Horowitz, Briggs-Gowan, Storfer-Isser, & Carter, 2007). Eight to 13% of new mothers experience postpartum depression, with another 16 - 23% experiencing elevated symptomology throughout the infant's first year of life (Ertel, Rich-Edwards, & Koenen, 2011). Typically, postpartum depression begins anytime during pregnancy or within 4-6 weeks after birth (Horowitz et al., 2007), but may start anytime during the first year of the infant's life. Symptoms of depression include a range of behaviors, such as withdrawn affect, persistent feelings of sadness, trouble sleeping or insomnia, feelings of worthlessness, anxiety, and a lack of energy (Horowitz & Goodman, 2004).

Maternal depression is a well-documented predictor of compromised parenting. For example, mothers with elevated depressive symptoms are less likely to engage in safety-promoting practices, such as using back-to-sleep positions, consistent car-seat use, and well-child visits (Balbierz, Bodner-Derem, Wang, & Howell, 2014; Field, 2010). Furthermore, mothers with elevated depressive symptoms interact with their infants less, are more withdrawn, and are less responsive to infant cues, leading to greater incidences of insensitive caregiving (Jones, Field, Hart, Lundy, & Davalos, 2001). A meta-analysis of 48 observational studies examined the association between maternal depression and negative and disengaged parenting behavior, and found an effect size moderate in magnitude for both measures of maternal behaviors (Lovejoy, Graczyk, O'Hare, & Neuman, 2000). Although most research linking depressive symptoms with lower

maternal sensitivity focuses on sensitivity in free play or other non-stressful interactions (e.g. NICHD; Smaling et al., 2016), there is some evidence that elevated depressive symptoms also predict lower maternal sensitivity to infant distress (Leerkes, 2010; Leerkes et al., 2015). Efforts to replicate this finding and to identify the mechanisms by which elevated depressive symptoms undermine sensitive responses to distress are warranted.

One common argument is that distorted maternal cognitions, driven by depressive symptoms, may lead to mother-centered rather than infant-centered approach to caregiving, (e.g. when mothers attend to their own needs before attending to infant signals), resulting in less sensitive caregiving, particularly when infants are in distress (Cicchetti, 2010; Dix, Moed, & Anderson, 2014). Mothers with depression are susceptible to cognitive deficits and appear biased when processing emotional events (Girgus & Nolen-Hoeksema, 2006). They are more likely to have a negative view about themselves and the world, and therefore may tend to have a negative view about their infants. These negative cognitions may play a role in explaining the association between elevated depressive symptoms and lower sensitivity to distress. Beck's theory of depression (Beck, 1967) is a useful framework for understanding why mothers with elevated depressive symptoms may be more likely to misidentify the causes of infant crying by disregarding situational factors, leading to less sensitive responding and caregiving.

Beck's Cognitive Theory of Depression

Beck's theory of depression (Beck, 1967) is a valued framework for identifying why depression may be associated with negative cognitions. For example, a mother suffering from elevated depressive symptoms may be more likely to misidentify the causes of infant crying by disregarding situational factors, leading to less sensitive responding and caregiving. Beck recognized that maladaptive thinking may lead to automatic negative thoughts, which may encourage distortions in negative thinking (Beck, 1976; Beck, 2011; Rush & Beck, 1977). These automatic negative thoughts are quick, inaccurate responses to events or situations, and may lead to negative physiological, behavioral, and emotional responses from mothers. For individuals with depression, these automatic thoughts are consistently negative, and may create an alternative, unrealistic explanation about what has happened or what might happen in the future, while ignoring other interpretations or viewpoints (Beck, 2011). Certain individuals may be more prone to these errors, which are based on three specific cognitive constructs that explain the onset and maintenance of depression: schemas, the cognitive triad, and cognitive errors.

Schemas

The first cognitive construct contributing to the onset and maintenance of depression is the mother's current schemas. Schemas are existing representations of ideas, experiences, and expectations that screen incoming material from the environment to guide attention, interpretation, and memory functioning (Gotlib & Abramson, 1999; Joormann & Arditte, 2014). Schemas are considered stable cognitive patterns, where

individuals can categorize and store cognitions for interpreting situations (Rush & Beck, 1977). Mothers with elevated depressive symptoms may misinterpret incoming information from their infant (e.g. not understanding that her crying baby has a need), leading to maladaptive interpretation of infant distress.

The Cognitive Triad

According to Beck's theory, individuals experiencing depressive symptoms are influenced by unrealistic negative perspectives, which generate the cognitive triad. This triad consists of three negative views, including a negative interpretation of the self, the world, and the future, resulting in low self-esteem and feelings of hopelessness (Gotlib & Abramson, 1999). The first component of the cognitive triad is when an individual views the self as flawed and insufficient (Rush & Beck, 1977). Mothers with low maternal self-efficacy believe that infant behavior is based on themselves as mothers, leading mothers to feel rejected and worthless when responding to infants who are in distress (Thompson & Bendell, 2014). The second component of the cognitive triad is when individuals make negative interpretations about their surrounding world (Rush & Beck, 1977). Mothers may inaccurately interpret interactions between themselves and their surroundings as being constantly negative, and lack the ability to reflect on available information, resulting in a generally negative view about their infants. The last component of the triad consists of a negative interpretation about the future. Mothers with elevated depressive symptoms may assume failure and adversity when attempting to complete a particular task, such as soothing a distressed infant, expecting failure even before they attempt caregiving (Girgus & Nolen-Hoeksema, 2006). Cognitive patterns

become consistent ways of thinking about situations. The patterns guide responses, modulate one's sense of control, and increase the predictability of one's experience as being positive or negative.

Cognitive Errors

Cognitive errors, or distortions individuals make, are known to intensify and sustain symptoms of depression (Rush & Beck, 1977). Cognitive errors of depressed individuals include arbitrary inferences, selective abstraction, overgeneralization, minimizing or magnification, and personalization (Rush & Beck, 1977). Arbitrary inferences refer to conclusions that are made in the absence of or contrary to evidence that supports the conclusion (e.g. mother may think she is not good at comforting her crying baby). Selective abstraction occurs when an individual is preoccupied on a detail that was taken out of context, ignoring other aspects of the event, and drawing conclusions of the entire situation based on the core of this component (e.g. mother may think her baby is crying on purpose to annoy her, rather than expressing a genuine negative emotion). Overgeneralization occurs when a conclusion is drawn based on a singular component or incident (e.g. mother may deem infant crying as an unpleasant event that is part of a never-ending pattern of defeat), and magnification and minimization occurs when reflections are distorted by over or under evaluating an event or situation (e.g. mother may dismiss the significance about why infant is crying). Lastly, personalization occurs when an individual relates external events and situations to herself when there is no evidence that supports their involvement or connection (e.g. mother feels she caused her infant to cry). Making cognitive errors in any of these processes

increases the likelihood of an individual reinforcing negative thinking about themselves, and their experiences, spilling over into motherhood. All individuals use existing experiences and representations to filter and process information from the environment. However, processing information with distorted cognitions may increase depressive symptoms, with an underlying assumption that things will turn out badly.

Beck's theory of depression (Beck, 1967), including the negative schemas, cognitive triad, and cognitive errors may drive the understanding of how maternal depressive symptoms lead to less sensitive caregiving of infants. Given the characteristic pattern of automatic negative cognitions among mothers with elevated depressive symptomology, they may have skewed information processing, and negatively view infant behavior. For example, elevated maternal depressive symptoms may interfere with a mother's ability to accurately interpret distress in infants (e.g. infant crying), and therefore may lead to maladaptive causal attributions about why their infant is crying. In the next section, I define causal attributions, summarize relevant theoretical models, and review the existing literature about (a) links between maternal depressive symptoms, negative cognitions/attributions about infant crying (or other child behavior) and (b) links between maternal attributions and maternal behavior.

Mediational Role of Maternal Causal Attributions

Attribution Theory

Causal attributions are the inferred reasons for someone else's behavior. According to Weiner (1986), attributions for others' behavior fall on three dimensions. The first dimension, external/internal location (locust), describes whether behaviors and

actions reflect inner characteristics of the individual, or are due to external/contextual factors (e.g. infant crying because they are difficult versus crying because a task was stressful). Second, stability/instability describes whether behaviors are believed to reflect regular, predictable, and ongoing traits, such as intelligence, versus short-term states. Lastly, controllability indicates whether the individual has perceived influence or control over a behavior in order to fulfill or achieve a goal (e.g. infant crying on purpose to manipulate mother), leading to an assumption about intentionality of a behavior, versus the view that behavior is somewhat out of one's control. Weiner proposed that causal attribution along these three dimensions guide and predict future behavior. Generally, causal attributions about others' challenging behavior that are internal, stable, and controllable are believed to lead to more negative behaviors towards that person. Subsequently, parenting scholars have applied this perspective to understand the origins of parenting.

Maternal Causal Attributions

Maternal causal attributions, according to Dix and Grusec (1985), are cognitions that depend on inferences about the traits and motives of infants, the situational forces operating on infants, and importantly, the causes of infant behavior. Negative, or maladaptive maternal attributions are associated with harsh responding, indifference, or possibly ignoring infant crying. This may result in more mother-centered caregiving and reduce parenting quality (Bugental & Happaney, 2002; Leerkes & Siepak, 2006). Mothers may, for example, infer intentionality when it does not exist, leading them to view the behavior, such as crying, as unacceptable (Grusec & Mammone, 1995). During

stressful laboratory visits, Leerkes and Siepak (2006) identified three causal attributions women commonly make about infant crying: negative (e.g. baby crying on purpose), minimizing (e.g. baby was tired), and situational attributions (e.g. baby upset by the situation). Negative attributions can be described as stable, internal, and controllable in Weiners' (1986) terms; whereas situational are more external and unstable. Minimizing attributions primarily reflect the unstable dimension, but also reflect a tendency to dismiss the fact that crying may occur for an emotional reason and not just physical reasons, and as such is expected to undermine sensitive responsive parenting. These are the attributions examined in the current project. Elevated depressive symptoms may negatively interfere with a mothers' ability to understand why her infant is crying, therefore I will review these associations in the next section.

Links between Maternal Depressive Symptoms and Attributions about Infant Crying

Mothers with depression are susceptible to cognitive deficits and appear biased when processing emotional events (Girgus & Nolen-Hoeksema, 2006). Mothers with elevated depressive symptoms have negative views about themselves and the world, and therefore tend to have negative views about their infants. Studies have demonstrated positive associations between mothers' elevated depressive symptoms and negative attributions (Leerkes et al., 2015), signifying that depressive symptoms interfere with social patterns of responsiveness towards a crying infant due to negative cognitions and schemas that depression brings (Frizzo, Vivian, Piccinini, & Lopez, 2013). Thus, elevated maternal depressive symptoms lead to a fundamental attribution error and an

underestimation of the importance of situational constraints. Consistent with this view, mothers with elevated depressive symptoms incorrectly attribute infant behavior to infant characteristics rather than because of environmental stimuli (Leerkes, Su, Calkins, Supple, & O'Brien, 2016). Further, mothers with elevated depressive symptoms misinterpret facts in negative ways, inaccurately identify emotions, and blame themselves for negative things that happen, leading to deleterious thinking patterns and cognitive distortion (Field, 2010). Cognitive distortion, driven by elevated depressive symptoms, may affect a mother's understanding as to why her infant is crying (Couch, Skowronski, Milber, & Harris, 2008). For example, if a mother thinks her baby is crying to annoy or manipulate her, she may rate the infant behavior as negative, or if she thinks the baby is crying because of temperament or being hungry, she may be more likely to minimize why the baby is crying and ignore situational influences.

Due to distorted cognitions from depression, mothers make attributions about infant crying based on either perceiving the infant as being 'bad,' or perceiving herself as being a 'bad' mother (Joiner & Wagner, 1996). When mothers make decisions based on infant behavior as being deliberate and negative, mothers are more likely to use harsher parenting strategies, and respond less sensitively to infant cues (Dix, Ruble, & Zambarano, 1989; Leerkes et al., 2015). For example, when mothers with elevated depressive symptoms perceive infant actions as being negative and internally driven, they are more likely to infer that infant behaviors are purposeful and manipulative. However, when mothers perceive infant actions as being negative and externally driven, they are then more likely to infer that the infant's behavior is a response to situational experiences

that goes beyond their control, such as tasks being difficult (Peterson, Bettes, & Seligman, 1985). In the next section, I review existing literature examining associations between maternal causal attributions about infant crying and maternal sensitivity.

Links between Maternal Causal Attributions and Maternal Sensitivity

Social behavior relies on ongoing appraisal of other persons and their behavior. Central influences regulating parenting assessment of infant behavior are parents' beliefs about what infants are like, and why infants behave as they do (Dix & Grusec, 1985). Parenting behavior depends on the mother's interpretation of social properties, as well as situational influences operating on infants, leading to an understanding or misunderstanding about the causes of infant behavior (Wang, Deater-Deckard, & Bell, 2016). For example, misinterpretation (e.g. maladaptive attribution) about the causes of infant behavior leads to a lack of maternal responsiveness or leads to harsh, insensitive caregiving, especially in response to infants in distress (Nash, Morris, & Goodman, 2008).

Maternal maladaptive causal attributions about infant crying may negatively affect responsiveness towards infants in many ways. First, fundamental attribution error (Dix & Grusec, 1985), when mothers make mistakes interpreting infant behavior, can occur if a mother assumes infant crying is based on negative aspects about the infant rather than situational responses from their environment. Second, mothers may assume their infant is able to cry on purpose, leading to dispositional inferences and assumptions about infant behavior (Grusec & Mammone, 1995). For example, if mothers feel their infant is responsible for their negative behavior (e.g. crying on purpose), then they are

more likely to respond harshly towards their infants by placing blame and promoting punishment (Nash et al., 2008). Consistent with these negative views, negative maternal attributions have been associated with lower maternal sensitivity (Leerkes et al., 2016), and biased appraisals of infant behavior have been associated with harsh parenting (Lorber & O’Leary, 2005).

Some mothers with elevated depressive symptoms may be at higher risk than others for making faulty attributions about infant distress and responding insensitively towards their crying infant. In the next section, I will review maternal race, and socioeconomic risk factors that may exacerbate the association between depressive symptoms and maladaptive maternal attributions towards infant crying.

Socioeconomic Risk and Race as Moderators

Understanding the role of race and low socioeconomic status (SES) in individual and family functioning is a challenge (Collins, 1998; Earnshaw et al., 2013), yet doing so is important. Relative disparities exist such that maternal depression is higher in women with low socioeconomic status and in racial minority (e.g. Black) mothers compared to mothers with higher socioeconomic status and who are nonminority (e.g. White) mothers (Huang, Lewin, Mitchell, & Zhang, 2012). Often, minority status and socioeconomic status are confounded, making it difficult to tease out the extent to which differences in health and family functioning are the result of one versus the other (Collins, 1998). Beyond group differences, relatively little is known about the extent to which depressive symptoms have comparable or varying effects on parenting processes depending on race and socioeconomic status.

Socioeconomic Risk

Socioeconomic status is typically defined as a combination of education, occupation, and income, and usually represents social status of individuals or groups (American Psychological Association, 2018). Home environments where SES is low may be more chaotic, lead to heightened stress, and when coupled with depression, may make caregiving more mother-focused rather than infant focused (Deater-Deckard, Chen, Wang, & Bell, 2012; Wang, Deater-Deckard, & Bell, 2013). Importantly, demographic factors beyond education and income are also known to contribute to stress. Notably, the absence of a partner in the home and low maternal age are frequently associated with compromised mental health and parenting outcomes (Horowitz et al., 2007; Lanza, Rhoades, Greenberg, & Cox, 2011; Piffner, McBurnett, & Rathouz, 2001; Pittman & Boswell, 2008), and as such the importance of considering multiple aspects of socioeconomic risk, not just income. Family socioeconomic status is believed to operate with characteristics of mothers and infants to predict parenting, and related cognitions (Belsky, 1984). As such, maternal depressive symptoms may have a more negative effect on causal attributions about infant distress when socioeconomic risk is high because the stress affiliated with low SES may exacerbate the tendency to engage in negative thoughts and undermine the likelihood of engaging in more benign or positive attributions. This hypothesis is consistent with the dual risk perspective.

Dual risk, also known as diathesis-stress, is a theoretical perspective that explains the relationship between adaptation and risk factors (Belsky, 1984; Taraban & Shaw, 2018). Dual risk suggests vulnerabilities, such as elevated depressive symptoms are more

likely to be associated with maladaptive outcomes when paired with stressful life experiences, such as higher SES risk. This perspective is uniform with Beck's (1976) emphasis of vulnerability factors of depression that influence maternal cognitions. Thus, maternal depression and elevated SES risk may interact to predict mother's causal attributions of infant distress. Consistent with this view, results of a meta-analysis demonstrate that the association between depressive symptoms and compromised parenting outcomes is greater among samples with low socioeconomic status than samples with high socioeconomic status (Lovejoy et al., 2000).

Race

Racial group differences in mean level depressive symptoms and sensitivity are apparent. For example, several studies found racial disparities in the prevalence of maternal depression such that it is higher for Black mothers compared to White mothers (Hain, Oddo-Sommerfeld, Bahlmann, Louwen, & Schermelleh-Engel, 2016; Mukherjee, Trepka, Pierre-Victor, Bahelah, & Avent, 2016). Studies have also demonstrated lower maternal sensitivity among Black mothers compared to White mothers, but these differences tend to become non-significant when SES is controlled (Mesman, van IJzendoorn, Bakermans-Kranenburg, 2012; Pereira, Negrao, Soares, & Mesman, 2015). What remains relatively untested is the possibility that associations between maternal depressive symptoms, parental cognitions, and sensitivity vary based on race while controlling for SES. Such a question is important given differences in sociocultural history, oppression and discrimination, but also cultural adaptations between groups (Brown, 2013; Few-Demo, 2014; Garcia-Coll et al., 1996).

This question is exploratory. Generally, it seems unlikely that the processes that predict maternal sensitivity operate differently based on race (Pittman & Boswell, 2008), but on the other hand, race may be a proxy for other moderators. To illustrate, although Black mothers have higher rates of depression, studies show White mothers have greater access to mental health resources (Chang, Tabet, Elder, Kiel, & Flick, 2016). Lower access to resources for Black mothers could reflect historical, social, or political barriers (Collins, 1998). Thus, depressive symptoms may be more detrimental among Black mothers if fewer supports are available to treat those symptoms. On the other hand, cultural adaptations that stem from this sociopolitical history, such as stronger multigenerational relations and spirituality, may serve as protective factors among Black women, reducing the likelihood that depressive symptoms have a deleterious effect on parental attributions or sensitivity. Given the current sample is half Black and half White, formally testing whether associations vary or are comparable between Black and White mothers was deemed superior to merely treating race as a covariate, as it may contribute meaningfully to existing literature.

The Current Study

In the current study (please see Figure 1), I will use a longitudinal multi-method, quantitative design to examine the extent to which early maternal depressive symptoms (composite score of third trimester and 6-month postpartum symptoms) interfere with a mother's ability to interpret infant distress at 6 months, leading to maladaptive causal attributions about why her infant is crying, which in turn contributes to less sensitive maternal responding to infant distress when infants are 1 to 2 years of age.

The possibility that socioeconomic risk, characterized by lower maternal age, education, and income-relative-to-needs, as well as the absence of a partner in the home may exacerbate the association between maternal depressive symptoms and maladaptive causal attributions about infant crying will be examined. Lastly, I will examine if any of these pathways vary for Black versus White mothers. Given limited prior literature in this area, these analyses were exploratory and not hypothesis driven. If no differences are found, indicating race does not operate as a moderator of pathways, then race may be used as a covariate in a final model because prior research in this sample has demonstrated group differences in depressive symptoms and sensitivity (Leerkes et al., 2015). Additionally, a composite of maternal depression at 1 and 2 years (concurrent to the outcome) and observed infant affect at 1 and 2 years of age was screened as a potential composite covariate given evidence these factors correlate with both causal attributions about crying and maternal sensitivity (Leerkes et al., 2016).

Research Question 1

Do maternal causal attributions about infant crying mediate the associations between maternal depressive symptoms and subsequent insensitive responding to infant distress?

Hypotheses 1.a. There will be a direct negative association between maternal depressive symptoms and maternal sensitivity such that higher levels of depressive symptoms predict less sensitive responding to infant distress.

Hypothesis 1.b. Maternal depressive symptoms will predict higher minimizing and negative attributions about crying, and lower situational-emotional attributions about infant crying.

Hypothesis 1.c. Minimizing and negative attributions will be negatively associated with maternal sensitivity to infant distress, whereas situational emotional attributions will be positively associated with maternal sensitivity to infant distress.

Research Question 2

Will maternal socioeconomic risk moderate the associations between maternal depressive symptoms and maternal causal attributions about infant crying?

Hypotheses 2. Associations between depression and (a) negative, (b) minimizing, and (c) situational emotional attributions will be stronger among mothers with higher SES risk than among mothers with lower SES risk.

Exploratory Research Question 3

Do any of the proposed pathways in this moderated mediation model vary between Black and White mothers? Given limited prior literature in this area, no formal hypothesis was formed.

CHAPTER II

METHOD

Participants

Participants in the current study were drawn from a prospective longitudinal study investigating the origins of maternal sensitivity during infancy. The initial sample included 259 primiparous mothers (128 European American and 131 African American) and their infants, with no participants self-identifying as White-Hispanic, and 4 self-identifying as Black-Hispanic. Fifty-two percent of infants were female, and 48% were male. At recruitment, participants had an annual family income range between less than \$2000 to over \$100,000, with the median income at \$35,000. Participants ranged in age from 18-44 years ($M = 25$ years). Forty-six percent of the participants had a 4-year college degree or beyond, 27% had some college, and 27% had a high school degree or less. The majority of mothers (71%) were married or living with their infant's father, and 18% were single and not living with the infant's father. As part of the inclusion criteria, infants were full term and overall healthy.

The analytic sample consisted of the full sample of 259 participants. Of the initial 259 participants, 211 participated at 6 months, 222 participants at 1 and/or 2 years. Key reasons for attrition, or missing data, include infant mortality (2 cases), withdrawing from the study (9 cases), moving from the area and not being able to return for behavioral observations (19 cases), and failure to schedule or complete data collection after several

efforts to schedule (40 cases). Mothers with no missing data were significantly older ($t(256) = -3.5, p < .001$), were more educated ($t(255) = -4.4, p < .001$), and had higher incomes ($t(240) = -1.7, p < .05$), compared to women with missing data, but they did not differ on infant gender, maternal race, or prenatal depressive symptoms. The level of retention is high compared to other transition to parenthood studies. When comparing Black and White participants, Black participants were less educated ($t(247) = 5.64, p < .01$), were younger ($t(248) = 5.96, p < .01$), and had lower income-relative-to-needs ratio ($t(231) = 8.03, p < .01$) than White participants.

Procedure

Pregnant mothers were recruited during their third trimester of pregnancy from breastfeeding classes, childbirth classes, obstetric practices and through word of mouth. Mothers who agreed to participate were mailed consent forms, a measure of depression symptoms, and a demographic questionnaire. Mothers and their infants visited campus when infants were approximately 6 months, 12 months, and 24 months of age. Each visit began with a free play procedure, followed by a series of tasks designed to elicit distress (e.g. anger, frustration) described below. Mothers and their infants/toddlers were videotaped during these assessments. Mothers were mailed a measure of depressive symptoms prior to each visit. At the end of each laboratory visit, mothers were compensated \$50 to \$125, and mothers and infants received a small gift. All procedures in the current study were approved by the university's institutional review board. Importantly, the tasks were designed to elicit distress, however, expected distress was not more than what happens in daily lives of infants, with mothers instructed to terminate

tasks if they ever felt uncomfortable, and were encouraged to soothe infants between tasks. Staff were also trained to terminate tasks if infants were at peak distress for a consecutive 30 seconds. This happened rarely, and infants recovered (i.e. calmed) relatively quickly once each distress task ended.

6-Month, 1-Year, and 2-Year Observation and Interview

6-month observation and interview. The first distress task, designed to elicit infant frustration, consisted of a 4-minute arm restraint procedure. The experimenter knelt in front of the infant while gently holding the infants' forearms still, while looking away and not interacting with the infant. The next distress task was designed to elicit fear. The novel toy approach consists of the infant tucked into a table in a seat with a barrier that prevented the toy from touching the infant. A remote-controlled dump truck with loud sounds and bright, flashing lights approached the infant three times. The truck vibrated, played music with lights flashing, as the horn, ignition, and a voice sounded. During the first minute of both tasks, mothers were instructed to have a blank face, look away, and not interact with their infant. After one minute, the mother was instructed that she could interact with her infant in any way she pleased. The last distress task was the still-face procedure. During the still face task, infants remained in the car seat, and mothers' chairs were placed in front of infants such that they were eye level with one another, but sitting a few feet apart. First, mothers were instructed to interact with their infants for two minutes as they usually would. Next, they were asked to briefly look away from the infant, and then look back to the infant with a neutral face for 2 minutes. Finally, the mothers were instructed to look away and then back again at their infant, and

then to interact and play with their infant as they normally would for 2 minutes (re-engagement phase).

Following the 6-month laboratory observations, mothers viewed video-clips of themselves and their infants participating in 3 distress tasks described above. The order of the presentation was fixed. After viewing each clip, mothers were asked to rate their emotions, their infants' emotions, why their baby behaved as they did, and to rate how confident they felt responding in that situation.

1-year observation and interview. At one year, mothers and toddlers returned to the laboratory and were videotaped during a laboratory assessment of several interactive tasks designed to elicit toddler distress. The phone task, designed to elicit frustration (frustration task), lasted 4 minutes. For this task, a toy phone was introduced to the toddlers and they were allowed to play with it for about 1 minute. Once the toddler seemed interested in the toy, the researcher placed the toy phone in a clear plastic jar that the toddlers could see the toy but not open on their own. The toddlers were given the jar, and were then prompted to get the toy phone out during the entirety of the task by the researcher. For the first minute, mothers were instructed to stay seated on the couch and remain neutral. During the next 3 minutes, mothers were able to interact with their toddlers any way they wanted to, but without opening the jar.

The last task was the Shrek task (fear task), where a researcher dressed up in a Shrek costume, entered the laboratory with the toddler and mother and walked around the room and talked for 4 minutes. Shrek approached towards and retreated away from the child throughout the task while talking, waving, stating child's name, or singing a song.

Again, for the first minute, mothers were instructed to stay seated in their chairs and remain neutral. For the remaining 3 minutes, mothers were instructed that they could interact in any way they pleased with their infant except touch or talk to Shrek.

2-year observation and interview. At the 2-year visit, mothers and toddlers returned to the laboratory visit and were videotaped during a laboratory assessment of various interactive tasks, designed to elicit distress in toddlers. The lock box task (frustration task) lasted 4 minutes, and was designed to elicit distress in toddlers.

Toddlers were shown two toys and allowed to choose one, and were then allowed to play freely with the toy. Once the child was engaged with the toy, the researcher placed the toy in a clear plastic box and placed a lock on it. Children were first shown how to use the lock and key, and then given a set of many keys that did not open the box. Children were encouraged and prompted by the researcher to open the box and get the toy out throughout the entire task. Mothers were instructed to stay in their seats and remain neutral during the first minute. For the remaining 3 minutes, mothers were instructed to interact with their child in any way they please, except open the lock box. When the task was complete, the researcher opened the locked-box and gave the child the toy to play with.

The last task was the spider task (fear task), where a stuffed spider attached to a remote controlled car was placed in the laboratory with the mother and child. First, the spider remained still at a distance, then the spider moved around the room for 4 minutes by approaching towards the child and stopping, then moving by approaching towards and retreating from the child. For the first minute, mothers were instructed to stay seated and

remain neutral. For the next 3 minutes, mothers could interact in any way they wanted, except touch or pick up the spider. During the last 30 seconds, a researcher entered the room and asked the child to touch the spider 3 times.

Measures

Socioeconomic Risk

Mothers completed a brief demographic questionnaire prenatally, including mother's age, education level, paternal involvement (father/partner living in the home), family income, and family composition (income-to-needs ratio consists of the ratio of reported family income to the federal poverty guideline for poverty based on family size). A principal components factor analysis on these scores yielded a single factor with eigenvalue of 2.6 that accounted for 65.55% of the variance. Based on this analysis, a composite SES risk index was computed by averaging the standardized values for maternal education, paternal involvement, income-to-needs, and maternal age by multiplying the final score by -1. A high SES risk index score indicates lower income-relative-to-needs, maternal education and age, and the father was not living in the home.

Center for Epidemiological Studies- Depression (CES-D)

Maternal depressive symptoms were assessed prenatally and at 6 months (the primary independent variable) and at 1 and 2 years (potential covariate) using the 20-item Center of Epidemiologic Studies- Depression Scale (CES-D; Radloff, 1977), which is a brief self-report depression scale used for screening depression, and is used for measuring changes of symptoms over time. The CES-D is a checklist of feelings, cognitions, and moods associated with depression (e.g., "I felt depressed," "I feel that people dislike

me.”), and is designed to be used with community samples. Participants indicate how often they felt a particular way during the previous week on a 4-point scale ranging from 0 (never/rarely) to 3 (most of the time). The CES-D demonstrates convergent validity with the Beck Depression Inventory (Spitzer, Endicott, & Robins, 1978) and with Research Diagnostic Criteria, a common standardized psychiatric interview, as well as correlated with parenting behavior in other studies (Crockenberg & Leerkes, 2003). Items are summed to create a global measure of depression symptomology. The scores can range from 0-60, with higher scores representing higher levels of depressive symptomology. Scores of 16 or higher on this scale are considered to have clinical implications. Depressive symptoms prenatally and at 6 months postpartum correlated significantly ($r = .42, p < .001$), therefore, a composite of prenatal and 6-month CES-D scores was created to capture early maternal depressive symptoms. Likewise, correlation between 1 and 2 years CES-D was significant ($r = .54, p < .001$), therefore I averaged and created a composite for consideration as a covariate (same time point as the dependent variable).

Given the plan to test race as moderator for the entire model, we calculated consistency reliability for appropriate measures for the entire sample and separately by racial group to ensure measures were adequately reliable for each. Chronbach’s alpha was $\alpha = .87$ for the full sample, $\alpha = .87$ for White women and $\alpha = .86$ for Black women. In this low risk, community sample, a moderate percentage of women had depressive symptoms in the clinical range: 32.9%, 20.4%, 25.1%, and 23% at the prenatal, 6 months, 1 year, and 2 year waves respectfully.

1 and 2 year Infant Affect

During the 1 year and 2 year visit, two distress tasks were recorded for each visit, and continuously coded from digital media files using INTERACT 9 (Manggold, Arnstorf, Germany). Event based coding was used, meaning once a behavior was noted, a code was entered and remained until a new behavior was observed, signaling the offset of the previous behavior. Infant affect was rated during the distress tasks on a 7-point scale ranging from 1 (high positive affect) to 7 (high negative affect), adapted from Brangart-Rieker and Stifter (1996) on the basis of infants' vocalizations, facial expressions, and body tensions. Interrater reliability was conducted at 1 year on 30 tapes, with a weighted kappa = .75, and at 2 years on 33 tapes, with a weighted kappa of .81. A score reflecting average infant affect across distress-eliciting tasks was created at each time point; these were then averaged together across 1 and 2 year assessment to create a single measure in which high scores reflect more infant distress.

Maternal Causal Attributions about Infant Crying

Immediately following the 6-month laboratory observation, during the video-recall interview, mothers rated the extent to which they agreed with 18 attribution statements about why their infant was crying during each task (arm restraint/frustration, novel truck task/fear, and still-face re-engagement) on a 4-point scale ranging from strongly disagree to strongly agree (Leerkes & Siepak, 2006). This scale yields three factors: minimizing (temporary/physical) attributions include 5 items (e.g. "baby having a bad day," "baby in a bad mood, tired, hungry or not feeling well") that deemphasize the distressing nature of tasks; negative/internal attributions include 6 items (e.g. "baby is

spoiled”, “baby has a difficult temperament”, “baby trying to make mother’s life difficult”, “baby is unreasonable”, “baby is crying on purpose”, “baby is selfish”, and “baby just wants attention”) that emphasizes stable, negative child characteristics; and situational/emotional attributions includes 4 items (e.g. “baby is upset by the situation”, “no one is helping the baby”, “baby trying to show he/she needs help”, and “baby had no way to feel better”) that focus on reasonable, context-specific causes external to the infant. For each scale, the items were averaged across the three emotion eliciting/distressing tasks to create overall scores of negative ($\alpha = .830$ overall; .790 for White women, and .831 for Black women), minimizing ($\alpha = .863$ overall; .865 for White women, .861 for Black women), and situational attributions of infant distress ($\alpha = .831$ overall; .841 for White women, .823 for Black women).

Maternal Sensitivity

Maternal sensitivity for both 1-year and 2-year were rated separately for each task using Ainsworth’s 9-point sensitivity/insensitivity scale ranging from (1) highly insensitive to (9) highly sensitive (Ainsworth, Bell, & Stayton, 1974). The purpose of this scale is to assess the extent to which mothers are able to read and respond to her toddler’s cues, and demonstrate an awareness of her toddler’s state by adjusting her own behavior. Reliability was calculated by double coding 20% of the video recordings at 1-year and 15% for those videos at 2-years. Measurement equivalence was addressed by examining maternal sensitivity separately by race, at both 1 year ($\alpha = .681$ for Black mothers, and $\alpha = .728$ for White mothers), and again at 2 years ($\alpha = .809$ for Black mothers, and $\alpha = .671$ for White mothers), indicating the same constructs were indeed

being measured for both groups of mothers. At 1-year, a maternal sensitivity to distress average composite was created from the phone and Shrek tasks, to reflect overall maternal sensitivity to distress ($\alpha = .77$). At 2-years, maternal sensitivity to distress composite was created from the locked-box, and spider tasks ($\alpha = .84$). Maternal sensitivity at 1 and 2 years correlated significantly ($r = .58, p < .001$), therefore a composite of maternal sensitivity at 1 and 2 years was created by averaging these score.

Data Analysis Plan

The primary purpose of the current study was to test a moderated-mediation model (see Figure 1), in which maternal causal attributions mediate the effect of maternal depression on later maternal sensitivity, particularly under conditions of high socioeconomic risk. Descriptive statistics were calculated and distributions were examined to assess normality and the extent to which outliers are present. Next, simple correlations were calculated among potential covariates and key variables (see Table 1). Primary analyses were conducted via Structural Equation Modeling (SEM), using Mplus software (Muthén & Muthén, 2017). In contrast to a standard regression model, path analysis, or SES permits the simultaneous decompositions of effects into direct and indirect effects, providing powerful tests of hypotheses regarding mediation and allows for testing moderated mediation. All continuous variables used to create interaction terms were centered, and interaction terms were calculated as the product of centered variables. Path coefficients and standard errors were estimated using robust maximum likelihood estimation, with 95% confidence intervals for indirect effects estimated using

bootstrapped standard errors (bootstrap = 1000). Confidence intervals that span zero indicate the indirect effect is not significant.

First, the entire model was computed, and direct and indirect effects were examined with bootstrapped confidence intervals to identify significant mediational pathways. In the event of significant moderation effects, conditional direct and indirect effects were computed and evaluated to determine if the association between depressive symptoms and each attribution varied as a function of socioeconomic risk. Given sufficient degrees of freedom, model fit statistics were inspected to ensure adequacy of the model prior to inspecting and interpreting parameter estimates. Cases with partial data on endogenous variables (e.g. maternal causal attributions, maternal sensitivity) were retained and full information maximum likelihood estimation was used to handle missing data. Race was then examined as a dichotomous moderator (White mothers and Black mothers) via a multi-group exploratory analysis to test whether pathways differ as a function of race.

CHAPTER III

RESULTS

Preliminary Analysis

Missing Data

There was less than 7% missing data overall. Little's test indicated that data were missing at random $\chi^2(355) = 360.925, p = .158$. Primary analyses were run using structural equation modeling, and missing data were handled using full information maximum likelihood (FIML).

Correlations

Preliminary analyses were conducted to examine the distributions of all study variables. Descriptive statistics and bivariate correlations were calculated for all major variables, and are displayed in Table 1. Potential covariates (depression scores at 1 and 2 years, and infant affect across distress tasks at 1 and 2 years) were identified by examining their correlations with the outcome variable maternal sensitivity, and predictor variables, maternal depressive symptoms, negative causal attributions, minimizing causal attributions, situational causal attributions, and socioeconomic risk. Correlations among all major variables and the remaining covariates are displayed in Table 1.

As anticipated, higher depressive symptoms and infant affect at 1 and 2 years correlated with lower maternal sensitivity at 1 and 2 years, justifying their inclusion as covariates. Likewise, maternal race and socioeconomic status also correlated with lower

maternal sensitivity at 1 and 2 years of age, which also justified their possible inclusion as covariates, even in the absence of the proposed moderating effects of maternal race and SES risk. Notably, correlations between both concurrent depressive symptoms and affect with sensitivity were in the small to moderate range whereas the associations between race and SES risk with sensitivity were large in magnitude. Maternal depressive symptoms were highly stable over time. Lastly, all three attributions were correlated moderately and positively with each other.

In terms of primary variables, early maternal depressive symptoms correlated significantly with higher negative maternal causal attributions about infant crying, but not with minimizing or situational causal attributions, lending partial support to hypothesis 1. Early maternal depressive symptoms correlated negatively with maternal sensitivity, consistent with hypothesis 1. Minimizing and negative attributions correlated negatively with maternal sensitivity; situational attributions did not correlate significantly with maternal sensitivity, lending partial support to hypothesis 2.

Primary Analysis

Hypothesis Testing

In the full model, a composite of maternal depressive symptoms prenatally and at 6 months was the independent variable; negative, minimizing, and situational causal attributions at 6 months were mediators; the maternal sensitivity composite at 1 and 2 years was the dependent variable; and socioeconomic risk was the moderator. Infant affect composite at 1 and 2-years and CES-D composite at 1 and 2-years were entered as covariates. I conducted a multi-group analysis to determine if there were differences in

paths between Black and White mothers. A model in which all paths were freely estimated across the two samples was compared to a model in which paths were constrained to equality between the two groups. Model fit did not improve when paths were allowed to vary ($\Delta\chi^2 = 2.97, p \leq .936$). When all paths were constrained to equality, there was adequate model fit with RMSEA = 0.000 (0.000-0.026); CFI = 1.00, and SRMR = 0.021. Thus, in relation to the exploratory research question, there was no evidence that paths varied by race. Contrary to hypothesis 2, in the full model, none of the pathways involving interaction terms with SES risk and depressive symptoms were significant, therefore these pathways were removed from the final model for parsimony, and race and SES risk were specified as covariates predicting maternal sensitivity. Standardized path coefficients for hypothesized paths from the final reduced model are presented in Figure 2.

Contrary to hypothesis 1, there was no direct effect between maternal depressive symptoms and later maternal sensitivity ($B = -.020, p = .777$) in the final model. However, partially consistent with hypotheses 1, there was a positive association between maternal depressive symptoms and negative causal attributions ($B = 0.18, p < .05$) but not between maternal depressive symptoms and either minimizing causal attributions or situational causal attributions ($B = 0.078, p = 0.265$ and $B = -.113, p = 0.078$, respectfully). Contrary to hypothesis 1, none of the three types of attributions (minimizing, negative, or situational) were significantly associated with maternal sensitivity ($B = -.041, p = .826$; $B = -.072, p = .173$; and $B = .040, p = .465$, respectfully). The results indicated that the total indirect effect of depressive symptoms on maternal

sensitivity via all three attributions was not significant, and none of the specific indirect effects were significant because the bootstrapped confidence intervals for the specific indirect effects included zero. The non-significant indirect effects from maternal depressive symptoms to maternal sensitivity were as follows: for minimizing causal attributions ($B = 0.000$; 95% CI [-0.002, 0.002]); for negative causal attributions ($B = 0.002$, 95% CI [-0.007, 0.001]), and for situational casual attributions ($B = -0.001$; 95% CI [-0.005, 0.001]).

According to associations among covariates and maternal sensitivity, mothers with infants who demonstrated more negative infant affect during the 1 and 2-year laboratory distress tasks were more likely to be rated less sensitive in their caregiving ($B = -.261$, $p < .001$). Race was also used as a covariate in the full model, revealing that Black mothers were rated as less sensitive than White mothers in the distress tasks ($B = -.233$, $p < .001$). Lastly, SES risk was negatively associated with maternal sensitivity ($B = -.446$, $p < .001$), indicating the higher SES risk index, the lower mothers were rated on sensitive responding during the distress tasks.

The final, reduced model demonstrated adequate fit $\chi^2 (3, N = 259) = 0.84877$, $p = 0.837$; RMSEA = 0.01; CFI = .95; TLI = 1.074; and SRMR = .003. The chi-square goodness-of-fit test is intended to test how likely an observed distribution is due to chance. It is called a 'goodness-of-fit' statistic because it measures how well the observed distributions of the data fits with the distribution that is expected if the variables are independent. Based on a non-significant chi square, there is insufficient evidence to determine if differences are detected between observed variables and the distribution that

is expected. Thus, other goodness-of-fit indices were also used, and showed very good fit of the data. The Root Mean Square Error of Approximation (RMSEA) indicates good fit when a score falls below 0.05, and in this case, the RMSEA = 0.01, indicating good model fit. The Comparative Fit Index, or CFI, produces values between 0-1, and values greater than 0.95 are an indication of adequate model fit, and in this case, the CFI = .95, indicating adequate model fit. With the Tucker Lewis Index (TLI), a score above 0.95 is indicated as an acceptable fit, however the larger the TLI value indicates a better fit. The final reduced model TLI = 1.074, indicating a good model fit. Lastly, when the Standardized Root Mean Square Residual index (SRMR) is lower than 0.05, it is an indicator of good model fit, and in this case, the SRMR = .003, indicating a good model fit. Therefore, based on these scores, it is determined that the overall final reduced model shows adequate model fit.

CHAPTER IV

DISCUSSION

Maternal sensitive responsiveness towards infant distress is important because an infant's early experiences with their caregivers are essential for healthy development (Bowlby, 1988). It is essential that infants experience well-timed and empathic caregiving, particularly in response to distress, in order for them to develop secure attachments with their caregivers, as well as better skills in emotion regulation and behavioral competence (Leerkes et al., 2009). Thus, the primary goal of this study was to examine the extent to which maternal depressive symptoms is linked with later maternal sensitivity through three maternal causal attributions about infant crying (minimizing, negative, and situational). SES risk was examined as a moderator of the paths between elevated depressive symptoms and the three maternal causal attributions about infant crying, and the possibility that the model varied by maternal race was examined. As described in further detail below, the proposed moderated mediation model was not supported, SES risk did not moderate the paths between elevated depressive symptoms and the three causal attributions about infant crying, and no effects varied by maternal race.

Links Between Maternal Depressive Symptoms, Attributions, and Maternal Sensitivity

Inconsistent with hypothesis 1a, there was no direct effect between elevated maternal depressive symptom and later maternal sensitivity, however, elevated maternal depressive symptoms was positively associated with negative maternal causal attributions. This result indicates that maternal mental health may interfere with later parenting cognitions. However, contrary to prediction, there were no significant associations between depressive symptoms and either minimizing or situational causal attributions. Given depressive symptoms are associated with a pattern of negative distortion (Girgus & Nolen-Hoeksema, 2006; Rush & Beck, 1977), it is not surprising that depressive symptoms only predicted negative attributions. That is, Beck's theory (1976) recognized that maladaptive thinking and negative schemas may lead to automatic negative thoughts, which may encourage distortions in negative thinking. Mothers with elevated depressive symptoms may not be at elevated risk for making minimizing or situational causal attributions about why their infants are crying, because elevated depressive symptoms may not lead to misinterpreting contextual factors as much as child factors. According to Weiner's (1986) conceptualization of attributions, both minimizing and situational attributions are more temporary inferences about infant behavior (e.g. infant crying because she is hungry, or no one helping her in the moment), and do not present as stable characteristics of the infant, compared to negative causal attributions, which implies infants have control over their behavior (e.g. infant crying to manipulate

mothers). Thus, mothers with elevated depressive symptoms are at particular risk for making more negative, stable, internal inferences about why their infants are crying.

Although negative attributions about infant crying did not longitudinally predict maternal sensitivity independent of covariates, they have been demonstrated to undermine maternal sensitivity to distress in the moment (Leerkes et al., 2016), underscoring the importance of identifying predictors of negative attributions and perhaps intervening to alter mothers' patterns of thinking about infant crying. The lack of longitudinal prediction from negative attributions to sensitivity may result from change of attributions over time. That is, if mothers have come to think differently about infant crying by the time their child is a toddler, their patterns of thinking in early infancy may be less important. Despite this being a longitudinal design study, it could be that the 2-year maternal sensitivity is too far apart from the predictor variables. The effects may be weakened by 2 years, whereas only having 1-year maternal sensitivity as the dependent variable may be a better time frame for predicting the effects of early maternal behaviors on sensitive caregiving at a later time point. Social information processing factors may be more useful in predicting 'in the moment' behaviors, than behaviors over time, as symptoms of depression fluctuate, as well as having more parenting experience. Infants are constantly growing and developing over time, therefore, mothers may gain confidence and greater maternal self-efficacy as her skills at parenting improves, leading mothers to feel more confident all around in her parenting skills. This study does not examine such developmental changes over time. Thus, future research about stability and change in maternal attributions about infant crying and their predictors are warranted.

Based on the concurrent negative associations between infant affect and maternal sensitivity, it appears that infant affect in the moment plays an important role in mothers' response to infant distress. Mothers whose infants were more distressed were observed to respond less sensitivity, consistent with the view that responding to infant distress is challenging. Perhaps, maternal depressive symptoms and attributions moderate those links (see Leerkes, 2010). For example, it may be that associations between negative infant affect and maternal sensitivity are especially strong for mothers with elevated depressive symptoms, however, it may be that associations between infant affect and maternal sensitivity are weaker for mothers with elevated depressive symptoms who make more situational emotional attributions about infant crying. It is also important to note that infant affect in the moment affects maternal attributions. For example, elevated infant distress in the moment is associated with mothers making more attributions of each of the three types, negative, minimizing, and situational (Leerkes et al., 2016) and in fact, additional analyses demonstrate that infant affect actually accounts for much of the unexpected associations among 6-month attributions. That is, the positive associations between situational emotional attributions and both negative and minimizing attributions are greatly reduced in magnitude once concurrent infant affect is controlled. This underscores the strong role of infant affect in the moment in social cognitive processes. It is probably that infants emitted different cues at 1 and 2 years than at 6 months, and mother's cognitions about concurrent cues are likely most relevant in relation to social behavior in the moment. In fact, social information processing perspective (Crick & Dodge, 1994) is primarily focused on cognitions and behavior in the moment. The

longitudinal prediction from social cognitive factors to later social behavior, in this case sensitivity to distress, is likely dependent on stability in those cognitions over time and comparability of the social context and the social partners' cues across time.

Lastly, in this study attributions were examined separately, and it could be that if examined in combination, different patterns relations with both depressive symptoms and sensitivity may emerge. For example, given that the three correlated, it may be considering them simultaneously undermined the ability to detect associations between any one and the proposed predictor (depressive symptoms) and outcome (maternal sensitivity). Thus, creating an attribution composite may be a useful approach. Alternatively, it may be the case that mothers engage in unique patterns of attributional processes such that some are high on minimizing and negative attributions and low on situational emotional attributions. Presumably, this pattern would be more risky than a pattern of high negative and minimizing attributions couple with moderate to high situational emotional attributions. An approach such as latent profile analysis may be useful in this regard.

The Role of Socioeconomic Risk and Race

Contrary to prediction and prior evidence supporting the dual risk perspective (Taraban & Shaw, 2018), heightened socioeconomic risk did not moderate the association between depressive symptoms and mothers' attributions about crying. However, SES risk played an important role in that mothers with an elevated SES risk index score were at higher risk for less sensitive caregiving. The correlations also demonstrated the mothers with elevated SES risk were more likely to make negative and

minimizing attributions about infant crying. These associations are highly consistent with prior research linking low SES with negative parenting outcomes (Horowitz et al., 2007; Huang et al., 2012). In this study, a robust association was found between SES risk and maternal sensitivity. The stressors affiliated with high SES risk may exacerbate the tendency to engage in negative thoughts that undermine sensitive caregiving, thus limiting engagement in more benign or positive attributions. Home environments where SES risk index is high may be more chaotic, leading to heightened stress, and in turn make caregiving more mother-focused rather than infant-focused (Deater-Deckard et al., 2012). SES risk was only examined in the “a” paths between maternal depressive symptoms and the three maternal causal attributions. It could be that examining SES risk in the “b” paths between the three causal attributions and maternal sensitivity could produce different results. Also to note, there were strong main effects between SES risk and maternal depression than other studies (Kettunen & Hintikka, 2017), which could be because of the risk composite, or because there is more variability in this sample compared with other studies (Abbasi, et al., 2013).

Race did not moderate any paths in the model, consistent with prior research in this sample (Leerkes et al., 2015). However, Black mothers rated as significantly less sensitive in the distress contexts than White mothers, a finding that was not accounted for by SES, since that was controlled for in the final model. It may be that certain stressors are unique to being Black, such as racism/inequality, which may undermine maternal sensitivity (Few, 2007). It is essential to take a socio-historical lens when examining the experiences of Black mothers, as systems of oppression may intersect at many social

locations within the lives of Black mothers (Neuhauser, 2018). This may include being marginalized by multiple systems of oppression, such as being Black and being a woman, and exposing Black mothers to everyday stressors that White mothers may not encounter. Thus, the build-up of these stressors may lead to less sensitive caregiving for Black mothers, specifically when infants are in distress. However, it is important to try to identify what is driving this effect in future research.

Implications for Practice

That elevated depressive symptoms assessed prenatally and at 6-months predicted negative maternal causal attributions at 6 months suggests that maternal self-report on elevated depressive symptoms may be one way to identify mothers at risk for subsequent compromised parenting cognitions. Examining other moderators and mediators may also explain which mothers are at greater risk for compromised parenting cognitions, with causal attributions being only one aspect of social interaction processing. Leerkes et al. (2015) found an indirect effect between maternal emotional risk (e.g. higher negative emotionality, low agreeableness) and maternal sensitivity through mother-oriented cry processing (e.g. mother's anger, anxiety, and negative beliefs about crying). Specifically, that mothers who were high in negative emotional risk reported more negative beliefs about infant crying, and felt angry and anxious in response towards infant crying, compared to mothers who were low on emotional risk, indicating that mother-oriented cry processing matters, and therefore may result in how mothers respond towards infant cues. Focusing on social-information-processing factors, including a combination of encoding situational cues, interpretations of those cues, and finally responses towards

those cues, may be more meaningful than focusing on attributions alone (Crick & Dodge, 1994; Leerkes et al., 2015).

Black mothers in this study were rated as responding less sensitively when their infants were in distress, compared to White mothers, and this effect was independent of SES. Black mothers are exposed to other socio-historical factors, including a lack of access to resources, such as mental health services, or even the harms of implicit and explicit racism, compared to White mothers, leading to more stressful living environments for Black mothers, which may then spillover into parenting (Brown, 2013; Few-Demo, 2014). The evolution and experiences of motherhood may be different for Black and White mothers. To better understand the daily stressors that may be unique to Black mothers' experiences of racism and oppression when becoming a new mother is essential, as there may be differences for Black mothers and their infants, compared to the lives of White mothers and their infants. These unique experiences may cause differences in how Black mothers interpret and respond to infant cues, especially when infants are in distress. This indicates a great need for examining within group differences among Black mothers to better understand the mechanisms that drive the risk of less sensitive responsiveness towards infants.

Mothers with higher SES risk may be more vulnerable to less sensitive caregiving when their infants are in distress, compared to mothers with low SES risk. In future research, it will be important to identify factors that may reduce the negative effect of SES risk on maternal sensitivity. Moreover, interventions targeting maternal knowledge,

attributions, and parenting skills may be ineffective unless SES stressors are addressed given their robust effect on sensitivity.

Strengths, Limitations, and Directions for the Future

Strengths and Limitations

There are many strengths of this study, including the multi-method, longitudinal design, and that the complex moderated mediation model was tested using best practices in structural equation modeling (e.g. FIML, bootstrapping). Further, the community sample was moderately large and diverse with respect to race and socioeconomic status allowing for a formal comparison across two racial groups, Black and White mothers, ultimately demonstrating generalizability of the study findings to these two racial groups. Importantly, the reliability of measures was comparable for both groups, making it unlikely that measurement invariance played a role in any of the findings. The indicator variable included 32.9% mothers with elevated depressive symptoms prenatally, and 20.4% of mothers with elevated depressive symptoms at 6 months. The use of a community sample is important because even non-clinical levels of depressive symptoms may undermine parenting and child outcomes (Field, 2010), however, results may have been different or stronger in a clinical or high-risk sample; in particular, a formal diagnosis of depression may have a different effect on cognitions and parenting than elevated symptoms of depression.

Additionally, the focus on maternal sensitivity during distress tasks is a strength given evidence that sensitivity in these contexts has unique implications for child development (Leerkes et al., 2009), however, it is important to note that each observation

was relatively brief. Gedaly and Leereks (2016) suggested that maternal insensitivity during distress-eliciting tasks could be a strong indicator of attachment disorganization over and above maternal insensitivity during non-distressing tasks, demonstrating that context may be an important indicator of eliciting maternal responsiveness. A unique aspect of the current study is that mothers rated why they thought their infant was crying immediately following the 6-months distress tasks by viewing the video recordings. This allowed mothers to rate their own infants, as opposed to viewing infants that are not related to them. Also, this method attempted to capture as close as possible to an ‘in the moment’ understanding mothers have about why they think their infant is crying when they are in distress. Thus, identifying predictors of sensitivity to distress is important. That maternal behaviors in this study were observed and rated in multiple contexts and aggregated over time is a strength in that it should have yielded a highly reliable measure of maternal sensitivity.

Next, maternal depressive symptoms were assessed by the CES-D via self-report, which focuses on symptoms over the prior two weeks. Although the reports were gathered twice, and gathered over time, this does not fully address the chronicity with which mothers experienced and infants were exposed to depressive symptoms during the first 6 months. Mothers with elevated depressive symptoms may develop an early negative style of thinking about her infant that may carry over through time even after depressive symptoms are reduced. Mothers were not asked in this study to report a diagnosis of Major Depressive Disorder (MDD), or if they were seeking treatment or taking medications for MDD. Mothers who were in active treatment of MDD may not

have had current symptoms of depression, and reported based on not having current symptoms of depression, or treatment may moderate links between depressive symptoms and outcomes. This reaches beyond the scope of this study. This study was primarily examining elevated depressive symptoms and not a clinical diagnosis of depression, therefore, it could be that a clinical diagnosis of depression would alter these results. Finally, including composite scores of both CES-D at 1-year and 2-year, and infant affect to distress tasks at 1-year and 2-year as covariates is a strength, and rules out competing explanations for the observed associations.

Directions for the Future

There is great need to examine stability and change in maternal causal attributions over time, with relative importance on impacts of early depression for mother's long-term cognitions about their infants. There also is a need to better understand why Black mothers are rated as less sensitive than White mothers when infants are in distress. Thus, early screening may enhance the mother-infant relationship, emphasizing the importance of early social information processing between infants and mothers.

Conclusion

In the current study, I examined maternal causal attributions (negative, minimizing, and situations) as potential mediators of the relationship between elevated maternal depressive symptoms and later maternal sensitivity, and considered SES risk index and race as moderators of the mediated relationship. Results indicated that there were no indirect effects within the model, meaning that none of the causal attributions mediated the relationship between elevated maternal depressive symptoms and later

maternal sensitivity. A positive association between mothers with elevated depressive symptoms and negative causal attributions was found, however, contrary to prediction, no mediational pathways between depressive symptoms and sensitivity via attributions about crying were significant. A direct negative effect with elevated SES risk index and maternal sensitivity was found, indicating that mothers with higher SES risk index are at greater risk for less sensitive caregiving in distress contexts, compared to mothers with low SES risk index scores. The results from the current study suggest that mothers with elevated maternal depressive symptoms are more likely to make negative causal attributions about why their infant is crying, however, these negative attributions did not predict maternal sensitivity over time. Moreover, early depressive symptoms did not predict sensitivity over time and above the identified covariates. Given the significance of maternal sensitivity to infant distress for later child outcomes, additional research identifying the most salient predictors of this domain of parenting is needed, with particular attention to factors that may ameliorate the negative effect of SES risk on maternal sensitivity.

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APPENDIX A

TABLES

Table 1

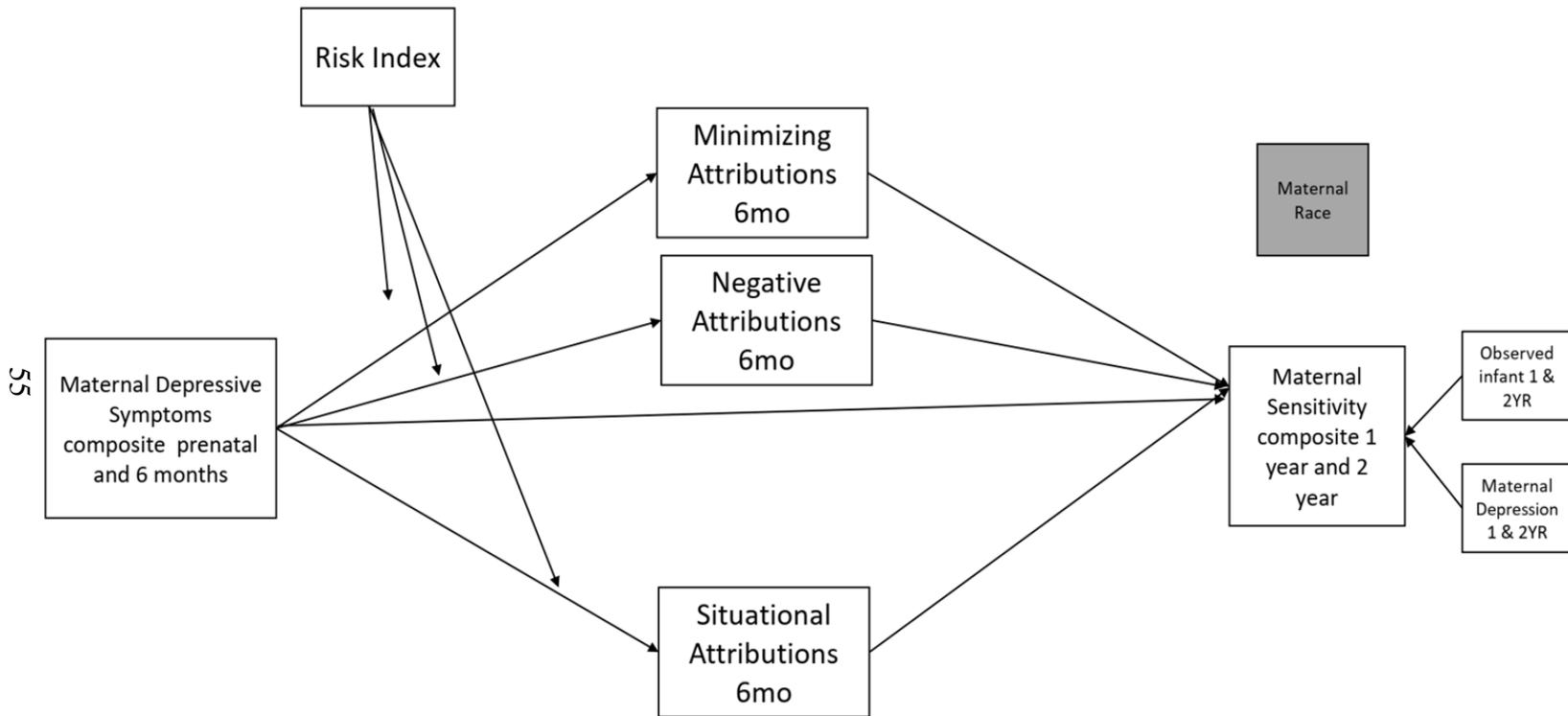
Correlations and Descriptive Statistic

	1	2	3	4	5	6	7	8	9
1. CES-D (prenatal & 6mo composite)	--								
2. Negative Causal Attributions	.20**	--							
3. Minimizing Causal Attributions	.09	.46**	--						
4. Situational Causal Attributions	-.11	.22**	.31**	--					
5. Maternal Sensitivity to Distress (1 & 2yr composite)	-.27**	-.26**	-.16*	.07	--				
6. Risk Index Composite	.33**	.27**	.17*	-.07	-.65**	--			
7. Maternal Race	.20**	.31**	.04	-.01	-.50**	.53**	--		
8. CES-D (1 & 2yr composite)	.67**	.27**	.17*	-.12	-.21**	.56**	.22**	--	
9. Infant Affect (1 & 2yr composite)	.03	.14*	.18*	.02	-.36**	.15	.07	.01	--
Mean	12.38	1.30	1.42	2.04	5.49	.02	1.51	10.88	4.17
SD	8.03	.29	.43	.60	1.60	.81	.50	7.87	.19

Note: * $p < .05$, ** $p < .01$. CES-d = Center for Epidemiological Studies- Depression; yr = year; mo = months

APPENDIX B

FIGURES



Race will be used as a covariate if no paths vary when running entire model with race as a moderator.

Figure 1. Conceptual Moderated Mediation Model.

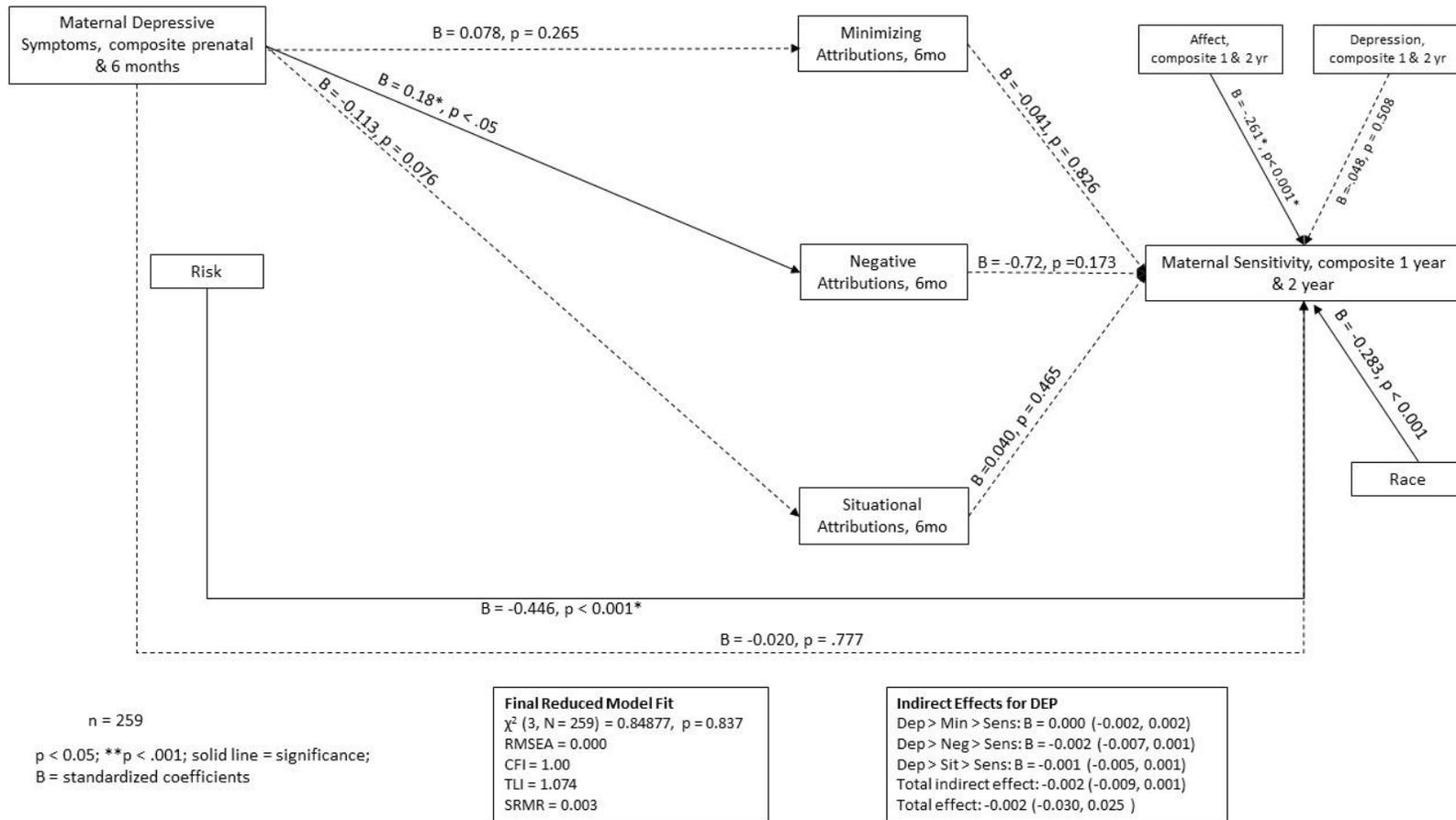


Figure 2. Full Statistical Moderated Mediation Model.