Stress, Depression, and the Mother-Infant Relationship Across the First Year

by

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ABSTRACT

Postpartum depression (PPD) is a significant public health concern affecting up to half a million U.S. women annually. Mexican-American women experience substantially higher rates of PPD, and represent an underserved population with significant health disparities that put these women and their infants at greater risk for substantial psychological and developmental difficulties. The current study utilized data on perceived stress, depression, maternal parenting behavior, and infant social-emotional and cognitive development from 214 Mexican-American mother-infant dyads. The first analysis approach utilized a latent intercept (LI) model to examine how overall mean levels and within-person deviations of perceived stress, depressive symptoms, and maternal parenting behavior are related across the postpartum period. Results indicated large, positive between- and within-person correlations between perceived stress and depression. Neither perceived stress nor depressive symptoms were found to have significant between- or within-person associations with the parenting variables. The second analysis approach utilized an autoregressive cross-lagged model with tests of mediation to identify underlying mechanisms among perceived stress, postpartum depressive symptoms, and maternal parenting behavior in the prediction of infant social-emotional and cognitive development. Results indicated that increased depressive symptoms at 12- and 18-weeks were associated with subsequent reports of increased perceived stress at 18- and 24-weeks, respectively. Perceived stress at 12-weeks was found to be negatively associated with subsequent non-hostility at 18-weeks, and both sensitivity and non-hostility were found to be associated with infant cognitive development and social-emotional competencies at 12 months of age (52-weeks), but not

with social-emotional problems. The results of the mediation analyses showed that non-hostility at 18- and 24-weeks significantly mediated the association between perceived stress at 12-weeks and infant cognitive development and social-emotional competencies at 52-weeks. The findings extend research that sensitive parenting in early childhood is as important to the development of cognitive ability, social behavior, and emotion regulation in ethnic minority cultures as it is in majority culture families; that maternal perceptions of stress may spillover into parenting behavior, resulting in increased hostility and negatively influencing infant cognitive and social-emotional development; and that symptoms of depressed mood may influence the experience of stress.

DEDICATION

This dissertation is dedicated to my graduate adviser, Keith Crnic, who, with a contagious mix of optimism and enthusiasm continually challenged and inspired me to do my very best. Keith generously welcomed me into both his academic and real families, and helped me find the much-needed happiness, support, and confidence to persevere the long years of graduate training. Of the many Keith-isms I've collected over the years, there are two I reflect on regularly: How to gauge the height of the bar to most efficiently reach the mark; and, to always have my idea book on hand and ready for any fleeting thoughts, brilliant or otherwise. Thank you for everything, Keith. You helped me find my star power.

"I do live in a topsy-turvy world. It seems like I have to do something wrong first, in order to learn from what not to do. And then, by not doing what I'm not supposed to do, perhaps I'll be right. But I'd rather be right the first time, wouldn't you?"

—Alice to the Mad Hatter in Lewis Carroll's *Alice in Wonderland*

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After seven amazing years filled with laughter and friends, trials and tears, time-crunches and to-do lists, brilliant colleagues, sleepless nights and sleep-filled days, and a zillion edits to my dissertation, I am ready for the challenges and responsibilities that come with the title of Doctor.

I could not have survived without the love and encouragement of my family: my mother, Diane; my sisters, Ann and Elena; my aunt, Carmela; my love, Jacob; my besties Erin, Nicole, Josh, and Jared; and my incredible network of friends.

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And finally, I want to acknowledge the support of my mentor Steve West. I will forever remember the sage advice he gave me through the timeless words of the Red Queen in Lewis Carroll's *Alice in Wonderland*: "My dear, here we must run as fast as we can, just to stay in place. And if you wish to go anywhere you must run twice as fast as that."

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CHAPTER 1

INTRODUCTION

The dissertation investigated the transmission of risk from mothers with postpartum depression to their infants. Using data collected from a low-income, Mexican-American sample at multiple time points during the first postpartum year, a series of models were run to specify the complex, longitudinal relations among perceived stress, depressive symptoms, maternal parenting behavior, and infant developmental outcomes at one year postpartum. The aims of the dissertation were to examine how overall mean levels of perceived stress, depressive symptoms, and maternal parenting behavior relate across the postpartum period; to investigate the within-person relations among perceived stress, depressive symptoms, and maternal parenting behavior, that is, whether elevations in one variable for a given person at a given occasion (e.g. greater than usual report of stress) are associated with elevations in the other variables at that occasion; and test for mediation within an autoregressive lagged model to determine whether maternal parenting behavior functions as a mediating factor between perceived stress and postpartum depressive symptoms, and infant social-emotional and cognitive development.

CHAPTER 2

BACKGROUND LITERATURE

Rates of Postpartum Depression

The perinatal period has attracted much attention due to increased awareness of the detrimental effects of postpartum depression on children (Goodman, 2007). In fact, exposure to maternal depression during the first few months of life has been suggested to be more harmful than later exposure (Murray, Sinclair, Cooper, Ducournau, Turner, & Stein, 1999). Early infant experiences during the postnatal period are considered a critical influence in the emergence of children's cognitive and emotional/behavioral competencies (Bornstein, 1989; Sroufe, Coffino, & Carlson, 2010). Much research has focused on the early postnatal period, often conceptualized as a "sensitive period," or vulnerable point of development during which early interaction with the environment determines future functioning and adaptation of the infant (Bornstein, 1989; Knudsen, 2004). Given that there is increased risk for onset of depression to occur during the first 5 months postpartum (Munk-Olsen, Munk Laursen, Bøcker Pedersen, Mors, & Mortensen, 2006), that symptoms can persist well into and beyond the first postpartum year (Goodman, 2004), and that the early postpartum period is critical for infant development (Sroufe, Coffino, & Carlson, 2010), there is substantial reason to investigate these processes as they unfold across the first year.

Recent epidemiological research has indicated that the period prevalence of depression among women is 21.9% during the first postpartum year (Wisner et al., 2013), with reported point prevalence during pregnancy ranging from 8.5% to 11%, and point prevalence during the first postpartum year ranging from 6.5% to 12.9% (Banti et al.,

2011; Gavin, Gaynes, Lohr, Meltzer-Brody, Garlehner, & Swinson, 2005; Wisner et al., 2013). Although the prevalence of depression did not differ significantly between pregnancy and postpartum, Banti and colleagues (2011) reported that the incidence, or rate of new cases of depression during postpartum was three times higher than the rate of new cases during pregnancy at (6.8%). Further, the percentage of new onset first time episodes of depression occurring postpartum was 5.8%, and the percentage of recurring cases during postpartum for women with a history of depression was 7.7%, data that points to the elevated risk for depression onset or recurrence during the postpartum period (Banti et al., 2011).

In Hispanic and Latina populations, postpartum women report more depressive symptoms than European-American women, and after controlling for socio-economic factors and other measures of functioning and support, the adjusted odds ratio for reported postpartum depressive symptoms was 1.89 (95% CI: 1.19-3.01) compared to European-American women (Howell, Mora, Horowitz, & Leventhal, 2005). Although there is indication for increased rates of depression, there is significant disparity in research that has included Hispanic and Latina women (Howell et al., 2005), a strong reason to study postpartum depression in this population.

Measurement of Postpartum Depression

Importantly, there is wide variability in the way depression in measured across studies. Whereas some researchers include measures of clinical depression diagnosed through clinical interviews (Banti et al., 2011), other researchers utilize self-reported symptom scales such as the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987). Rates of depression using self-reported symptom scales like the

EPDS were found to be significantly higher than interview-based diagnoses (O'Hara & Swain, 1996). However, the findings of a meta-analysis indicated that the absolute difference in postpartum depression prevalence estimates between self-report of symptoms (14%) and diagnostic interview (12%) was relatively small in magnitude, albeit significant (O'Hara & Swain, 1996). Moreover, women identified as having depression by clinical diagnosis or symptom scales did not differ significantly on measures of psychosocial dysfunction (Gotlib, Lewinsohn, & Seeley, 1995), suggesting that subclinical symptom levels of depression are still associated with significant impairment (Allen, Chango, Szwedo, & Schad, 2014; Lewinsohn, Rohde, Seeley, Klein, & Gotlib, 2000). Other reports have found a similar small difference among minority women in prevalence rates using symptom scales versus clinical diagnosis (Zayas, Cunningham, McKee, & Janknowski, 2002), providing support for the use of symptom scales to report depression. Symptom scale measures like the EPDS (Cox et al., 1987) have been validated in multiple populations including Latin American women (Affonso et al., 1992; Morris-Rush, Freda, & Bernstein, 2003), and are the most frequently used measures of depression in postpartum women (Affonso, De, Horowitz, & Mayberry, 2000). The benefits of symptom scales measures include reduction of research burden on participants (Howell et al., 2005), greater sensitivity to changes in depression symptoms over time (Eberhard-Gran, Eskild, Tambs, Opjordsmoen, & Samuelsen, 2001), and greater statistical power (MacCallum et al., 2002). Tracking symptoms longitudinally rather than relying on cut-off scores and diagnostic categories increases flexibility to measure heterogeneity in depression symptoms with techniques such as latent structural equation models (Ryu, West, & Sousa, 2012).

The latent-class and trajectory studies move away from the classification schemes that assume the existence of clearly defined subgroups and potentially enable a more nuanced understanding of the course and severity of depressive symptoms over the postpartum period (Campbell, Morgan-Lopez, Cox, McLoyd, & NICHD Early Child Care Research Network, 2009). Moreover, the trajectory models allow investigation of the factors that may be associated with a particular course of depression, and provide important clinical information about which women may be at risk for more chronic and disabling depression. Unfortunately, there are few studies that use trajectory analyses to model postpartum depression over time, limiting our current understanding of the factors contributing to the variability in postpartum depression.

Course of Postpartum Depression

There is substantial debate about the definition and course of postpartum depression. A discussion of the criteria for postpartum depression highlights the inconsistencies in the field (Wisner, Moses-Kolko, & Sit, 2010), with current Diagnostic and Statistical Manual (DSM-5) (American Psychiatric Association, 2013) diagnostic criteria requiring *onset* within 4 weeks of childbirth, and the International Classification of Diseases (ICD-10; 1992) specifying 6 weeks postpartum for onset of the disorder. It has been recommended by expert panels to expand the onset time range to 3 months postpartum (Elliott et al., 2000), as the risk for psychiatric illness was significantly higher throughout that period of time (Munk-Olsen et al., 2006), and others have suggested that for some women, the onset of symptoms may occur later in the first postpartum year (Goodman, 2004). Generally much of the research on postpartum depression measures symptoms at least across the first three months, and frequently across the first year

postpartum, as the effects of symptoms on the mother-infant relationship and infant development during this time are substantial (Teti, Gelfand, Messinger, & Isabella, 1995). In addition, the course of symptoms has been found to be highly variable, with some women remitting early in the first few months postpartum, and others having symptoms continue past the first year postpartum (Goodman, 2004).

Although it has been reported that the majority of women with early postpartum depressive symptoms recover in the first 3 to 6 months postpartum, particularly those with first lifetime onset of depression (Campbell, Cohn, Flanagan, Popper, & Meyers, 1992; Cooper & Murray, 1995; Horowitz & Goodman, 2004), the data from studies with different methodologies converge to indicate that women who experience postpartum depression in the first few months postpartum are at an increased risk for subsequent depressive symptoms (Sutter-Dallay, Murray, Dequae-Merchadou, Glatigny-Dallay, Bourgeois, & Verdoux, 2011). In fact, a high proportion of women (approximately 15%-25%) continue to experience clinically significant symptoms at 1 to 2 years postpartum, and 30%-40% of women continue to have subclinical levels of depression across the 2 year postpartum period (Beeghly et al., 2002; Campbell, Cohn, Flanagan, Popper, & Meyers, 1992; Cooper & Murray, 1995; Horowitz & Goodman, 2005). It was reported in Beeghly et al. (2002) that women's depressive symptoms measured every three months were correlated across time points, and that women reporting higher levels of symptoms at 2 months postpartum were at increased risk for continuing to experience higher levels of depressive symptoms throughout the postpartum year. Moreover, significant intra-individual stability in depressive symptoms has been found in the postpartum period

(Beeghly et al., 2002; Dipietro, Costigan, & Sipsma, 2008), suggesting that on average, women were maintaining consistent levels of depressive symptoms over time.

However, several studies report variability in trajectory classes of women, with some groups of women reporting declining symptoms over time (Ashman, Dawson, & Panagiotides, 2008; Campbell, et al., 2009). Interestingly, there is longitudinal evidence that change in symptoms may follow non-linear patterns and that early declines in symptoms may not be indicative of long-term trajectories (Wu, Selig, Roberts, & Steele, 2011). Although these findings provide information about the overall levels of postpartum depressive symptoms and generally suggest rank order stability of depressive symptoms over time, there is indication of non-linear change that prompts investigation into individual differences in depressive symptoms, particularly the within-individual changes, or the ups-and-downs, that women experience over time. Using symptom reports to map increases or decreases in symptoms at particular time points may provide information about environmental triggers or interpersonal characteristics that influence the rise and fall of symptoms over time.

Factors that have been consistently associated with postpartum depressive symptoms, including higher mean levels and changes in symptoms, include sociodemographic characteristics such as low socioeconomic status, younger maternal age, marital status, and lower education (Beeghley et al., 2002; Poehlmann, Schwichtenberg, Bolt, & Dilworth-Bart, 2010); psychosocial factors such as previous psychiatric history, social support, major life events, and chronic stressors (Honey & Morgan, 2003; Milgrom et al., 2008; Seguin, Potvin, St-Denis, & Loiselle, 1999; Swendsen & Mazure, 2000); and infant-related factors such as preterm birth, parenting

stress, and infant temperament (Poehlmann, Schwichtenberg, Bolt, & Dilworth-Bart, 2009; Crnic & Greenberg, 1990; Hopkins, Campbell, & Marcus, 1987; Mayberry & Affonso, 1993). Unfortunately, the majority of research investigates predictors that are measured cross-sectionally, and few studies include longitudinal measures of predictors of postpartum depression (see Campbell et al., 2009; Goodman, 2004; Horwitz, Briggs-Gowan, Storfer-Isser, & Carter, 2007). Interestingly, the literature on major depressive disorder and depressive symptoms across the lifespan has provided theoretical argument and strong evidence in support of the role of chronic perceived stress in the onset and maintenance of depression (Hammen, 2005), a line of research that may help to explain the variability in postpartum depression.

Stress as a Risk Factor for Depression

Interest in the relation between stress and depression is longstanding, and given the significant neurophysiological changes associated with stress, it is not surprising to find substantial evidence that stressful life experiences are associated with increased risk for depression (Hammen, 2005; Kessler, 1997). In current conceptualizations, the generally accepted definition of stress involves a real or anticipated threat to homeostasis or an anticipated threat to well-being (Herman, 2011). This threat may be a true homeostatic threat, such as blood loss, but can also take the form of a psychogenic or psychological stressor, manifesting as "anticipated" threats in which sensory stimuli are interpreted through the lens of previous experience or innate dispositions (Herman et al. 2003). Although having a greater number of stressors is an important risk factor for depression, there is debate regarding whether the subjective *stressfulness* of events may be more influential than the objective frequency of events (Kuiper, Olinger, & Lyons, 1986).

As such, the extent to which a stressor may influence mood and symptoms may be related to the individual's appraisal of the situation, and the extent to which the event was bothersome. The transactional stress theory suggests that personal stake, degree of threat, and available coping resources determine the emotional impact of a stressor on an individual (Lazarus & Folkman, 1984). Accordingly, what might be a highly threatening stressor to one person (e.g. transportation difficulties) may not bother another. Thus, it is important to capture the degree to which situations in one's life are perceived as stressful. The Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983) is one of the most widely used instruments for measuring the perception of stress (Anderou et al., 2011). The PSS was developed to measure the psychological perception of stress, with scale items evaluating how unpredictable, uncontrollable, and overloading the respondents find their lives (Karam et al., 2012). Importantly, the PSS has been frequently used as a measure of stress in peripartum populations (Razurel, Kaiser, Antonietti, Sellenet, & Epiney, 2013), and was recently assessed as psychometrically valid and reliable in a population of pregnant women (Karam et al., 2012).

The current understanding of the association between stress and depression has been limited by the extent to which the literature has focused on clinical samples of depressed individuals, and has neglected prospective studies in other special populations that might be at heightened risk for depression. Much of the research on the relation between stress and depression has primarily been done with adults, with particularly strong support in samples of women (Hammen, 2009; Liu & Alloy, 2010). Unfortunately, women in the perinatal and postpartum period, particularly Latina women, have not been systematically studied, even though these women provide a unique context in which to

study the onset of depression and its relation to stress. Latina women have been reported to have greater exposure to chronic life stressors, including risk factors common in the general population (i.e. marital problems, social support), but also greater exposure to stressors related to poverty and social class, and stressors more specifically related to their immigration status, discrimination, and acculturation (Zelkowitz et al., 2004), placing these women at greater risk for depression and other psychosocial difficulties (See Mendelson, Rehkopf, & Kubzansky, 2008 for review). Moreover, "role entry" such as becoming a new mother, has been identified as an opportunity to prospectively study changes in chronic stress and the effects on depression (Kessler, 1997). In fact, the birth of a child and the peripartum period are inherently stressful times associated with social, psychological, and physical adaptations that occur with new parenthood (Razurel et al., 2013). From the transition to/from the hospital, to the logistics of caring for a new baby, to the inevitable changes in the family structure, mothers experience a full range of stressors that may contribute to elevated levels of psychogenic stress and depressive symptomatology (See Hung, Lin, Stocker, & Yu, 2011). With women generally facing high rates of both chronic stress and depression, and first time mothers facing a host of stressful life changes, there is reason to suspect that stressors during the postpartum are related to the course of depression (Swendsen & Mazure, 2000).

Studies that specifically measured stress levels during the perinatal period have shown that mothers' overall stress levels increased following childbirth (Krieg, 2007), that high levels of reported daily hassles and child care stress were associated with low postnatal mood and increased psychological distress (O'Hara, Hoffman, Phillipps, & Wright, 1992; O'Hara, Zekoski, Phillipps, & Wright, 1990; Honey & Morgan, 2003), and

that daily stress in the form of arguments with family was predictive of postpartum depression (Page & Wilhelm, 2007). Importantly, daily stressors and cognitive appraisals of stressful events significantly predicted depressive symptoms after controlling for prior symptoms (Honey & Morgan, 2003). According to a meta-analysis of eleven studies conducted by Razurel et al. (2013), symptoms of depression in the postnatal period were strongly associated with the level of perceived stress reported during pregnancy and after childbirth. As such, the converging evidence suggests that perceived stress may play a crucial role in the onset and recurrence of depressive symptoms.

Although many of the studies in the meta-analysis reported longitudinal findings (n = 7), they primarily focused on the association of perceived stress at Time 1 with depressive symptoms at Time 2, did not track trajectories of stress and symptoms over time (Razurel et al., 2013) and did not partition stress and symptoms into between-person and within-person components. Thus, it is important to incorporate multiple measurements of stress and depressive symptoms over time in order to model change and stability. Longitudinal models, including autoregressive models, assess the bidirectional influence of stress and depression as a way to investigate the direction of effect as well as change in stress or depression (i.e. increase/decrease) as a result of prior stress and symptoms.

Influence of Stress and Depression on Maternal behavior

As mentioned previously, depression during the postpartum period has been shown to significantly interfere with maternal functioning, the mother-infant relationship, and infant development (Goodman & Tully, 2006). Parenting behavior, especially maternal sensitivity, has been linked extensively with maternal psychological

functioning. It has been suggested that the symptoms of depression interfere with the ability to effectively parent (Goodman & Gotlib, 1999). Symptoms of anhedonia, dysphoria, fatigue, low energy, reduced concentration, sleep disturbances, and suicidal ideation can be extremely debilitating and make it difficult for mothers to provide the attention, warmth, responsiveness, stimulation, nurturance, and consistency that children need for optimal development (Belsky, 1984). Specifically, depressed mothers were noted to be more irritable and hostile, be less engaged, show less emotion and warmth, and have lower rates of play with their infants (Lovejoy, Graczyk, O'Hare, & Neuman, 2000). When mothers were asked to engage face-to-face with their infants, those with depression were less vocal, smiled less, and did not do as much imitation or game playing (Field, Diego, & Hernandez-Reif, 2006), behaviors that are considered important for infant cognitive, social, emotional, and physical development (Britto, Fuligni, & Brooks-Gunn, 2002). Similarly, highly stressed mothers were reported to be less supportive and responsive, more insensitive, and to use more controlling, intrusive, and harsh parenting behaviors (Crnic, Gaze, & Hoffman, 2005; Crnic, Greenberg, Ragozin, Robinson, & Basham, 1983; Pianta & Egeland, 1990).

Importantly, many of these studies utilize observational methods to capture mother-infant interactions (Lovejoy et al., 2000). Although there remain issues with inconsistency in the scoring measures used, the developmental period of measurement, and the amount of observation time, the observational methodology is thought to provide invaluable information about maternal behavior during interactions with her infant (Honig, Tannenbaum, & Caldwell, 1973). Observations have been successfully used to measure maternal parenting behavior during the first postpartum year (Field, 2010), and

observation length was only weakly associated with effect sizes on measures of parenting behavior (Lovejoy et al., 2000). Although an observed interaction represents a small cross-section of behavior, significant variability in behaviors have been shown, and the ability to compare observed interactions over time lends support to the consistency of this methodology (Mills-Koonce, Gariepy, Sutton, & Cox, 2008).

Interestingly, ratings of observed maternal sensitivity were found to be stable in level and rank order over time, whereas ratings of maternal intrusiveness were not, a finding suggesting there may be trait and state influences on these behaviors that warrant repeated observations (Feldman, Greenbaum, Mayes, & Erlich, 1997). Further, there are numerous coding systems that attempt to capture mother-infant interactions and maternal parenting behavior. There is variation in whether investigations report the use of global measures of parenting, or whether the focus is given to discrete behaviors indicative of the larger construct (Kemppinen, Kumpulainen, Raita-Hasu, Moilanen, & Ebeling, 2006; Bornstein & Tamis-LeMonda, 1990). Methodological considerations become increasingly important with changes in development – if a measure encompasses maternal behaviors that are characteristic of a particular developmental stage, this measure may not be appropriate for later stages of development, introducing instability in the measurement (Lohaus, Keller, Ball, Voelker, & Elben, 2004). Global measures are considered more stable than measures of discrete behavior that are likely to change over time (Holden & Miller, 1999). As such, many studies, including the present proposal, incorporate a global measure of parenting behavior taken from observation. The global measure is thought to be robust to developmental stage and more accurately reflect the expression of the particular parenting construct.

Several models measuring depressive symptom levels over time have shown that that symptoms at a given time point are negatively associated with maternal sensitivity, such that higher levels of depressive symptoms are associated with lower maternal sensitivity levels at that time point (Campbell et al., 2009; Mills-Koonce et al., 2008). Additionally, a meta-analysis indicated that concurrent symptomatology was more strongly associated with negative parenting behavior than lifetime occurrence of depression, whereas there were no differences in effect size for the association between positive parenting behavior and concurrent or lifetime depression (Lovejoy et al., 2000). Similarly, a study using hierarchical linear modeling (HLM; Raudenbush & Bryk, 2002) reported that mothers with only one episode of depression during early infancy (<24 months)) significantly differed from mothers with recurrent depression (measured through child age 6 years) on measures of consistent parenting and positive discipline, in which recurrently depressed mothers used more harsh and physical punishment. However, they did not differ on measures of warmth and nurturance, with both groups of depressed mothers being less warm and nurturing than non-depressed mothers (Letourneau, Salmani, & Duffett-Leger, 2010).

These patterns of findings are intriguing because they suggest that increases in symptoms like irritability, negative affect, fatigue, and anhedonia may specifically and concurrently contribute to increased negative, critical, and harsh parenting behavior. In contrast, low levels of *positive* maternal behavior may be related to more dispositional and interpersonal characteristics that underlie vulnerability for depression, an argument conceptually related to the stress generation model (Hammen, 2006). Providing support for a model of depression as concurrently affecting maternal behavior, Letourneau and

colleagues (2010) suggested that parenting behaviors that are established early on, like warmth and nurturance, might be vulnerable to early depressive symptoms that continue to affect these parenting behaviors in the long term. In contrast, the authors suggest that parenting behaviors that emerge as children mature, such as consistency and positive discipline, are more vulnerable to later incidence of depression (concurrent negative effects). These findings are also in accordance with data to suggest that improvement in or remittance of depression does not consistently result in improvements in maternal sensitivity or positive mother-infant interactions (Foreman, O'Hara, Stuart, Gorman, Larsen, & Coy, 2007; Goodman, Broth, Hall, & Stowe, 2008; Gunlicks & Weissman, 2008; Murray, Cooper, Wilson, & Romaniuk, 2003). In fact, mothers with a history of depression tend to have less positive parent-infant interactions across childhood (Hipwell, Goossens, Melhuish, & Kumar, 2000). With such differential relations between positive and negative parenting and symptomatology, it will be crucial to compare types of parenting behavior (i.e. sensitivity, hostility, intrusiveness) to provide nuanced information regarding the concurrent and long-term parental vulnerabilities associated with stress and depression.

Although there is ample evidence that mean levels of stress and depression are associated with less positive parenting and more negative parenting, there has been little investigation into the relations among these factors at a within-person level. That is, how individuals' elevations and decreases in stress, depression, and mother-infant interaction quality relate to each other concurrently and across time. Although it may be the case that there is no significant mean level change in stress, symptoms, or mother-infant interaction quality over time, it is possible that there are fluctuations from the mean that

may provide meaningful information about the associations among stress, symptoms, and parenting. Taking an example from health research, heart rate readings or blood pressure are expected to stay relatively stable over time within each individual but vary between individuals. Within each individual, however, fluctuations around the mean level may occur in response to factors such as environmental demands (e.g. exercise). Thus, even though there may not be trajectories of growth or decline over time, longitudinal data still provides the opportunity to separate between-person and within-person effects to investigate the relations between mean levels as well as the relations between fluctuations within person (see Ryu et al., 2012).

Finally, in the few studies that investigate parenting in Latina and Mexican mothers, maternal depression has also been linked with more hostile parenting (Parke et al., 2004), as well as decreased warmth and less consistent parenting (White, Roosa, Weaver, & Nair, 2009). In addition, external stressors including financial hardship and acculturation stress (e.g. pressure to speak English) were significantly related to lower levels of maternal warmth, mediated through depressive symptoms (White et al., 2009). However, other studies have indicated that maternal behavior did not differ between Latin American mothers with high and low levels of depressive symptoms (Boyd, Zaya, & McKee, 2006; Ruttenberg, Finello, & Cordeiro, 1997), and that maternal psychosocial functioning was not associated with maternal sensitivity, although this particular sample reported little psychosocial distress (Howes & Obregon, 2009). In addition, Latina mothers were found to be more controlling and intrusive during interactions with their children than European American mothers, although this may be related to cultural factors (Halgunseth, Ipsa, & Rudy, 2006), and in fact, high maternal control in less

acculturated families has been associated with subsequently more positive interpersonal relationships for the children (Ipsa et al., 2004). It seems that level of acculturation may be more directly influential on maternal behavior than psychosocial functioning, helping to explain some findings of mitigated effects of depression on parenting (Perry, Ettinger, Mendelson, & Le, 2011). Thus, it will be important to account for level of acculturation when investigating parenting behaviors in Hispanic and Latina populations in order to have a more accurate and nuanced understanding of the role of stress and postpartum depression on maternal behavior.

Infant Social Emotional and Cognitive Development

The quality of the mother-infant relationship and parenting behavior has been identified as important for the development of emerging child competencies and a likely mechanism through which mothers affect child development (Goodman & Gotlib, 1999). The mother-infant relationship is thought to provide the context for the socialization of emotion regulation (Cole, Michel, & Teti, 1994), as well as the necessary scaffolding to foster attention and cognitive development (Murray, Fiori-Cowley, & Cooper, 1996). Within the literature on attachment and emotional availability, there is extensive evidence that higher quality mother-infant interactions and greater emotional availability are associated with more optimal outcomes across important domains such as attachment security, emotional and behavioral regulation, and cognitive functioning (Easterbrooks, Biesecker, & Lyons-Ruth, 2000; Landry, Smith, Swank, Assel, & Vellet, 2001). In particular, efficient emotion regulation and cognitive skills are necessary for healthy adaptation (Cole & Deater-Deckard, 2009) and have significant roles in numerous developmental outcomes such as mental health, academic achievement, and social

behavior (Murray et al., 1999). Moreover, these processes seem to be interrelated, with better emotion regulation skills found to increase as a function of cognitive and language development (Cole & Deater-Deckard, 2009).

There is strong empirical support for the role of early caregiving on the development of infant regulatory abilities, and accordingly, on the necessary early foundation for subsequent cognitive and social-emotional development. For example, maternal sensitivity and scaffolding evaluated at 12-15 months significantly predicted executive function at 18 and 26 months (Bernier, Carlson, & Whipple, 2010). Relatedly, greater maternal sensitivity during emotionally arousing tasks was related to infants' adaptive emotion regulation and the absence of behavioral problems (Crockenberg & Leerkes, 2004, 2006; Moore & Calkins, 2004). Moreover, maternal vocalizations, especially infant-directed speech, and quality of the home environment were associated with later intelligence, including better performances on cognitive tests and standardized scales (Murray, Kempton, Woolgar, & Hooper,1993) and higher IQ scores at 12 years (Sigman, Cohen, & Beckwith, 1997). Evidence has linked maternal postpartum depression to numerous developmental outcomes in children that may be related to underlying attentional and emotional regulation skills, including emotional and behavioral dysregulation, cognitive impairment, the emergence of psychopathology, insecure attachment, and maladaptation (Goodman & Tully, 2006). As a result, it is reasonable to theorize that the mother-infant relationship functions as a mechanism through which mothers affect infant development, and that if the process becomes disrupted, then infant development will be impaired.

Infants and children of depressed mothers show poorer regulation of negative affect, less shared positive affect, and greater emotional disturbances (Zahn-Waxler, Cummings, McKnew, & Radke-Yarrow, 1984). They are noted to be more irritable, listless, and disinterested (Tronick, 1989), and subsequently have difficulties in regulating the intensity and duration of emotion. When the process of emotion regulation is ineffective, emotions affect behavior in ways that are problematic and can interfere with learning and social interactions (Cole & Hall, 2008). Early exposure to depression is associated with greater risk for adverse effects on child emotional well-being, and significantly predict emotion regulation difficulties in children at age 4 years (Maughan, Cicchetti, Toth, & Rogosch, 2007).

Similar to disruptions in early emotion regulation, there is evidence that exposure to maternal depression negatively affects attentional processes, and subsequently, cognitive development. Infants of depressed mothers showed lower cognitive and psychomotor development (Cornish, McMahon, Ungerer, Barnett, Kowalenko, & Tennant, 2005), lower scores on developmental assessments (Field, 1998), sensorimotor problems in infancy (Murray, 1992), attention problems (Hay, Pawlby, Sharp, Asten, Mills, & Kumar, 2001) and deficits in associative learning (Kaplan, 2009). Remarkably, long-term cognitive effects of postpartum depression were found at 11 and 16 years of age (Hay, Pawlby, Waters, & Sharp, 2008), and cognitive detriments were especially true for boys (Hay et al., 2001; 2008; Murray et al., 1996). Several studies reported that toddlers and preschoolers of chronically depressed mothers showed greater cognitive or language deficits compared to never- or sometimes-depressed mothers (Brennan, Hammen, Andersen, Bor, Najman, & Williams, 2000; Field, 1992; Kurstjens & Wolke,

2001; NICHD Early Child Care Research Network, 1999), a finding supported by subsequent research that chronic depression has increasingly detrimental effects (Goodman, 2007). The literature on cognitive and social-emotional outcomes strongly suggests that infants of depressed mothers are at risk for long-term deficits and invites more longitudinal research to better understand the role of the parent-infant relationship as a mediating factor.

Parenting Behavior as a Mediator

Parenting behavior has long been considered a mediating mechanism (Baron & Kenny, 1986) or intervening variable through which maternal depression influences child functioning (Burke, 2003; Goodman & Gotlib, 1999). In the Integrative Model for the Transmission of Risk to Children of Depressed Mothers, Goodman and Gotlib (1999) proposed several mechanisms to explain the relation between maternal depression and the development of psychopathology and other issues in children, each of which have empirical support and help to explain the complexity in process of transmission of risk (Goodman & Gotlib, 1999; Goodman, 2007). The proposed mechanisms include (1) heritability, (2) innate dysfunctional neuroregulatory mechanisms, (3) exposure to mothers' negative affect, cognitions, behavior; and (4) exposure to stressful environments. Only brief consideration will be given to the first two mechanisms, given the focus of this dissertation on the final two mechanisms.

1. *Heritability*. Heritability must always be considered in the context of parent-child processes, and there are data to suggest genetic susceptibility to depression and associated vulnerabilities that may help to explain the transmission of risk from parents to

children. However, genetic studies on the topic have been limited, and genetic effects do not fully explain the variance in childhood disorders (Goodman, 2007).

2. Dysfunctional neuroregulatory mechanisms. Innate neuroregulatory dysfunction refers to the child's fetal and early life exposure to conditions associated with maternal depression (e.g. poor health behaviors, elevated stress hormones, exposure to antidepressants) that impair the development of neurobiological systems, including the HPA axis. The resulting stress-related physiological dysregulation in infants and children has been associated with subsequent emotional and behavioral problems (Wadhwa, 2005). This area of research is important to establish early neurobiological vulnerability to risk, and although there is substantial support in animal models (Weinstock, 2005), not as much research has been done with human infants (Field, 2002; Goodman & Tully, 2006). .

3. *Mother's negative affect, cognitions, behavior.* Exposure to negative and maladaptive maternal affect, cognitions, and behavior has also been identified as a mechanism through which infants and children may model and acquire emotional, cognitive, and behavior vulnerabilities for depression and other problems (Goodman & Gotlib, 1999). As previously discussed, negative maternal mood and dysfunctional patterns of emotion and behavior may disrupt the infant's ability to learn to effectively regulate emotion and attention (Goodman & Tully, 2006). Relatedly, depressed mothers who are withdrawn or intrusive may not provide adequate stimulation or arousal modulation to promote developmental competencies (Field, 1998), suggesting that inadequate parenting due to depressive symptoms and vulnerabilities may prevent mothers from meeting infants' needs (Cicchetti, Rogosch, & Toth, 1998) and interfere

with healthy infant development. There is growing evidence that these parenting processes mediate the relation between maternal depression and infant and child outcomes, including cognitive and social emotional development.

The Conduct Problems Prevention Group completed a yearlong study from kindergarten to first grade that indicated mother-child interaction quality partially mediated the relation between maternal depressive symptoms and child externalizing behavior (Harnish, Dodge, & Valente, 1995). Additional studies reported that inconsistent discipline mediated the relation between maternal distress and child aggression in boys ages 9 to 12 years (Barry, Dunlap, Lochman & Wells, 2009), and that parenting (consistent discipline, rejection, nonviolent discipline, psychological aggression) partially mediated the relation between maternal depression and child emotional and behavior problems and fully mediated the relation with adaptive skills in children ages 4 to 10 years in a low income sample (Riley et al., 2009). Although these studies provide evidence in support of an indirect effect of the mother-child relationship, the cross-sectional data do not demonstrate more than concurrent relations among the variables. In a subsequent longitudinal study by the Conduct Problems Prevention Group on child disruptive behavior, the quality of the mother-child relationship and interviewer ratings of maternal warmth were found to mediate the association between maternal depression when children were 5 years old, and child disruptive behavior three years later (McCarty, McMahon, & Conduct Problems Prevention Research Group, 2003).

Similarly, two additional studies reported that the longitudinal relation between parental psychological distress and child adjustment problems in children followed from age 8-to 16-years old was partially mediated by parental acceptance (Papp, Cummings, &

Goeke-Morey, 2005), and that over a two year period, parental nurturance, rejection, and monitoring mediated the effects of depressive symptoms on internalizing and prosocial behavior in children ages 10-15 years (Elgar, Mills, McGrath, Waschbusch, & Brownridge, 2007). These longitudinal studies are important because they provide strong evidence in support of the mother-child relationship as a temporal mediator for child effects. Each of the studies utilized independent raters of parent, child, and relational behavior, and Papp et al. (2005) systematically compared alternate models that indicated support for reciprocal relations between parent behavior and children. Moreover, these studies cover a broad developmental span from childhood to adolescence, suggesting that meditational processes transcend developmental periods.

Additionally, several large, longitudinal studies investigated negative parental behavior as a mediator between parental psychiatric status and child adjustment/maladjustment (Bifulco et al., 2002; Burt, McGue, Krueger, & Iacono, 2005; Johnson, Cohen, Kasen, Smailes, & Brook, 2001). Importantly, these studies each showed that the effects of parental psychiatric status on child adaptation/maladaptation in late adolescence or early adulthood was mediated by negative parental behavior, including a maladaptive parenting composite (e.g. low time spent with child, low affection, harsh punishment, poor communication, etc.) (Johnson et al., 2001) and measures of control, neglect, and abuse (Bifulco et al., 2002; Burt et al., 2005). Thus, the current literature provides broad support for both positive and negative aspects of parenting and the parent-child relationship as mediators of the relation between maternal depression and child adaptation.

4. *Exposure to stressful environments.* Goodman and Gotlib (1999) have theorized that maternal depression increases children's stress exposure through inadequate parenting, symptoms and course of depression, chronic and episodic stressors associated with maternal depression, and stress generation associated with depression (for review see Hammen, 2006; Goodman, 2007). Little research has been done on exposure to maternal stress as a mediator of the maternal depression-child outcome relationship as has been done on parenting behavior. Measures of maternal stress have more frequently been used as predictors of child outcomes that may be mediated by parenting behavior (e.g. Crnic et al., 2005; Wierson & Forehand, 1992). There is evidence that contextual stressors such as social adversity and chronic family stress mediate the relation between maternal depression and problems in children (Brennan, Hammen, Katz, & Le Brocque, 2002; Dawson et al., 2003), although these findings are not consistent across studies. For example, social adversity did not explain relations between postpartum depression and children's IQ (Hay et al., 2001) and family stressors did not significantly predict children's emotional and behavior problems or adaptive behavior after controlling for maternal depression (Riley et al., 2009).

More acute measures of family distress (e.g. marital conflict) and maternal and child distress (e.g. family anger, parental distress, child health problems) were found to mediate relations between history of parental depression and child social and academic impairment in families with high SES (Essex et al., 2006). Interestingly, for adolescents with depressed parents, their depression was more strongly associated with social stressors than for depressed adolescents without depressed parents (Hammen & Brennan, 2001), consistent with prior discussion on the role of chronic interpersonal stressors in

depression (Hammen, 2005). Moreover, parenting stress was found to mediate the relation between maternal depressive symptoms and parenting behavior (Gerdes et al., 2007), providing support for a more indirect model of the effect of stress on parenting behavior, and subsequently, child outcomes. Finally, in a transactional study on parent and child psychopathology, child-related acute and chronic stressors mediated the relation between child psychopathology and parent psychopathology, such that stress in children was associated with subsequent parental psychopathology (Raposa, Hammen, & Brennan, 2011). Thus, the literature on stress exposure points more toward a model of acute threat exposure or shock to the family system as a mechanism of change for child functioning rather than more passive exposure to chronic environmental stress. That is, although broad social adversity is associated with poorer child outcomes, children's development and psychosocial functioning may be more directly vulnerable to change by stressors at the level of the parent-child relationship or family system.

With substantial variability in the way the role of stress is measured and modeled in these different studies, it will be important to test alternative models that include perceived stress as it predicts to maternal depression, parenting behavior, and subsequent infant development, as well as its inclusion as a mediator between depression and infant development. Exploring longitudinal data in this way will provide insight into the complex relations among depression, stress, and parenting behavior in the prediction of infant emotional and cognitive development.

Unfortunately, there is a lack of studies during the perinatal period that have directly tested the mother-infant relationship or maternal sensitivity as a mediator between postpartum depression and infant outcomes, although maternal sensitivity has

been identified as a mechanism through which the trajectory of infant development can be altered within the context of perinatal depression (Kaplan, Evans, & Monk, 2008). There has been support for interactions between maternal sensitivity and depression, whereby higher levels of sensitivity in depressed women were associated with more positive infant outcomes (Campbell, Brownell, Hungerford, Spicker, Mohan, & Blessing, 2004; Feldman, Granat, Pariente, Kanety, Kuint, & Gilboa-Schechtman, 2009). Moreover, several studies of infancy and early childhood (ages 1- to 36-months) provided evidence that maternal sensitivity predicted children's behavior and cognitive outcomes over and above maternal depressive symptoms (Kaplan, Burgess, Sliter, & Moreno, 2009; NICHD Early Child Care Research Network, 1999), and that maternal and social stress during infancy has been associated with infant development (Burchinal, Vernon-Feagans, Cox, & FLP investigators, 2008). Additionally, there is a need for investigation of these processes in Latin American or Hispanic populations, as differences in the roles of stress and depression on parenting behavior have been reported (Perry et al., 2011) that may also influence how these processes relate to infant development.

Summary

Postpartum depression (PPD) is a significant public health concern affecting up to half a million U.S. women annually (Wisner, Parry, & Piontek, 2002; 7.1-19.2% prevalence rate, O'Hara, 2009). Mexican-American women experience substantially higher rates of PPD (Gress, Lake, Luecken, Lemery-Chalfant, & Howe, 2010), and represent an underserved population with significant health disparities that put these women and their infants at greater risk for substantial psychological and developmental difficulties. Explicating the course and effects of PPD in a high-risk population extends our

understanding of key risk and protective factors, and identifies underlying processes critical for early development. The early postnatal period involves major developmental processes crucial to infant adaptation and is often considered a "sensitive period" during which environmental input can either enhance or disrupt typical developmental processes (O'Connor, 2003; Bornstein, 1989). For example, stress during the postnatal period, including acute trauma or maternal depressive symptoms, is reported to have significant long-term effects on infant cognitive and emotional development (Goodman & Gotlib, 1999). Given the high rates of postpartum depression, and its significant impact on child development and mother-infant relationship quality (Brennan, Hammen, Andersen, Bor, Najman, & Williams, 2000; Maughan et al., 2007), there is compelling reason to address the nature of onset and the mechanisms through which stress and depression affect children. Prior theoretical and empirical work suggests that stress increases the risk for depression in general (Hammen, 2005), and that stress and depression during the postpartum period may have long-term effects on infant cognitive and emotional functioning (Goodman, 2007). Further, there is strong evidence that the quality of the mother-infant relationship also influences developmental processes, particularly emotion regulation and cognitive development (Cole, Michel, & Teti, 1994; Pungello, Iruka, Dotterer, Mills-Koonce, & Reznick, 2009). Indeed, the quality of maternal caregiving and the mother-infant relationship may mediate the effects of exposure to stress and depression on child outcomes (Elgar et al., 2007; Brennan et al., 2000; Kaplan, et al., 2008).

Identifying these mechanisms has important implications for strategies to prevent long-term developmental consequences in children. However, few studies have

addressed this complex of factors in a longitudinal design to explore the between-person and within-person relations among perceived stress, depressive symptoms, and parenting, to tease apart the various influences of these variables on infant development, or to use advanced quantitative methods to test specific mediational models. Emerging from prior theoretical and cross-sectional work, the proposed conceptual model theorizes a mediational causal chain from chronic stress to depression to maternal caregiving in the prediction of infant developmental competencies.

Current Study

The current study examined a series of models to specify the complex, longitudinal relations among perceived stress, depression, maternal parenting behavior (e.g. sensitivity, non-hostility, non-intrusiveness, and structuring), and infant developmental outcomes (cognitive and social-emotional) during the postpartum period. Specific Aims include:

1. Assess the mean level (between-persons) relations between perceived stress, depressive symptoms, and maternal parenting behavior during the postpartum period. See Figure 1.
    a. It was expected that the mean level of perceived stress would be positively related to the mean level of depressive symptoms.
    b. It was expected that the mean level of perceived stress and the mean level of depressive symptoms would be positively related to negative maternal parenting behaviors (i.e. hostility and intrusiveness).

c. It was expected that the mean level of perceived stress and the mean level of depressive symptoms would be negatively related to positive maternal parenting behavior (i.e. sensitivity and structuring).

2. Assess the deviations from each person's own mean level, or the within-person relations, between perceived stress, depressive symptoms, and maternal parenting behavior during the postpartum period. See Figure 1.
    a. It was expected that deviations, or changes from the typical level of perceived stress (i.e. residuals), would be positively related to the deviations of depressive symptoms from mothers' own mean levels.
    b. It was expected that deviations from mothers' own mean levels of perceived stress, and deviations from mothers' own mean levels of depressive symptoms would be positively related to deviations from the typical level of negative maternal parenting behavior.
    c. It was expected that deviations from mothers' own mean levels of perceived stress, and deviations from mothers' own mean levels of depressive symptoms would be negatively related to deviations from the typical level of positive maternal parenting behavior.
3. Examine the influences of perceived stress and depressive symptoms on infant social-emotional competencies and problems, and cognitive developmental level as a function of maternal parenting behavior. Analyses will examine the "leading" effect of perceived stress versus depression and the specific role of sensitive and non-hostile maternal behavior as mediators. See Figure 2.

a. It was expected that depressive symptoms at 18 weeks and hostile maternal parenting behavior at 24 weeks would mediate the relation between perceived stress at 12 weeks and infant development (i.e. cognitive and social-emotional development) at 52 weeks.
b. It was expected that depressive symptoms at 18 weeks and sensitive maternal parenting behavior at 24 weeks would mediate the relation between perceived stress at 12 weeks and infant development (i.e. cognitive and social-emotional development) at 52 weeks.

CHAPTER 3

METHODOLOGY

Participants

Participants included 214 pregnant, low-income Mexican-American women. Women were recruited during prenatal visits at low-income clinics in the Phoenix-metro area. See Table 1 for sample demographic information. Initial eligibility criteria included fluency in either Spanish or English, self-identification as Mexican or Mexican-American, and anticipated delivery of a singleton (based on ultrasound results). Low-income status was determined by eligibility for Medicaid, or by self-reported annual income below $25,000. Women were recruited at any point in their pregnancies prior to week 34. Eligible pregnant women were invited to participate by a female, bilingual interviewer, who obtained informed consent and detailed contact information, and scheduled the first home visit. Participation involved three home visits in the first six postpartum months (12-, 18-, and 24-weeks) and a final laboratory visit at Arizona State University at 52-weeks.

Procedure

Bilingual interviewers conducted in-home computer-assisted interviews using Blaise 4.5 software (Statistics Netherlands, 2002). All interviews were administered in participant language of choice (English or Spanish). All questionnaires were administered via the interview format, and the questions were read aloud due to variations in literacy. Specifically, mothers answered questions about demographics, depressive symptoms, and perceived stress. Interviews were scheduled for approximately 2.5 hours and the women

were compensated $50 for the first postnatal visit, $50 each for the subsequent home visits, and $100 for the laboratory visit.

Observational episodes of mothers interacting with their infants were recorded during home visits at 12-, 18-, and 24-weeks of age. Mothers and their infants participated in five individual episodes. First, they participated in a Free Play task (5 minutes) during which mothers were provided with a small basket of toys and objects and were asked to simply play with their infants as they usually do when they are alone. Next, mothers were asked to restrain their infants' arms (2 minutes) as they were shown an enticing toy in order to elicit frustration from the infant. Following the restraint task, mothers were asked to soothe their infant (3 minutes). Then, mothers were provided with a set of objects and asked to help their infants complete a problem-solving task (5 minutes). Tasks were selected from the Bayley Scales of Infant and Toddler Development-III (Bayley, 2005) and reflected skills one to two months beyond the typical infant's capabilities, creating a context for mother and infant to experience mild frustration. Finally, mothers were asked to play "peek-a-boo" with their infants (3 minutes).

During the laboratory visit at 52 weeks, infants were administered a measure of cognitive and language development (Bayley Scales of Infant and Toddler Development-III, Bayley, 2005) by a trained, bilingual research assistant. Finally, mothers completed an interview that included a parent-report measure of infant social and emotional competencies and problems (Briggs-Gowan & Carter, 2006).

Measures

Questionnaire measures were professionally translated into Spanish and back-translated if they were not previously validated in Latin American populations. Measures were administered via interview format, and interviewers recorded responses into the Blaise 4.5 interview software (Statistics Netherlands, 2002).

Spanish Language. Interviews were completed in either Spanish (= 1) or English (= 0) depending on the preference of the mother.

Depressive symptoms. Depressive symptoms were measured at all measurement points (12-week, 18-week, and 24-week interviews) with the 10- item *Edinburgh Postnatal Depression Scale* (EPDS; Cox et al., 1987). The EPDS has demonstrated moderate to strong test-retest reliability and internal consistency, as well as moderate correlations with other measures of depression (Boyd, Le, & Somberg, 2005). The EPDS has high sensitivity in predicting postpartum depression (Eberhard-Gran, Eskild, Tambs, Opjordsmoen, & Samuelsen, 2001), and has been validated prenatally (Murray & Cox, 1990), and in Spanish-speaking samples (Garcia- Esteve, Ascaso, Ojuel, & Navarro, 2003). Items are scored on a 0 – 3 scale; scores above 12 are considered clinically significant for postpartum depression.

Perceived Stress. The 4-item revised *Perceived Stress Scale* (PSS; Cohen, Kamarck, & Mermelstein, 1983; Gonzales Ramirez & Landero Hernandez, 2007) was measured at all measurement points (12-week, 18-week, and 24-week interviews) and assessed the degree of stress a person perceived in the past month using a zero (*Never*) to four (*Very Often*) scale. Items were summed to create a total score. Higher scores reflect higher perceived stress. The PSS is available in Spanish and has established reliability

and validity in pregnant and postpartum Hispanic women (Zambrana, Scrimshaw, Collins, & Dunkel-Schetter, 1997).

Parent-Infant Interactions. Mother-infant interactions observed during the home visits and the laboratory visit were video recorded and mother and infant behaviors were coded by independent raters for the 12-week, 18-week, and 24-week measurement points. Due to constraints on time and costs, only a sub-sample of observation data was coded (*n* = 63). Maternal behavior during free play, soothing, and peek-a-boo was consistently measured across time, and the tasks did not change longitudinally.

1. Emotional Availability. The quality of the mother-infant relationship and maternal behavior was assessed using the Emotional Availability Scales (EAS, 4th Ed.; Biringen, 2008). The EAS addresses six dimensions thought to capture the dyadic, transactional nature of the parent-child relationship. The rating system includes four parent dimensions (sensitivity, structuring, non-hostility, and non-intrusiveness). Trained, independent coders rated mother and infant behaviors on a 7-point scale for an overall score on each dimension (e.g. 7 = highly sensitive, 1 = not at all sensitive). Sensitivity and structuring dimension scores were treated in analyses as representative indicators of positive maternal behavior, and non-hostility and non-intrusiveness score were treated as indicators of negative maternal behavior. Interrater reliability was calculated using ICCs, and raters were reliable at .75 and above for all scales.

Infant Cognitive Development. The Bayley Scales of Infant and Toddler Development-III **(**BSID-III; Bayley, 2005) were administered at 52-weeks to assess infant developmental level. The BSID-III is a well-validated, reliable, and standardized

measure of development in children. Children were administered the cognitive, receptive language, and expressive language scales. Scaled scores for cognitive, receptive, and expressive language were calculated according to age-appropriate norms, and used in analyses as measures of cognitive development. The BSID-III has been translated into Spanish (kindly provided by Dr. Lourdes Schnaas from the National Institute of Perinatology, Mexico City) and has been used to measure infant development in Spanish-speaking populations (Rink, Ardoino, Queirolo, Cicariello, Manay, & Kordas, 2014).

Infant Social-Emotional Development. The Brief Infant Toddler Social-Emotional Assessment (BITSEA, Briggs-Gowan & Carter, 2006) is a 42-item mother-report of infant social-emotional/behavioral problems and competencies at 52-weeks. The BITSEA has good test-retest reliability and is validated for use with 12- to 36-month-old infants, and with Spanish-speaking populations. Major domains on the BITSEA include Total Problems and Competence, each of which was used in analyses as an individual measure of infant social-emotional development.

Analysis Plan

Preliminary Analyses. Scale scores were calculated according to the scoring criteria for each measure described above, at each time point. For the observational data, composite scores for each parenting dimension (e.g. sensitivity, hostility, intrusiveness, and structuring) were calculated across the free play, soothing, problem-solving, and peek-a-boo tasks at each measurement point, providing an overall average measure of maternal parenting behavior at each time point. All data were checked for out of range values and graphical exploratory analyses were completed to ensure the integrity of the data (Tabachnick & Fidell, 2013, Chapter 4). Due to the nature of the sample, attrition

was anticipated, and the rate of missingness was approximately 10% at the 24-week time point. Analyses were run in Mplus 6.0 (Muthén & Muthén, 1998-2004) and utilized full information maximum likelihood estimation in order to account for missing data. With this approach, all of the available observations for each case were used to compute the likelihood function (Enders & Bandalos, 2001), providing unbiased estimates with minimal standard errors when data are missing at random (Schafer & Graham, 2002). It should be noted that data were limited to the first two cohorts of the larger study because coding of the parenting behaviors has only been completed on a random subsample of participants from the first two cohorts (n = 63). Thus, the current interim analyses demonstrate the conceptual model and the utility of the analysis plan using only the available cohort 1 and cohort 2 data.

Analyses for Aim 1 and Aim 2. Due to preliminary analyses indicating a lack of mean level growth over time (see Longitudinal Growth Models below), Aim 1 analyses focused on the between-person and within-person relations among perceived stress, depressive symptoms, and maternal parenting behavior across the early postpartum period (i.e. 12-, 18-, and 24-weeks postpartum). It was hypothesized that higher mean levels of perceived stress (chronic stress) would be associated with higher mean levels of depressive symptoms (chronic depression) across time. Further, it was hypothesized that higher mean levels of perceived stress would be associated with higher mean levels of negative maternal parenting behavior and lower mean levels of positive maternal parenting behavior. Finally, higher mean levels of depressive symptoms would be associated with higher mean levels of negative maternal parenting behavior and lower mean levels of positive maternal parenting behavior. The purpose of Aim 2 was to

investigate the relations among the within-person deviations from the mean level of stress, depressive symptoms, and maternal parenting behavior across the early postpartum period (i.e. 12-, 18-, and 24-weeks postpartum). It was hypothesized that increases in stress within person would be associated with increases in depressive symptoms within person across time. Further, it was hypothesized that increases in stress would be associated with increases in negative maternal parenting behavior and decreases in positive maternal parenting behavior. Finally, increases in depressive symptoms would be associated with increases in negative maternal parenting behavior and decreases in positive maternal parenting behavior.

Initial analyses utilized longitudinal growth models in the structural equation modeling (SEM) framework to estimate trajectories of perceived stress, depressive symptoms, and parenting behavior over time and to check for the existence of mean level growth. Growth was not indicated and thus subsequent analyses utilized a latent intercept (LI) model with correlated residuals in the structural equation modeling (SEM) framework (Ryu, West, & Sousa, 2012), which assumes no average growth in the variables over time and equal variances and covariances across measurements (Figure 1). Stress (S) and depressive symptoms (D) were measured at 12-, 18-, and 24-weeks postpartum (considered measurement occasions 1, 2, and 3, respectively), and maternal parenting behavior was measured at 12-, 18-, and 24-weeks postpartum (measurement occasions 1, 2, and 3, respectively). According to the LI model described by Ryu et al. (2012), each measured variable loads on its underlying latent construct (i.e. Perceived Stress = STRESS; Depressive Symptoms = DEP; and Maternal Parenting Behavior = PARENT), with the value of each loading constrained to 1 to assure that the latent

variable represents the mean of the underlying measures. Additionally, the intercepts of each measured variable are set to 0 and the variances and covariances among the residuals are constrained to be equal across measurement occasions. The following equations specify the measurement model for each measured variable:

(1a) $S_{mi} = STRESS_i + \varepsilon_{Smi}(m = 1, 2, 3)$

(1b) $D_{mi} = DEP_i + \varepsilon_{Dmi}(m = 1, 2, 3)$

(1c) $P_{mi} = PARENT_i + \varepsilon_{Pmi}(m = 1, 2, 3)$,

where the latent factors ($STRESS_i$, DEP_i, and $PARENT_i$) represent the mean across measurement occasions and the residuals (ε's) represent the deviations from the mean at each occasion. There is no slope parameter. The estimated parameters include factor means (α), which represent the mean of each latent factor; factor variances and covariances (φ), of which the non-zero off-diagonal covariances represent the between-person relations of STRESS, DEP, and PARENT; and residual variances and covariances (Θ), of which the non-zero off-diagonal covariances represent the covariances between the fluctuations around the overall level that vary occasion to occasion. It should be noted that the relationship between Stress and Depression at the between-person level is potentially inflated due to rater bias (both self-report measures), but rater bias is not an issue at the within-person level.

Analyses for Aim 3. The purpose of Aim 3 was to evaluate the mediating influence of maternal parenting behavior on the association between stress/depression and infant social-emotional and cognitive development at 52-weeks. To examine the longitudinal relationships between perceived stress, depressive symptoms, and parenting behavior, an autoregressive cross-lagged (ARCL) model was explored. The basis of the ARCL model

can be described as the value of a variable at the time of [t] is explained by the value of that variable at the time of the previous point, [t-1], plus a new random component (Biesanz, 2013; Kenny & Campbell, 1989). To rule out spuriousness, the autoregressive model assumes that the constructs are measured at the same point in time (synchronicity) and that the relation between the constructs follows a constant process, that is, the correlation between a pair of variables does not change over time (stationarity) (Kenny, 1975). In the current study, each construct was measured at the same point in time, and correlations presented in Table 2, Table 3, and Table 4 demonstrate stationarity. Separate models were run for social emotional development (i.e. BITSEA) and for cognitive development (i.e. Bayley scores), as well as for positive and negative maternal parenting behavior. The analyses utilized an autoregressive lag 1 model as described in Cole and Maxwell (2003) to test for indirect effects using Mplus 6.0 (Figure 2). The model utilized repeated measurements from 12-, 18-, and 24-weeks in order to have equal numbers of measurement occasions across the variables. The model assessed the directional influence of stress and depression on each other, their influence on parenting behavior, and the influence of parenting on infant development. Following the suggestion of de Jonge, Dormann, Janssen, Dollard, Landeweerd, & Nijhuis, (2001), analyses followed a systematic evaluation of models in which a baseline model including only stability paths was compared to more complex models including cross-lagged paths. Thus, the following models were analyzed:

1. Baseline model (Figure 2) – no cross-lagged paths, only stability paths;

2. Stress-led model (Figure 3) – "down" cross-lagged paths from stress -> depressive symptoms -> parenting -> infant development, in addition to stability paths;
3. Depression-led model (Figure 4) – "up" cross-lagged paths from depressive symptoms -> perceived stress -> parenting -> infant development, in addition to stability paths;
4. Reciprocal model (Figure 5) – both up and down paths in addition to stability paths;

Nested model testing was used to determine whether models "leading" with stress or depression had better fit than the full model with both paths specified. The nested model testing may support temporal precedence of stress or depression, which will strengthen the causal inference suggested by the mediation. Table 2 summarizes the indirect effects examined in the analyses.

CHAPTER 4

DATA ANALYSIS AND RESULTS

Data Reduction

Data were limited to the first two of three cohorts in the larger sample due to lack of data on parenting behavior for the third cohort. Limiting the sample to the first two cohorts was intended to reduce potential bias in the estimates due to lack of data on cohort three.

The variables representing maternal parenting behavior, including sensitivity, non-hostility, scaffolding, and non-intrusiveness, represent individual composites of scores for a random sub-sample of data (n = 63) across the observation tasks at each time point, providing a mean level of observed parenting behavior for a given time point. Parenting behavior measured at each time point during free play, soothing, teaching, and peek-a-boo were averaged to form a composite for each parenting behavior variable for a given time point (i.e. 12-, 18-, 24-weeks). Ratings of parenting behavior showed moderate to large pairwise correlations between tasks per Cohen's (1988) norms for Sensitivity (range: .63 – .79), Non-Hostility (range: .54 – .79), and Structuring (range: .47 – .72). Non-Intrusiveness showed small to large correlations across the observation tasks, which may indicate greater influence from task demands (range: .15 – .64).

Descriptives and Correlations

Raw means, standard deviations, and correlation data for all study variables at each time point are presented in Table 3, Table 4, and Table 5. Spanish language was included as a measure of acculturation due to its greater association with study variables compared to the Mexican orientation scale. The mean data show that the variable scores

remain relatively stable across time, with the greatest change for depressive symptoms (EPDS). The Pearson correlation data indicated that depressive symptoms and perceived stress were strongly correlated at each time point, and that the parenting variables (Sensitivity, Non-Hostility, Non-Intrusiveness, and Structuring) were strongly correlated at each time point. At 12 weeks (Table 3), perceived stress was positively correlated with Non-Hostility. At 18 weeks (Table 4), perceived stress was negatively correlated with Non-Hostility. At 24 weeks (Table 5), sensitivity showed small to moderate negative correlations with depressive symptoms and perceived stress, and non-hostility and structuring were also negatively correlated with depressive symptoms. Finally, the use of Spanish as the primary language was positively correlated with parenting behaviors at 12 weeks, but unrelated or negatively correlated with parenting behavior at 18 and 24 weeks.

Longitudinal Growth Models

The assumption of the LI model that there is no systematic growth among the variables (Depressive Symptoms, Perceived Stress, Sensitivity, Non-Hostility, Non-Intrusiveness, and Structuring) was probed using longitudinal growth models in Mplus. The results indicated no significant growth for Perceived Stress, Sensitivity, Non-Hostility, Non-Intrusiveness, and Structuring. Figure 6 shows the estimated linear trajectory for Depressive Symptoms across measurement points (12 weeks, 18 weeks, and 24 weeks). Depressive symptoms decreased 0.32 points per measurement point on average ($z = -2.75$, $p < .05$), a decrease of approximately 1 point over the total measurement period. The magnitude of the mean change in depressive symptoms from 4.6 to 3.5 remains well below the meaningful cut-off for significant depressive symptoms (i.e. score of 10) and was too small to have clinical significance for the study (see Ryu et

al., 2012). Thus, the lack of significant growth in the study variables indicates the use of the LI model to be appropriate for the current analyses[1].

Between- and Within-Person Variability

A random intercept model was estimated for each measure using Mplus to test for reliable within-person variability of Depressive Symptoms, Perceived Stress, Sensitivity, Non-Hostility, Non-Intrusiveness, and Structuring. The results are summarized in Table 6. The last two rows show the standard deviations, which were computed by taking the square root of the variance estimates. For all constructs, both between- and within-person variances were significant, indicating meaningful fluctuation of Depressive Symptoms, Perceived Stress, Sensitivity, Non-Hostility, Non-Intrusiveness, and Structuring from time point to time point within each person over measurement waves, as well as significant and meaningful variability in the mean levels of Depressive Symptoms, Perceived Stress, Sensitivity, Non-Hostility, Non-Intrusiveness, and Structuring between persons.

Latent Intercept (LI) Model

The Latent Intercept Model as shown in Figure 1 was analyzed separately for each parenting behavior (see Table 7, Table 8, Table 9, and Table 10). The between-person relations show that the overall mean level of Perceived Stress was significantly positively associated with Depressive Symptoms, with a large correlation of 0.82,

[1] Given the small but statistically significant linear relationship with time found for Depressive Symptoms, each model was rerun using the same structural equation model with the inclusion of a linear trend for Depressive Symptoms. This modified model is a special case of Bollen and Curran's (2004) latent trajectory model. The covariance values did not differ appreciably from the corresponding values presented in Table 6, Table 7, Table 8, and Table 9.

potentially inflated due to rater bias. Thus, when mothers reported greater levels of perceived stress, they also tended to have more depressive symptoms on average. The within-person relations show that the residuals of Perceived Stress were significantly positively associated with Depressive Symptoms ($r = .22$, $p < .05$). Thus, when mothers reported more stress than usual (i.e. more stress than their own mean), they also tended to report more depressive symptoms than usual.

There were no significant associations found for any of the parenting variables and Perceived Stress or Depressive Symptoms. Table 7 shows that the mean level of Sensitivity was not significantly associated with Perceived Stress or Depressive Symptoms. The residuals for Sensitivity were not associated with the residuals for Depressive Symptoms or Perceived Stress. Table 8 shows that the mean level of Non-Hostility was not significantly associated with Perceived Stress or Depressive Symptoms. The residuals for Non-Hostility were not associated with the residuals for Depressive Symptoms or Perceived Stress. Table 9 shows that the mean level of Non-Intrusiveness was not significantly associated with Perceived Stress or Depressive Symptoms. The residuals for Non-Intrusiveness were not associated with the residuals for Depressive Symptoms or Perceived Stress. Finally, Table 10 shows that the mean level of Structuring was not significantly associated with Perceived Stress or Depressive Symptoms. The residuals for Structuring were not associated with the residuals for Depressive Symptoms or Perceived Stress.

Summary for Latent Intercept models

The results from the LI models showed significant between-person associations between perceived stress and depressive symptoms, indicating that when mothers

reported higher levels of stress on average, they also tended to have more depressive symptoms on average. In addition, there were significant within-person associations between perceived stress and depression such that when mothers reported more stress than usual at a given measurement (i.e. more stress than their own mean), they tended to report more depressive symptoms than usual. For parenting behavior, neither perceived stress nor depressive symptoms were found to have between- or within-person associations with any parenting variables. Some of the correlations indicated small effect sizes between perceived stress and sensitivity, non-hostility, non-intrusiveness, and structuring, but these correlations were not statistically significant, possibly due to attenuation from the small sample of parenting behavior data and a lack of power. These non-significant findings will not be interpreted.

Autoregressive Cross-Lagged Model

Tables 11, 12, 13, and 14 show the Pearson correlations for each autoregressive model. The autocorrelations for perceived stress, depressive symptoms, sensitivity, and non-hostility are moderate to large according to Cohen's norms (Cohen, 1988) and consistent over time, providing support for the stability and reliability of the variables (Kenny, 1975). The auto-correlations for non-intrusiveness and structuring varied significantly in both magnitude and sign, suggesting that the stability of these variables is low, or that the stationarity is low, possibly a function of changing needs over tasks/development. Thus, only models for sensitivity and non-hostility were analyzed. For each analysis, a baseline model (Figure 2), a stress-lead model (Figure 3), a depression-lead model (Figure 4), and a reciprocal model (Figure 5) were compared using nested model testing. The results for sensitivity in the prediction of cognitive

development are summarized in Table 15. The reciprocal model depicted in Figure 5 was the best fitting model with the following fit statistics: $\chi^2(19) = 53.34$, $p < .001$; comparative fit index (CFI) = 0.92; root mean square error of approximation (RMSEA) = 0.09; and standardized root mean square residual (SRMR) = 0.09. The results showed that depressive symptoms reported at 12 and 18 weeks were associated with subsequent reports of perceived stress at 18 and 24 weeks, respectively, over and above prior reports of perceived stress. Neither depressive symptoms nor perceived stress were significantly associated with maternal sensitivity. Sensitivity was positively associated with infant cognitive development at 52 weeks.

The results for sensitivity in the prediction of total social-emotional problems on the BITSEA are summarized in Table 16. The depression-lead model depicted in Figure 4 was the best fitting, most parsimonious model with the following fit statistics: $\chi^2(23) = 87.46$, $p < .001$; comparative fit index (CFI) = 0.86; root mean square error of approximation (RMSEA) = 0.11; and standardized root mean square residual (SRMR) = 0.12. The results showed that depressive symptoms reported at 12 and 18 weeks were positively associated with subsequent reports of perceived stress at 18 and 24 weeks, respectively, over and above prior reports of perceived stress. Neither depressive symptoms nor perceived stress were significantly associated with maternal sensitivity. Sensitivity was not significantly associated with infant total social-emotional problems at 52 weeks.

The results for sensitivity in the prediction of total social-emotional competencies on the BITSEA are summarized in Table 17. The depression-lead model depicted in Figure 4 was the best fitting, most parsimonious model with the following fit statistics:

$\chi^2(23) = 77.69$, $p < .001$; comparative fit index (CFI) = 0.89; root mean square error of approximation (RMSEA) = 0.11; and standardized root mean square residual (SRMR) = 0.10. The results showed that depressive symptoms reported at 12 and 18 weeks were positively associated with subsequent reports of perceived stress at 18 and 24 weeks, respectively, over and above prior reports of perceived stress. Neither depressive symptoms nor perceived stress were significantly associated with maternal sensitivity. Sensitivity was positively associated with infant total social-emotional competencies at 52 weeks.

The results for non-hostility in the prediction of cognitive development are summarized in Table 18. The reciprocal model depicted in Figure 5 was the best fitting model with the following fit statistics: $\chi^2(19) = 73.81$, $p<.001$; comparative fit index (CFI) = 0.89; root mean square error of approximation (RMSEA) = 0.12; and standardized root mean square residual (SRMR) = 0.08. The results showed that depressive symptoms reported at 12 and 18 weeks were positively associated with subsequent reports of perceived stress at 18 and 24 weeks, respectively, over and above prior reports of perceived stress. Perceived stress at 12 weeks was negatively associated with maternal non-hostility at 18 weeks. Non-hostility was positively associated with infant cognitive development at 52 weeks.

The results for non-hostility in the prediction of total social-emotional problems on the BITSEA are summarized in Table 19. The reciprocal model depicted in Figure 5 was the best fitting model with the following fit statistics: $\chi^2(19) = 84.34$, $p < .001$; comparative fit index (CFI) = 0.87; root mean square error of approximation (RMSEA) = 0.13; and standardized root mean square residual (SRMR) = 0.11. The results showed

that depressive symptoms reported at 12 and 18 weeks were positively associated with subsequent reports of perceived stress at 18 and 24 weeks, respectively, over and above prior reports of perceived stress. Perceived stress at 12 weeks was negatively associated with maternal non-hostility at 18 weeks. Non-Hostility was not significantly associated with infant total social-emotional problems at 52 weeks.

The results for non-hostility in the prediction of total social-emotional competencies on the BITSEA are summarized in Table 20. The reciprocal model depicted in Figure 5 was the best fitting model with the following fit statistics: $\chi^2(19) = 72.12$, $p < .001$; comparative fit index (CFI) = 0.90; root mean square error of approximation (RMSEA) = 0.11; and standardized root mean square residual (SRMR) = 0.07. The results showed that depressive symptoms reported at 12 and 18 weeks were positively associated with subsequent reports of perceived stress at 18 and 24 weeks, respectively, over and above prior reports of perceived stress. Perceived stress at 12 weeks was negatively associated with maternal non-hostility at 18 weeks. Non-hostility was positively associated with infant total social-emotional competencies at 52 weeks.

Collinearity Analysis

A final post-hoc regression analysis was used to determine the level of collinearity between the measures of perceived stress and the measures of depressive symptoms at 12 and 18 weeks by examining the Tolerance and Variance Inflation Factor (VIF) statistics. Separate regression analyses included measures of perceived stress at 12 or 18 weeks, depressive symptoms at 12 or 18 weeks, and Spanish language regressed on maternal hostility at 18 weeks. Tolerance statistics across all analyses ranged from .51 to .98 and VIF statistics ranged from 1.02 to 1.96, well below the conventional threshold

values cited in the literature (Cohen, Cohen, West, & Aiken, 2003), indicating that the inclusion of both perceived stress and depressive symptoms variables in the autoregressive analyses was not a problem.

Mediation Analysis

Indirect effects in the autoregressive models were tested using the bias-corrected bootstrapping method to correct for the sampling distribution of the mediated effect and to obtain the confidence interval around the estimate (MacKinnon, 2008). The bias-corrected bootstrap method was chosen based on recommendations by Hayes and Scharkow (2013) to use the bias-corrected bootstrap when there are concerns about power, as is the case with the current analysis. Table 21 summarizes the significant indirect effects and provides the estimates along with the Sobel test (Sobel, 1982) and the bias-corrected confidence intervals (MacKinnon, 2008). Maternal non-hostility at 18 and 24 weeks was found to mediate the relation between perceived stress at 12 weeks and infant cognitive development and social-emotional competencies at 52 weeks. When mothers reported more perceived stress at 12 weeks, they were found to express more hostility during interactions with their infants, which was negatively associated with infant cognitive and social-emotional development.

Summary for Autoregressive Cross-Lagged Model and Mediation

The results from the Autoregressive Cross-Lagged models provided the most support for the depression-led and reciprocal models (Figure 4 and Figure 5), with significant paths from Depressive Symptoms to Perceived Stress. Perceived Stress at 12 weeks was found to be negatively associated with subsequent Non-Hostility at 18 weeks (i.e. more stress = more hostile). Neither Perceived Stress nor Depressive Symptoms

were found to be associated with Sensitivity. Both Sensitivity and Non-Hostility were found to be associated with infant cognitive development and social-emotional competencies at 1 year (52 weeks), but not with social-emotional problems. The results of the mediation analyses showed that Non-Hostility at 18- and 24-weeks significantly mediated the association between Perceived Stress at 12 weeks and infant cognitive development and social-emotional competencies at 52 weeks.

CHAPTER 5

DISCUSSION

The current investigation provided a unique view of the early postpartum period in Mexican-American women within the context of socioeconomic risk, and illustrated the importance of non-hostile, sensitive parenting for infant development as well as a more nuanced understanding of mothers' symptomology and perceptions of stress during the postpartum period. In addressing the specific aims, the findings from the Latent Intercept Model showed concomitant between- and within-person associations for depressed mood and perceptions of stress (Aims 1 & 2), indicating that when women had more depressive symptoms overall, they also tended to have greater perceptions of stress overall; and when women had more depressive symptoms than usual at a given moment, they also tended to perceive their lives as more stressful than usual at that moment. Contrary to expectations, average parenting behavior and deviations from that average were not associated with perceived stress or depressive symptoms.

The results of the autoregressive models from Aim 3 indicated that mothers demonstrated consistent levels of hostility, depressive symptoms, and perceived stress at each measurement. However, maternal sensitivity was not consistent initially, but became increasingly stable between 18- and 24-weeks postpartum. Additionally, a directional, time-lagged influence of depressive symptoms on perceived stress emerged, and contrary to expectations, perceived stress but not depressive symptoms had a unique influence on hostile parenting behavior. Second, more sensitive and less hostile parenting was found to promote the acquisition of infant cognitive and social-emotional competencies during the first year of life, with no direct influence of maternal stress or depressive symptoms.

Unexpectedly, although parenting behavior was positively linked with infant cognitive and social-emotional competencies, it was not associated with social-emotional problems at 1 year postpartum. Finally, tests of mediation within the autoregressive models provided empirical support for theory-based transmission of risk through mothers' early hostile behavior to explain the influence of maternal perceptions of stress on infant developmental competencies. Greater perceptions of stress were associated with more hostile parenting behavior and subsequently with lower cognitive and social-emotional functioning in infants.

Differentiating Perceived Stress and Depressive Symptoms

Longstanding efforts have been made to understand the role of stress in the course of depression (Hammen, 2005), with a notable shift in the literature to explore more reciprocal or bidirectional relations between them (Hammen, 2006). The current investigation provided a unique opportunity to address questions about how perceived stress and depressive symptoms are related in the postpartum period, demonstrating their intertwined nature as well as the inherent difficulty in differentiating them as unique constructs. The results from the Latent Intercept analyses indicated that depressive symptoms and perceived stress were very strongly correlated in the overall sample, and tended to increase or decrease concomitantly at the individual level, suggesting significant relationship between the measures. As Cohen et al. (1983, p. 391) reported, "there is some overlap between what is measured by depressive symptomatology scales and measured by the Perceived Stress Scale (Cohen et al., 1983), since the perception of stress may be a symptom of depression." However, the cross-lagged models indicated that depression consistently predicted later perceived stress over and above prior

measures of perceived stress, complicating our understanding of the nature of the association between them by suggesting the importance of mood in modulating the experience of stress (Otto, Fava, Penava, Bless, Muller, & Rosenbaum, 1997).

Notably, subsequent analyses provided evidence against the possibility of collinearity between perceived stress and depression, and the directional influence of depressive symptoms on perceived stress in the cross-lagged models provided evidence for a distinct temporal association between perceived stress and depressive symptoms in women during the postpartum period. Although perceived stress may contain a mood component that is redundant with depressive symptoms in the regression on maternal hostility, the measure of perceived stress may also capture a stress-specific component of psychological functioning that is vulnerable to mood states. This interpretation is in line with prior investigations on the independence of constructs of stress and depression (Cohen et al., 1983; Otto et al., 1997), and suggests that depressive symptoms may prime women to subsequently perceive their lives as more stressful.

Further, research on the association between stress and depression has investigated the extent to which individuals are responsible for the generation of life stressors (Hammen, 1991; Liu & Alloy, 2010) or at least the perception of life as more stressful. Prior studies showed that after successful treatment of depression with antidepressants, levels of perceived stress were significantly reduced (Fava, Rosenbaum, McCarthy, Pava, Steingard, & Fox, 1992) and negative life events were no longer found to be associated with elevated levels of perceived stress (Otto et al., 1997). Moreover, subclinical levels of depression were found to mediate the relation between past depressive episodes and future stress (Shih & Eberhart, 2008) and some prospective

studies provided evidence that depressive symptoms subsequently predicted more chronic stress (Davila, Bradbury, Cohan, & Tochluk, 1997; Davila, Burge, & Hammen, 2000). Finally, a study of high-risk adolescents found that depressive symptoms were associated with more perceived stress one year later, especially for females and Latinos (Galaif, Sussman, Chou, & Wills, 2003). With longitudinal data and intensive analytic modeling, the current study provides noteworthy empirical evidence for the role of depressed mood on elevated perceptions of stress.

Stability of Early Parenting

It is broadly accepted that parental behavior during infancy lays the foundation for children's development (Ainsworth, Blehar, Waters, & Wall, 1978), and accordingly has been conceptualized as an evolving process from infancy through adulthood, with specific behaviors emerging and diminishing across time as children's needs change with development (Ciciolla, Crnic, & West, 2013). Maternal sensitivity in particular has received extensive attention in its relations to infant development and future adaptation (Landry, Smith, Miller-Loncar, & Swank, 1997; van den Boom, 1994; 1995). The current study provided unique longitudinal information on both sensitive and hostile maternal behavior at three time points during the first six months postpartum, and provided evidence in support of a developmental view of parenting that adjusts or changes with infant maturation.

The findings from the autoregressive analyses suggest that although levels of maternal hostility remained consistent across time, maternal sensitivity became increasingly stable (rank order stability) after 12 weeks postpartum so that by 18 weeks, mothers were more consistent in their sensitive behavior up to 24 weeks postpartum. The

current findings on maternal sensitivity align with prior research demonstrating its stability during infancy (Ainsworth et al., 1978; Joosen, Mesman, Bakermans-Kranenburg, & van IJzendoorn, 2013; Kemppinen et al., 2006), and offer an explanation for prior inconsistent findings that showed discontinuity in sensitive parenting from 12 weeks to 12 months postpartum (Lohaus, et al., 2004). With the inclusion of an intermediate measurement at 18 weeks, the current study showed that maternal sensitivity became increasingly consistent as infants approach 18 weeks of age. The increased stability might be associated with emerging reciprocal behavior as infants achieve more sophisticated developmental milestones (Feldman, 2007) such as social smiling and joint attention, further supporting a model of parenting that is sensitive to infant development.

In turn, the current investigation extends research on early parenting behavior to include indices of hostility. Research on early parenting behavior has primarily focused on maternal sensitivity, with early hostile behavior being excluded from the majority of studies or only measured at a single time point in the first postpartum year (Bradley & Corwyn, 2007; Forget-Dubois et al., 2007; Pierce, Boivin, Frenette, Forget-Dubois, Dione, & Tremblay, 2010). The current study provided a unique, earlier examination of maternal hostility, strengthening the limited evidence for stability in hostile maternal behavior during the first six months postpartum (Lorber & Egeland, 2011). The literature consistently shows increases in maternal hostility during the transition to toddlerhood that corresponds with increasing mobility, bids for independence, and oppositional behavior (Bornstein & Tamis-LeMonda, 1990; Pierce et al., 2010). The current finding extends the information about hostile parental behavior to early infancy, showing that the level of hostility remains constant across the first postpartum year, and suggests that any changes

or increases in hostile behavior occur in response to developmental or behavioral changes in children and do not increase solely as a function of time.

Early Parenting and Infant Development

The current study confirmed the importance of parenting for infant cognitive and social-emotional development. Specifically, the results of the autoregressive analyses indicated that low levels of hostility and high levels of sensitivity as early as 18 weeks postpartum played an important role in the acquisition of cognitive and social-emotional skills across the first year of life. This is in line with the broader literature reporting that hostile, harsh parenting is emotionally dysregulating for infants and children, heightens negative arousal (Eisenberg, Fabes, Shepard, Guthrie, Murphy, & Reiser, 1999; Feng, Shaw, & Silk, 2008), and disrupts the development of self-regulation and associated social-emotional and cognitive competencies (Eisenberg et al., 2005; Morrell & Murray, 2003; Zimmer-Gembeck & Thomas, 2010). In contrast, sensitive, responsive parenting is thought to provide an optimal environment for the development of cognitive and social competence by helping infants regulate negative arousal and by fostering reciprocal interactions in which infants have some degree of control (Landry et al., 1997; Baumrind, 1966). These repeated reciprocal interactions with parents are thought to facilitate social engagement and social skills practice (Feldman & Eidelman, 2009), hone attentional skills (Tomasello & Farrar, 1986), and encourage a more cooperative, active role in learning (Mac-Donald, 1992). Findings from this study extend the emerging cross-cultural evidence suggesting that sensitive parenting in early childhood is just as important to the development of cognitive ability, social behavior, and emotion

regulation in ethnic minority cultures as it is in majority culture families (Mesman, Van Ijzendoorn, & Bakermans-Kranenburg, 2012).

Additionally notable from the autoregressive findings, neither hostile nor sensitive parenting were associated with social-emotional problems at 12 months, despite the strong literature identifying hostile, negative parenting and a lack of sensitivity as associated with emotional and behavioral problems (Dietz, Jennings, Kelley, & Marshal, 2009; Lorber & Egeland, 2011; Marchand, Hock, & Widaman, 2002; Morrell & Murray, 2003; Rhoades, Leve, Harold, Neiderhiser, Shaw, & Reiss, 2011; Sellers et al., 2013; Zimmer-Gembeck & Thomas, 2010). Many studies investigating specific parenting behaviors utilize samples of older infants and toddlers (Lorber & Egeland, 2011), and few report on specific parenting behavior prior to 24 weeks postpartum (Landry et al., 1997), making the current study unique in its focus on very early observations of parenting behavior. Thus, possible explanations for the absence of links between parenting behaviors and infant problems may be that social-emotional difficulties are infrequently occurring or infrequently reported at age 1 year compared to age 2 years (Alink, et al., 2006), and that infant temperament may moderate the relationship such that temperamentally reactive infants will demonstrate more social-emotional problems in the absence of sensitive parenting (Calkins & Degnan, 2006; Leerkes, Blankson, & O'Brien, 2009).

Stress and Maternal Hostility

Although the literature has strongly implicated maternal depression and depressive symptoms as key influences on parenting (Gershoff, Aber, Raver, & Lennon, 2007; Mistry, Biesanz, Taylor, Burchinal, & Cox, 2002; Yeung, Linver, & Brooks-Gunn,

2002), the cross-lagged analyses in the current study provided evidence that it was perceived stress and not depressive symptoms that influenced maternal hostile behavior in this sample of Mexican-American women, over and above prior measures of hostility and depressive symptomology. To best interpret this finding, it is important to first note that the current sample had very low rates of postpartum depressive symptoms and did not indicate even moderate symptomology across the sample. This is in contrast to findings from a prior pilot study of women from the same population (Gress et al., 2010). It is important to note that in the current investigation, compared to the pilot study, participants had contact with a bilingual interviewer every three weeks, received a list of local resources, and were assisted in getting help if they indicated feeling depressed, the combination of which may have unintentionally provided a significant level of social support that reduced the risk for postpartum depression. Additionally, the measurement of symptoms via interview format (as compared to a pencil and paper study) may have resulted in underreporting of symptoms due to cultural or social pressures (Varela, Steele, & Benson, 2007).

Alternatively, the interview format employed in the current study may have encouraged the contextualization of PPD symptoms within a larger life framework, especially given that the women reported on infant health and sleep, perceived stress, and daily hassles prior to reporting on depressive symptoms. This interpretation corresponds with Cheryl Beck's substantive Grounded Theory method (1993; 2007), which proposed that the core social psychological process of PPD is characterized by "teetering on the edge," or a "loss of control" over "emotions, thought processes, and actions" (Abrams, 2009; Beck, 1993, p. 44). Beck argued that the grounded theory of PPD better captures

the cross-cultural experience of PPD by accounting for the personal and social meanings minority women attach to their symptoms (Beck, 2007), such as grounding their understanding of symptoms in more contextual factors such as stress (Edge & Rogers, 2005) or economic hardship (Rodrigues, Patel, Jaswal, & de Souza, 2003). Notably, members of minority groups are more inclined to attribute depression to situational causes and to reject biomedical explanations of symptoms than the majority population (Karasz, 2005). As a result, the women in the current study may not have conceptualized depressive symptoms as independent from other perceived stressors and thus their "PPD symptoms could not be disentangled from the reality of their difficult life circumstances" (Abrams, 2009, p. 359). For these mothers, the questions about general life stress earlier in the interview may have better captured their experience of "loss of control" as an interpretation of postpartum depressive symptoms than the questions on the EPDS, which utilizes more internal, psychological symptom interpretation.

As previously discussed, the perceived stress measure may capture a stress-specific component of psychological functioning that is vulnerable to mood states, providing a more accurate indicator of psychological distress in the current sample. The results showed that when mothers perceived their lives as more stressful, they were more hostile during interactions with their infants. This finding is consistent with research suggesting that as psychological distress increases, so does the use of punitive parenting behaviors (McLoyd, 1998; McLoyd, Jayaratne, Ceballo, & Borquez, 1994). It was reported that mothers with greater "psychological vulnerability" at childbirth, which included mental health problems and less perceived control of life circumstances, were at greater risk for child maltreatment (Healthy Families New York Study, Dumont et al.,

2008). It has been hypothesized that the frustration and aggression parents experience in response to aversive life circumstances may "spill over" into interactions with children (Prelow, Weaver, Bowman, & Swenson, 2010) and that the spillover of negative parental functioning is more likely under conditions of socioeconomic deprivation (Periera, Negrao, Soares, & Mesman, 2013). Although there is evidence that parenting behavior is influenced by aversive environmental contexts, much of the literature has focused on European American and African American families (Conger, Wallace, Sun, Simons, McLoyd, & Brody, 2002; McLoyd, 1998) whereas research on parenting among Latino and Mexican-American families is limited (Ceballo, Kennedy, Bregman, & Epstein-Ngo, 2012; Parke et al., 2004).

In a study of urban Latina women (Mexican and Puerto Rican), psychological distress was associated with less positive parenting of adolescent children, and mediated the influence of ecological risk (e.g. financial strain, housing problems, neighborhood problems) on parenting behavior (Prelow et al., 2010). Further, it was shown that Latina mothers with greater psychosocial risk (family stress checklist) engaged in harsher parenting practices with children at age 3 years, independent of SES risk (Martin, Fisher, & Kim, 2012). Thus, the current study provides evidence to advance our understanding of the association between perceptions of life stress and hostile maternal behavior for low-income Mexican-American women, and demonstrates that these processes occur in the early postpartum period. However, it was notable that the influence of perceived stress on maternal hostility in the autoregressive analyses was only found between 12- and 18-weeks, and thus it is possible that, the finding is age-specific and as infants develop, broad perceptions of stress become less influential to parenting than other factors such as

infant temperament (Leerkes et al., 2009) or social support (Cochran & Niego, 2002; Ensor & Hughes, 2010).

Transmission of Risk to Infants through Maternal Hostility

Finally, the current study provided evidence in support of the hypothesized transmission of risk model where maternal behavior is the mechanism through which maternal psychological functioning influences infant development. Specifically, the results of the mediation analyses indicated that the degree to which mothers expressed hostility during interactions with their infants helped to explain the connection between their perceptions of stress and later infant competencies, a finding consistent with prior research linking parent stress with hostile parenting (Martin et al., 2012; McKelvey, Fitzgerald, Schiffman, & Von Eye, 2002; Prelow et al., 2010), and with studies identifying hostile parenting as a mediator between parent stress and child outcomes (Deater-Deckard & Scarr, 1996; Jackson, 2000). However, much of the current understanding of parental hostility comes from the literature on harsh discipline (i.e. physical punishment; Gershoff et al., 2007), or has focused on measures of maternal sensitivity that presume the absence of hostile behavior (Joosen et al., 2012; Prelow et al., 2010). Thus, the current investigation not only succeeded in providing evidence for the transmission of risk from mothers to infants, it differentiated the singular vulnerability of hostile versus sensitive parenting to the influence of stress and demonstrated that hostility was the primary mechanism for the transference of risk from mothers to infants.

Additionally, much of our understanding of parenting behavior comes predominantly from studies of majority culture families (i.e. Caucasian families) and few studies have focused on parenting in ethnic minority families. A review of the literature

found 27 studies on maternal sensitivity in ethnic minority families that showed ethnic minority parents display significantly lower levels of sensitivity toward young children than do majority families (Mesman et al., 2012). However, due to substantial covariation between minority status and low SES, differences between majority and minority families greatly diminished when social and economic stress variables were controlled, a major premise of the Family Stress Model (Conger & Conger, 2002; Conger & Donnellan, 2007). The Family Stress Model posits that the context of economic hardship taxes parents' emotional, behavioral, and relational functioning (i.e. parent stress), and subsequently impairs parenting and child development (Conger & Conger, 2002; Conger & Donnellan, 2007). Subsequent studies have demonstrated the applicability of the model to ethnic minority families (Mesman et al., 2012) and to Mexican-American families in particular (Parke et al., 2004). In the current study, data were drawn from a sample of low-income Mexican American women, the majority of whom were living below 100% of the federal poverty guideline ($11, 670/year; U.S. Department of Health and Human Services, 2014). In support of a model of family stress, the results showed that it was hostility and not sensitivity that linked parent stress to infant developmental outcomes, suggesting that difficult life circumstances and increased stress in postpartum Mexican-American women spill over into parent-infant interactions through increased parental hostility (Pereira et al., 2013; Prelow et al., 2010), negatively influencing infants' cognitive and social-emotional development during the first year of life.

Strengths and Limitations

The results of the current study are based on a strong methodological foundation to explore the theoretical underpinnings of early postpartum influences on developmental

processes associated with infant competencies. Notably, the current investigation included the unique collection of intensive, longitudinal data across the first postpartum year that included both maternal report and observational data, as well as an analytic plan that utilized sophisticated statistical models to both examine the hypothesized longitudinal mediation model, and to parse data to better understand between- and within-individual processes, The findings provide evidence in support of longstanding theories in the field of child development that assert the importance of parenting to subsequent infant development (Burchinal, Vernon-Feagans, Cox, & Family Life Project Investigators, 2008; Sameroff & Fiese, 2000) as well as the influential role of stress in the postpartum period on relevant family and developmental processes (Burchinal et al., 2008; Conger & Conger, 2002; Conger & Donnellan, 2007; Goodman, Broth, Hall, & Stowe, 2008). Specifically, the current study provided a systematic empirical analysis of the transmission of risk from mothers to infants, approaching the question of causality with tests of mediation and temporal precedence. Moreover, the influence of sensitive and non-hostile parenting in the first 24 weeks postpartum by Mexican-American mothers was examined, illustrating the fundamental significance of parenting behavior across cultures as well as emphasizing the significance of the early postpartum period. Finally, explicating the connection between perceptions of stress and depressive symptoms longitudinally provided empirical evidence to support the theory of stress generation and extend our understanding of the interplay of stress and depression in a low-income, minority sample.

Although multiple strengths are apparent, the current study was limited in several ways. First, the observational data were limited in its power due to a very small

sample size. In addition, the data overall were limited to the first two cohorts of a larger data set, which may have introduced bias in our findings if the third cohort was somehow different than cohorts 1 and 2. However, these characteristics of the data would have made it more difficult to find significant results with the parenting data, and thus confidence in the current findings remains. Second, the analyses did not directly compare the influence of hostile versus sensitive maternal behavior in a single model due to a very high correlation between these observational variables. Theoretically, hostility and sensitivity represent independent constructs (Biringen, 2008), but operationally, these behaviors are very negatively correlated within the context of maternal interactions. Although it is possible for generally sensitive mothers to show hostile behavior, it is difficult to capture within the constraints of the study. Research on maternal sensitivity has shown that sensitive, responsive behavior specifically directed toward infant distress signals is uniquely associated with infant emotional well-being (Leerkes, Weaver, O'Brien, 2012). Thus, more precise and independent measurement across many different settings may be needed to more accurately compare the influence of sensitive versus hostile maternal behavior. Finally, as mentioned previously, the maternal reports of depressive symptoms were restricted and did not indicate even moderate symptomology across the sample. However, findings from a pilot study completed a few years prior with a sample from the same population showed elevated symptom scores that demonstrated increased risk for postpartum depression among low-income, Mexican-American women (Gress et al., 2010). Thus, the measurement of symptoms via interview format (as compared to pencil and paper in the pilot study) may have resulted in underreporting of symptoms due to cultural or social pressures (Varela et al., 2007).

Conclusions and Implications

This study has implications for understanding the emergence of early parenting behavior as well as for prevention and intervention strategies that might bolster infant developmental outcomes in postpartum Mexican-American families. The findings emphasize the importance of the early environment, especially interactions with parents on both cognitive and social-emotional development. With evidence that mothers' parenting behavior becomes increasingly stable by 18 weeks postpartum, this very early developmental period may be a key time for prevention services to educate and support mothers in being consistently sensitive caregivers. Related research on nurse home visiting programs has shown that reaching and educating mothers prenatally or soon after childbirth has profound influences on child and family outcomes (Dumont et al., 2008; Norr et al., 2003; Olds et al., 2007). Likewise, it is also important to understand mothers' psychosocial functioning in the first postpartum year as perceptions of stress, whether related to financial, interpersonal, mood, or other stressors, was linked to more hostile parenting behavior. There is evidence that social support may reduce the risk of postpartum depression by reducing the effect of stressors on the mother (see Swendsen & Mazure, 2000 for review), and research has shown that social support buffers the effects of ecological risk on mothers' psychological distress and parenting behaviors (Prelow et al., 2010). Thus, providing additional support to mothers in efforts to reduce stress levels may help them to have the resources to focus on their parenting and be sensitive with their infants.

In summary, the current investigation demonstrates the complexity surrounding the acquisition of cognitive and social-emotional competencies during the first year of

life for infants in Mexican-American families. It is remarkable that parental expression of sensitivity and hostility as early as 18 weeks postpartum has a lasting influence on infant development at one year, suggesting that very early on, parents are able to lay the foundation necessary to support emerging competencies. Further, it is notable that for Mexican-American mothers, depressive symptomology subsequently influences perceptions about the overwhelming and uncontrollable nature of their lives. In turn, these stressful perceptions interfere with their ability to parent their infants and result in greater expressions of hostility, and ultimately, may hinder infant developmental progress. Future studies may build on the current findings by including additional observations of mother-infant interactions to provide more in-depth examination of the emergence of parenting behavior during the postpartum period (e.g. 6 weeks, 1 year, 18 months, and 2 years postpartum); by investigating alternative measures of stress such as major life events or daily hassles to provide less emotionally-biased measures of stress and greater understanding of the specificity of types of stress on parental functioning; and finally, by including measures of infant temperament and social support to investigate their influence on parenting behavior and the emergence of problematic social-emotional behavior as well as developmental competencies. By addressing these issues, the field would gain greater understanding of the emergence and evolution of maternal parenting behavior across infancy, as well as its vulnerability to specific types of stress and its unique influence on the course of infant development and the emergence of problem behavior.

REFERENCES

Abrams, L.S., & Curran, L. (2009). "And you're telling me not to stress?" A grounded theory study of postpartum depression symptoms among low-income mothers. *Psychology of Women Quarterly, 33,* 351-362. doi: 10.1111/j.1471-6402.2009.01506.x

Affonso, D.D., De, A.K., Horowitz, J.A., Mayberry, L.J. (2000). An international study exploring levels of postpartum depressive symptomatology. *Journal of Psychosomatic Research, 49,* 207-216. doi: 10.1016/S0022-3999(00)00176-8

Affonso, D.D., Lovett, S., Paul, S., Sheptak, S., Nussbaum, R., Newman, L., & Johnson, B. (1992). Dysphoric distress in childbearing women. *Journal of Perinatology, 12*, 325-332.

Ainsworth, M.D.S., Blehar, M.C., Waters, E., & Wall, S. (1978). *Patterns of Attachment: A Psychological Study of the Strange Situation.* Hillsdale, NJ: Erlbaum.

Alink, L.R.A., Mesman, J., Van Zeijl, J., Stolk, M.N., Juffer, F., Koot, H.M., Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2006). The early childhood aggression curve: Development of physical aggression in 10- to 50- month old children. *Child Development, 77,* 954-966. doi: 10.1111/j.1467-8624.2006.00912.x

Allen, J.P., Chango, J., Szwedo, D., & Schad, M. (2014). Long-term sequelae of sub-clinical depressive symptoms in early adolescence. *Developmental Psychopathology, 26,* 171-180. doi: 10.1017/S095457941300093X

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (5th ed.).* Arlington, VA: American Psychiatric Publishing.

Ashman, S.B., Dawson, G., & Panagiotides, H. (2008). Trajectories of maternal depression over 7 years: Relations with child psychophysiology and behavior and role of contextual risks. *Development and Psychopathology, 20,* 55-77. doi: 10.1017/S0954579408000035

Banti, S., Mauri, M., Oppo, A., Borri, C., Rambelli, C., Ramacciotti, D., Cassano, G.B. (2011). From the third month of pregnancy to 1 year postpartum. Prevalence, incidence, recurrence, and new onset of depression. Results from the Perinatal Depression–Research & Screening Unit study. *Comprehensive Psychiatry, 52,* 343-351. doi: 10.1016/j.comppsych.2010.08.003

Baron, R.M., & Kenny, D.A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations.

Journal of Personality and Social Psychology, 51, 1173-1182. doi: 10.1037/0022-3514.51.6.1173

Baumrind, D. (1966). Effects of Authoritative Parental Control on Child Behavior. *Child Development, 37*, 887-907. doi: 10.2307/1126611

Barry, T.D., Dunlap, S., Lochman, J.E., & Wells, K.C. (2009). Inconsistent discipline as a mediator between maternal distress and aggression in boys. Ch*ild and Family Behavior Therapy, 31*, 1-19. DOI: 10.1080/07317100802701186

Bayley, N. (2005). *Bayley Scales of Infant and Toddler Development*, (3rd ed.). Psychological Corp: San Antonio, TX.

Beck, C.T. (1993). Teetering on the edge: A substantive theory of postpartum depression. *Nursing Research, 42*, 42-48.

Beck, C.T. (2007). Exemplar: Teetering on the edge: a continually emerging theory of postpartum. In P. L. Munhall (Ed.), *Nursing research: A qualitative perspective,* (4th ed.; pp.273-292). Sudbury, MA: Jones and Bartlett.

Beeghly, M., Weinberg, M.K., Olson, K.L., Kernan, H., Riley, J., Tronick, E.Z. (2002). Stability and change in level of maternal depressive symptomatology during the first postpartum year. *Journal of Affective Disorders, 71*, 169–180. doi: http://dx.doi.org/10.1016/S0165-0327(01)00409-8

Belsky, J. (1984). The determinants of parenting: A process model. *Child Development, 55*, 83-96. doi: 10.2307/1129836

Bernier, A., Carlson, S.M., & Whipple, N. (2010). From external regulation to self-regulation: Early parenting precursors of young children's executive functioning. *Child Development, 81,* 326-339. doi: 10.1111/j.1467-8624.2009.01397.x

Biesanz, J.C. (2013). Autoregressive Longitudinal Models. In R.H. Hoyle (Ed.), *Handbook of Structural Equation Modeling* (pp. 459-471). New York, NY: Guildford Press.

Bifulco, A., Moran, P.M., Ball, C., Jacobs, C., Baines, R., Bunn, A., & Cavagin, J. (2002). Childhood adversity, parental vulnerability, and disorder: Examining inter-generational transmission of risk. *Journal of Child Psychology and Psychiatry, 43,* 1075-1086. doi: 10.1111/1469-7610.00234

Biringen, Z. (2008). *The Emotional Availability (EA) Scales* (4th ed.). Unpublished manuscript.

Bollen, K.A., & Curran, P.J. (2004). Autoregressive latent trajectory (ALT) models: A synthesis of two traditions. *Sociological Methods and Research, 32*, 336-383. doi: 10.1177/0049124103260222

Bornstein, M.H. (1989). Sensitive periods in development: Structural characteristics and causal interpretations. *Psychological Bulletin, 105,* 179-197. doi:10.1037//0033-2909.105.2.179

Bornstein, M.H., & Tamis-LeMonda, C. (1990). Activities and interactions of mothers and their firstborn infants in the first six months of life: Covariation, stability, continuity, correspondence, and prediction. *Child Development, 61*, 1206-1217. doi: 10.1111/j.1467-8624.1990.tb02854.x

Boyd, R.C., Le, H.N., & Somberg, R. (2005). Review of screening instruments for postpartum depression. *Archives of Women's Mental Health, 8*, 141-153. doi: 10.1007/s00737-005-0096-6

Boyd, R.C., Zayas, L.H., & McKee, M.D. (2006). Mother-infant interaction, life events, and prenatal and postpartum depressive symptoms among urban minority women in primary care. *Maternal and Child Health Journal, 10*, 139-148. doi: 10.1007/s10995-005-0042-2

Bradley, R.H. & Corwyn, R.F. (2007). Externalizing problems in fifth grade: Relations with productive activity, maternal sensitivity, and harsh parenting from infancy through middle childhood. *Developmental Psychology, 43*, 1390-1401. doi: 10.1037/0012-1649.43.6.1390

Brennan, P.A., Hammen, C., Andersen, M.J., Bor, W., Najman, J.M., & Williams, G.M. (2000). Chronicity, severity, and timing of maternal depressive symptoms: Relationships with child outcomes at age 5. *Developmental Psychology, 36,* 759-766. doi: 10.1037//0012-1649.36.6.759

Brennan, P.A., Hammen, C., Katz, A.R. & Le Brocque, R.M. (2002). Maternal depression, paternal psychopathology, and adolescent diagnostic outcomes. *Journal of Consulting and Clinical Psychology, 70*, 1075–1085. doi:10.1037/0022-006X.70.5.1075

Briggs-Gowan, M.J. & Carter, A.S. (2006). *BITSEA Brief Infant-Toddler Social and Emotional Assessment Examiner's Manual.* San Antonio, TX: Harcourt Assessment, Inc.

Britto, P., Fuligni, A.S., & Brooks-Gunn, J. (2002). Reading, rhymes, and routines: American parents and their children. In N. Halfon, K. McLearn, and M. Schuster (Eds.), *Child rearing in America: The conditions of parents with young children* (pp. 117–145). New York: Cambridge University Press.

Burchinal, M.R., Vernon-Feagans, L., Cox., M., & The Family Life Project Key Investigators (2008). Cumulative social risk, parenting, and infant development in rural low-income communities. *Parenting: Science and Practice, 8*, 41-69. doi: 10.1080/15295190701830672

Burke, L. (2003). The impact of maternal depression on familial relationships. *International Review of Psychiatry, 15*, 243-255. doi: 10.1080/0954026031000136866

Burt, S.A., McGue, M., Krueger, R.F., & Iacono, W.G. (2005). How are parent–child conflict and childhood externalizing symptoms related over time? Results from a genetically informative cross-lagged study. *Development and Psychopathology, 17*, 145–165. doi: 10.1017/S095457940505008X

Calkins, S.D., & Degnan, K.A. (2006). Temperament in early development. In: Ammerman R, (Ed.), *Comprehensive Handbook of Personality and Psychopathology, Vol 3: Child Psychopathology*. Wiley; New York.

Campbell, S.B., Brownell, C.A., Hungerford, A., Spicker, S.J., Mohan, R., & Blessing, J.S. (2004). The course of maternal depressive symptoms and maternal sensitivity as predictors of attachment security at 36 months. *Development and Psychopathology, 16,* 231-252. doi: 10.1017/S0954579404044499

Campbell, S.B., Cohn, J.F., Flanagan, C., Popper, S., & Meyers, T. (1992). Course and correlates of postpartum depression during the transition to parenthood. *Development and Psychopathology, 4,* 29-47. doi: 10.1017/S095457940000554X

Campbell, S.B., Cox, M.J., McLoyd, V.C., Morgan-Lopez, A.A., & National Institute of Child Health and Human Development Early Child Care Research Network (2009). A Latent class analysis of maternal depressive symptoms over 12 years and offspring adjustment in adolescence. *Journal of Abnormal Psychology, 118,* 479-493. doi: 10.1037/a0015923

Ceballo, R., Kennedy, T. M., Bregman, A., & Epstein-Ngo, Q. (2012). Always aware (siempre pendiente): Latina mothers' parenting in high-risk neighborhoods. *Journal of Family Psychology, 26*, 805-815. doi: 10.1037/a0029584

Cicchetti, D., Rogosch, F. A., & Toth, S. L. (1998). Maternal depressive disorder and contextual risk: Contributions to the development of attachment insecurity and behavior problems in toddlerhood. *Development and Psychopathology, 10*, 283-300. doi: 10.1017/S0954579498001618

Ciciolla, L., Crnic, K.A., & West, S.G. (2013). Stress, depression, and the mother-infant relationship across the first year. *Parenting: Science and Practice, 13,* 178-195. doi: 10.1080/15295192.2013.756354

Cochran, M., & Niego, S. (2002). Parenting and social networks. In M. Bornstein (Ed.), *Handbook of Parenting* (pp. 393–418). Mahwah, NJ: Lawrence Erlbaum.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences (*2nd ed*.)*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Cohen, J., Cohen, P., West, S.G., & Aiken, L.S. (2003). *Applied multiple regression/correlation analysis in the behavioral sciences* (3rd ed.). Mahwah, NJ: Erlbaum.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A Global Measure of Perceived Stress. *Journal of Health and Social Behavior, 24*, 385-396. doi: 10.2307/2136404

Cole, D. A., & Maxwell, S. E. (2003). Testing mediational models with longitudinal data: Questions and tips in the use of structural equation modeling. *Journal of Abnormal Psychology, 112*, 558-577. doi: 10.1037/0021-843X.112.4.558

Cole, P.M., & Deater-Deckard, K. (2009). Emotion regulation, risk, and psychopathology. *Journal of Child Psychology and Psychiatry, 50,* 1327-1330. doi:10.1111/j.1469-7610.2009.02180.x

Cole, P.M., & Hall, S.E. (2008). Emotion dysregulation as a risk factor for psychopathology. In: T.P. Beauchaine, & S.P. Hinshaw, (Eds). *Child and adolescent psychopathology* (pp. 265–298). Hoboken, NJ: Wiley & Sons.

Cole, P.M., Michel, M.K., & Teti, L.O. (1994). The development of emotion regulation and dysregulation: A clinical perspective. *Monographs of the Society for Research in Child Development, 59,* 73-100. doi: 10.1111/j.1540-5834.1994.tb01278.x

Conger, R.D., & Conger, K.J. (2002). Resilience in Midwestern families: selected findings from the first decade of a prospective, longitudinal study. *Journal of Marriage and Family, 64*, 361–373. doi: 10.1111/j.1741-3737.2002.00361.x

Conger, R.D., & Donnellan, M.B. (2007). An interactionist perspective on the socioeconomic context of human development. *Annual Review of Psychology, 58,* 175–199. doi: 10.1146/annurev.psych.58.110405.085551

Conger, R.D., Wallace, L.E., Sun, Y., Simons, R.L., McLoyd, V.C., & Brody, G.H. (2002). Economic pressure in African American families: A replication and extension of the family stress model. *Developmental Psychology, 38,* 179-193. doi: 10.1037//0012-1649.38.2.179

Cooper, P.J., & Murray, L. (1995). The Course and Recurrence of Postnatal Depression. *British Journal of Psychiatry, 166*, 191–195. doi: 10.1192/bjp.166.2.191

Cornish, A.M., McMahon, C.A., Ungerer, J.A., Barnett, B., Kowalenko, N., & Tennant, C. (2005). Postnatal depression and infant cognitive and motor development in the second postnatal year: The impact of depression chronicity and infant gender. *Infant Behavior & Development, 28,* 407-417. doi: 10.1016/j.infbeh.2005.03.004

Cox, J.L., Holden, J.M., & Sagovsky, R. (1987). Detection of postnatal depression. development of the 10-item Edinburgh postnatal depression scale. *The British Journal of Psychiatry: The Journal of Mental Science, 150*, 782-786. doi: 10.1192/bjp.150.6.782

Crnic, K.A., Gaze, C., & Hoffman, C. (2005). Cumulative parenting stress across the preschool period: Relations to maternal parenting and child behavior at age 5. *Infant and Child Development, 14*, 117-132. doi: 10.1002/icd.384

Crnic, K.A., & Greenberg, M.K. (1990). Minor parenting stresses with young children. *Child Development, 61*, 1628-1637.

Crnic, K.A., Greenberg, M.T., Ragozin, A.S., Robinson, N.M., & Basham, R.B. (1983). Effects of stress and social support on mothers and premature and full-term infants. *Child Development, 54,* 209-217. doi: 10.1111/j.1467-8624.1983.tb00350.x

Crockenberg, S.C., & Leerkes, E.M. (2004). Infant and maternal behaviors regulate infant reactivity to novelty at 6 months. *Developmental Psychology, 40*, 1123–1132. doi: 10.1037/0012-1649.40.6.1123

Crockenberg, S.C. & Leerkes, E.M. (2006). Infant and maternal behavior moderate reactivity to novelty to predict anxious behavior at 2.5 years. *Development and Psychopathology, 18*, 17-34. doi: 10.1017/S0954579406060020

Cummings, E.M., Keller, P.S., & Davies, P.T. (2005). Towards a family process model of maternal and paternal depression: Exploring multiple relations with child and family functioning. *Journal of Child Psychology and Psychiatry, 46*, 479-489. doi: 10.1111/j.1469-7610.2004.00368.x

Davila, J., Bradbury, T.N., Cohan, C.L., & Tochluk, S. (1997). Marital functioning and depressive symptoms: Evidence for a stress generation model. *Journal of Personality and Social Psychology, 73*, 849−861. doi:10.1037/0022–3514.73.4.849

Davila, J.,Burge, D., & Hammen, C.(2000). Borderline personality disorder symptoms as predictors of 4-year romantic relationship dysfunction in young women:

Addressing issues of specificity. *Journal of Abnormal Psychology*, *109*, 451−460. doi: 10.1037//0021-843X.109.3.451

Dawson, G., Ashman, S.B., Panagiotides, H., Hessl, D., Self, J., Yamada, E., & Embry, L. (2003). Preschool outcomes of children of depressed mothers: role of maternal behavior, contextual risk, and children's brain activity. *Child Development, 74*, 1158–75. doi: 10.1111/1467-8624.00599

Deater-Deckard, K., & Scarr, S. (1996). Parenting stress among dual-earner mothers and fathers: Are there gender differences? *Journal of Family Psychology, 10*, 45-59. doi: 10.1037/0893-3200.10.1.45

De Jonge, J., Dormann, C., Janssen, P.P.M., Dollard, M.F., Landeweerd, J.A., & Nijhuis, F.J.N. (2001). Testing reciprocal relationships between job characteristics and psychological outcomes: A cross-lagged structural equation model. *Journal of Occupational and Organizational Psychology, 74*, 29–46. doi: d912f50d8f855dc672

Dietz, L.J., Jennings, K.D., Kelley, S.A. & Marshal, M. (2009). Maternal depression, paternal psychopathology, and toddler's behavior problems. *Journal of Clinical Child & Adolescent Psychology, 38*, 48‑61. 10.1080/15374410802575362

DiPietro, J.A., Costigan, K.A., & Sipsma, H. (2008) Continuity in self-report measures of maternal anxiety, stress, and depressive symptoms from pregnancy through two years postpartum. *Journal of Psychosomatic Obstetrics & Gynecology, 29*, 115–124. doi:10.1080/01674820701701546

DuMont, K.A., Mitchell-Herzfeld, C., Greene, R., Lee, E., Lowenfels, A., Rodriguez, M., & Dorabawila, V. (2008). Healthy Families New York Randomized Trial: Effects on early child abuse and neglect. *Child Abuse & Neglect, 32*, 295-315. doi: 10.1016/j.chiabu.2007.07.007

Easterbrooks, M.A., Biesecker, G., & Lyons-Ruth, K. 2000. Infancy predictors of emotional availability in middle childhood: the roles of attachment security and maternal depressive symptomatology. *Attachment and Human Development, 2*, 170-87. doi: 10.1080/14616730050085545

Eberhard-Gran M, Eskild A, Tambs K, Opjordsmoen S, Samuelsen SO (2001). Review of validation studies of the Edinburgh Postnatal Depression Scale. *Acta Psychiatrica Scandinavica 104*, 243–249. doi: 10.1034/j.1600-0447.2001.00187.x

Edge. D., & Rogers, A. (2005). Dealing with it: Black Caribbean women's response to adversity and psychological distress associated with pregnancy, childbirth, and early motherhood. *Social Science & Medicine*. 61, 15–25. doi: 10.1016/j.socscimed.2004.11.047

Eisenberg, N., Fabes, R.A., Shepard. S.A., Guthrie, I.K., Murphy, B.C., & Reiser, M. (1999). Parental reactions to children's negative emotions: longitudinal relations to quality of children's social functioning. *Child Development, 70,* 513-534. doi: 10.1111/1467-8624.00037

Eisenberg, N., Sadovsky, A., Spinrad T.L., Fabes, R.A., Losoya, S.H., Valiente, C., Reiser, M., Cumberland, A., & Shepard, S.A. (2005). The relations of problem behavior status to children's negative emotionality, effortful control, and impulsivity: Concurrent relations and prediction of change. *Developmental Psychology, 41*, 193–211. doi: 10.1037/0012-1649.41.1.193

Elgar, F.J., Mills, R.S., McGrath, P.J., Waschbusch, D.A., & Brownridge, D.A. (2007). Maternal and paternal depressive symptoms and child maladjustment: The mediating role of parental behavior. *Journal of Abnormal Child Psychology, 35,* 943-955. doi: 10.1007/s10802-007-9145-0

Elliott, S. A., Leverton, T. J., Sanjack, M., Turner, H., Cowmeadow, P., Hopkins, J. and Bushnell, D. (2000), Promoting mental health after childbirth: A controlled trial of primary prevention of postnatal depression. *British Journal of Clinical Psychology*, *39*: 223–241. doi: 10.1348/014466500163248

Enders, C.K. & Bandalos, D.L. (2001). The relative performance of full information maximum likelihood estimation for missing data in structural equation models. *Structural Equation Modeling: A Multidisciplinary Journal, 8*, 430-457. doi:10.1207/S15328007SEM0803_5

Ensor, R., & Hughes, C. (2010). With a Little Help from My Friends: Maternal Social Support, via Parenting, Promotes Willingness to Share in Preschoolers Born to Young Mothers. *Infant and Child Development. 19*, 127–141. doi: 10.1002/icd.643

Essex, M.J., Kraemer, H.C., Armstrong, J.M., Boyce, W.T., Goldsmith, H.H., Klein, M.H., Woodward, H., & Kupfer, D.J. (2006). Exploring risk factors for the emergence of children's mental health problems. *Archives of General Psychiatry, 63*, 1246-1256. doi: 10.1001/archpsyc.63.11.1246

Fava, M., Rosenbaum, J.F., McCarthy, M., Pava, J.A., Steingard, R., & Fox, R. (1992). Correlations between perceived stress and depressive symptoms among depressive outpatients. *Stress Medicine, 8,* 73-76. doi: 10.1002/smi.2460080203

Feldman, R. (2007). Parent-infant synchrony and the construction of shared timing; physiological precursors, developmental outcomes, and risk conditions. *Journal of Child Psychology and Psychiatry, 48,* 329-354. doi: 10.1111/j.1469-7610.2006.01701.x

Feldman, R., & Eidelman, A. I. (2009). Biological and environmental initial conditions shape the trajectories cognitive and social-emotional development across the first five years of life. *Developmental Science, 12*, 194-200. doi: 10.1111/j.1467-7687.2008.00761.x

Feldman, R., Granat, A., Pariente, C., Kanety, H., Kuint, J., & Gilboa-Schechtman, E. (2009). Maternal depression and anxiety across the postpartum year and infant social engagement, fear regulation, and stress reactivity. *Journal of the American Academy of Child and Adolescent Psychiatry, 48,* 919–27. doi: 10.1097/CHI.0b013e3181b21651

Feldman, R., Greenbaum, C.W., Mayes, L.C., & Erlich, H.S. (1997). Change in mother-infant interactive behavior: Relations to change in the mother, the infant, and the social context. *Infant Behavior and Development, 20,* 153-165. doi: 10.1016/S0163-6383(97)90018-7

Feng, X., Shaw, D.S., & Silk, J.S. (2008). Developmental trajectories of anxiety symptoms among boys across early and middle childhood. *Journal of Abnormal Psychology, 117,* 32-47. doi: 10.1037/0021-843X.117.1.32

Field, T. (1992). Infants of depressed mothers. *Development and Psychopathology, 4,* 49-66. doi: 10.1017/S0954579400005551

Field, T. (1998). Maternal depression effects on infants and early interventions. *Preventive Medicine, 27,* 200-203. doi: 10.1006/pmed.1998.0293

Field, T. (2002). Prenatal effects of maternal depression. In S. H. Goodman & I. H. Gotlib (Eds.), *Children of depressed parents: Mechanisms of risk and implications for treatment* (pp. 59–88). Washington, DC: American Psychological Association.

Field, T. (2010). Postpartum depression effects on early interactions, parenting, & safety practices: A review. *Infant Behavior and Development, 33,* 1-6. doi: 10.1016/j.infbeh.2009.10.005

Field, T., Diego, M., & Hernandez-Reif, M. (2006). Prenatal depression effects on the fetus and newborn. *Infant Behavior & Development, 29,* 445-455. doi:10.1016/j.infbeh.2006.03.003

Forget-Dubois, N., Boivin, M., Dionne, G., Pierce, T., Tremblay, R.E., & Perusse, D. (2007). A longitudinal twin study of the genetic and environmental etiology of maternal hostile-reactive behavior infancy and toddlerhood. *Infant Behavior & Development, 30,* 453-465. doi:10.1016/j.infbeh.2006.12.005

Forget-Dubois, N., Dionne, G., Lemelin, J.-P., Pérusse, D., Tremblay, R.E., & Boivin, M. (2009). Early child language mediates the relation between home environment and school readiness. *Child Development, 80*, 736-749. doi: 10.1111/j.1467-8624.2009.01294.x

Forman, D., O'Hara, M.W., Stuart, S., Gorman, L., Larsen, K. & Coy, K.C. (2007). Effective treatment for postpartum depression is not sufficient to improve the developing mother-child relationship. *Development and Psychopathology, 19*, 585-602. doi:10.1017/S0954579407070289

Garcia-Esteve, L., Ascaso, C., Ojuel, J., & Navarro, P. (2003). Validation of the Edinburgh postnatal depression scale (EPDS) in Spanish mothers. *Journal of Affective Disorders, 75*, 71-76. doi: doi: 10.1007/s00737-009-0073-6

Galaif, E.R., Sussman, S., Chou, C-P., & Wills, T.A. Longitudinal relations among depression, stress, and coping in high risk youth. *Journal of Youth and Adolescence, 32,* 243-258. doi:10.1023/A:1023028809718

Gavin, N.I., Gaynes, B.N., Lohr, K.N., Meltzer-Brody, S., Gartlehner, G., & Swinson, T. (2005). Perinatal depression: A systematic review of prevalence and incidence. *Obstetrics and Gynecology, 106,* 1071-1083. doi: 10.1097/01.AOG.0000183597.31630.db

Gerdes, A.C., Hoza, B., Arnold, L.E., Hinshaw, S. P., Wells, K.C., Hechtman, L., Greenhill, L., Swanson, J., Pelham, W.E., & Wigal, T. (2007). Child and parent predictors of perceptions of parent-child relationship quality. *Journal of Attention Disorders, 11*, 37-48. doi: 10.1177/1087054706295664

Gershoff, E.T., Aber, J.L., Raver, C.C, & Lennon, M.C. (2007). Income is not enough: Incorporating material hardship into models of income associations with parent mediators and child outcomes. *Child Development 78,* 70-95. doi: 10.1111/j.1467-8624.2007.00986.x

Goodman, J.H. (2004). Postpartum depression beyond the early postpartum period. *Journal of Obstetric, Gynecological, and Neonatal Nursing, 33,* 410-420. doi: 10.1177/0884217504266915

Goodman, S.H. (2007). Depression in mothers. *Annual Review of Clinical Psychology, 3,* 107-135. doi: 10.1146/annurev.clinpsy.3.022806.091401

Goodman, S.H., Broth, M.R., Hall, C.M., & Stowe, Z.N. (2008). Treatment of postpartum depression in mothers: Secondary benefits to the infants. *Infant Mental Health Journal, 29,* 492-513. doi: 10.1002/imhj.20188

Goodman, S.H., & Gotlib, I.H. (1999). Risk for psychopathology in children of depressed mothers: A developmental model for understanding mechanisms of transmission. *Psychological Review, 106*, 458-490. doi: 10.1037/0033-295X.106.3.458

Goodman, S.H., & Tully, E.C. (2006). Depression in women who are mothers: An integrative model of risk for the development of psychopathology in their sons and daughters. In C. L. M. Keyes & S. H. Goodman (Eds.), *Women and Depression: A Handbook for the Social, Behavioral, and Biomedical Sciences* (pp. 241-280). New York, NY: Cambridge University Press.

Gotlib, I.H., Lewinsohn, P.M., & Seeley, J.R. (1995). Symptoms versus a diagnosis of depression: Differences in psychosocial functioning. *Journal of Consulting and Clinical Psychology, 63*, 90-100. doi: 10.1037//0022-006X.63.1.90

Gress, J., Lake, A., Luecken, L.J., Lemery-Chalfant, K. & Howe, R. (2010). *The prospective relation between postpartum depression and infant health in low-income and ethnic minority women*. Poster presented at the American Psychosomatic Society Annual Conference, Portland, OR.

Gunlicks, M.L., & Weissman, M.M. (2008). Change in child psychopathology with improvement in parental depression: a systematic review. *Journal of the American Academy of Child and Adolescent Psychiatry, 47*, 379-389. doi: 10.1097/CHI.0b013e3181640805

Halgunseth, L.C., Ispa, J.M., & Rudy, D. (2006). Parental control in Latino families: An integrated review in the literature. *Child Development, 77*, 1282-1297. doi:10.1111/j.1467-8624.2006.00934.x

Hammen C. (1991). Generation of stress in the course of unipolar depression. *Journal of Abnormal Psychology, 100*, 555–561. doi: 10.1037/0021-843X.100.4.555

Hammen, C. (2005). Stress and depression. *Annual Review of Clinical Psychology, 1,* 293-319. doi: 10.1146/annurev.clinpsy.1.102803.143938

Hammen, C. (2006). Stress generation in depression: Reflections on origins, research, and future directions. *Journal of Clinical Psychology, 62,* 1065-1082. doi: 10.1002/jclp.20293

Hammen, C. (2009). Children of depressed parents. In I. Gotlib & C. Hammen (Eds.) *Handbook of Depression*, (2nd ed.), (pp. 275–297). New York: Guilford Press.

Harnish, J.D., Dodge, K.A., & Valente, E. (1995). Mother-child interaction quality as a partial mediator of the roles of maternal depressive symptomatology and socioeconomic status in the development of child behavior problems. *Child Development, 66,* 739-753. doi: 10.1111/j.1467-8624.1995.tb00902.x

Hay, D.F., Pawlby, S., Sharp, D., Asten, P., Mills, A., Kumar, R. (2001). Intellectual problems shown by 11-year-old children whose mothers had postnatal depression. *Journal of Child Psychology and Psychiatry, 42,* 871-889. doi: 10.1111/1469-7610.00784

Hay, D.F., Pawlby, S., Waters, C.S., Sharp, D. (2008). Antepartum and postpartum depression: Different effects on different adolescent outcomes. *Journal of Child Psychology and Psychiatry, 49*, 1079-1088. doi: 10.1111/j.1469-7610.2008.01959.x

Hayes, A.F., & Scharkow, M. (2013). The relative trustworthiness of inferential tests of the indirect effect in statistical mediation analysis: Does method really matter? *Psychological Science, 24,* 1918-1927. doi:10.1177/0956797613480187

Herman, J.P. (2011). Central Nervous System Regulation of the Hypothalamic–Pituitary–Adrenal Axis Stress Response. In C.D. Conrad (Ed.), *The Handbook of Stress: Neuropsychological Effects on the Brain*, (pp. 3-28), Oxford, UK: Wiley-Blackwell.

Herman, J.P., Figueiredo, H., Mueller, N.K., Ulrich-Lai, Y., Ostrander, M.M., Choi, D.C. & Cullinan, W.E. (2003). Central mechanisms of stress integration: hierarchical circuitry controlling hypothalamo-pituitary-adrenocortical responsiveness. *Frontal Neuroendocrinology*, *24*, 151-80. doi: 10.1016/j.yfrne.2003.07.001

Hipwell, A.E., Goossens, F.A., Melhuish, E.C., & Kumar. R. (2000). Severe maternal psychopathology and infant-mother attachment. *Development and Psychopathology, 12*, 157–175. doi: 10.1017/S0954579400002030

Holden, G.W., & Miller, P.C. (1999). Enduring and different: A meta-analysis of the similarity in parents' child rearing. *Psychological Bulletin, 125*, 223-254. doi: 10.1037//0033-2909.125.2.223

Honey, K.L., & Morgan, M. (2003). A stress-coping transactional model of low mood following childbirth. *Journal of Reproductive and Infant Psychology, 21,* 129-143. doi: 10.1080/0264683031000124082

Honig, A.S., Tannenbaum, J., & Caldwell, B.M. (1973). Maternal behavior in verbal report and in laboratory observation: A methodological study. *Child Psychiatry and Human Development, 3*, 216-230. doi: 10.1007/BF01433217

Hopkins, J. Campbell , S.B. Marcus , M.D. (1987). Role of infant-related stressors in postpartum depression. *Journal of Abnormal Psychology, 96*, 237-241. doi: 10.1037/0021-843X.96.3.237

Horowitz, J.A., & Goodman, J.H. (2005). Identifying and treating postpartum depression. *Journal of Obstetric, Gynecological, and Neonatal Nursing, 34,* 264-273. doi: 10.1177/0884217505274583

Howell, E.A., Mora, P.A., Horowitz, C.R., & Leventhal, H. (2005). Racial and ethnic differences in factors associated with early postpartum depressive symptoms. Obstetrics & Gynecology, 105, 1442-1450. doi: 10.1097/01.AOG.0000164050.34126.37

Howes, C., & Obregon, N.B. (2009). Emotional availability in Mexican-heritage low-income mothers and children: Infancy through Preschool. *Parenting: Science and Practice, 9,* 260-276. doi: 10.1080/15295190902844589

Hung, C.H., Lin, C.J., Stocker, J., & Yu, C.Y. (2011). Predictors of postpartum stress. *Journal of Clinical Nursing, 20*, 666-674. doi: 10.1111/j.1365-2702.2010.03555.x

Ipsa, J.M., Fine, M.A., Halgunseth, L.C., Harper, S., Robinson, J., Boyce, L., Brooks-Gunn, J., & Brady-Smith, C. (2004). Maternal intrusiveness, maternal warmth, and mother–toddler relationship outcomes: Variations across low-income ethnic and acculturation groups. *Child Development, 75*, 1613–1631. doi: 10.1111/j.1467-8624.2004.00806.x

Jackson, A.P. (2000). Maternal self-efficacy and children's influence on stress and parenting among single black mothers in poverty. *Journal of Family Issues, 21*, 3–16. doi: 10.1177/019251300021001001

Johnson, J.G., Cohen, P., Kasen, S., Smailes, E., & Brook, J.S. (2001). Association of maladaptive parental behavior with psychiatric disorder among parents and their offspring. *Archives of General Psychiatry, 58*, 453-406. doi: 10.1001/archpsyc.58.5.453

Joosen, K.J., Mesman, J., Bakermans-Kranenburg, M.J., Pieper, S., Zeskind, P.S., & van IJzendoorn, M.H. (2013). Physiological reactivity to infant crying and observed maternal sensitivity. *Infancy, 18*, 414–431. doi: 10.1111/j.1532-7078.2012.00122.x

Kaplan, P. (2009). Maternal sensitivity and the learning-promoting effects of depressed and nondepressed mothers' infant-directed speech. *Infancy, 14,* 143-161. doi: 10.1080/15250000802706924

Kaplan, P.S., Burgess, A.P., Sliter, J.K., & Moreno, A.J. (2009). Maternal sensitivity and the learning-promoting effects of maternal infant-directed speech. *Infancy, 14*, 143-161.

Kaplan, L.A., Evans, L., & Monk C. (2008). Effects of mothers' prenatal psychiatric status and postnatal caregiving on infant biobehavioral regulation: can prenatal programming be modified? *Early Human Development, 84*, 249-256. doi: 10.1016/j.earlhumdev.2007.06.004

Karam, F., Berard, A., Sheehy, O., Huneau, M.C., Briggs, G., Chambers, C., Einarson, A., Johnson, D., Kao, K., Koren, G., Martin, B., Polifka, J.E., Riordan, S.H., Roth, M., Lavigne, S.V., Wolfe, L., & OTIS Research Committee, (2012). Reliability and validity of the 4-item perceived stress scale among pregnant women: Results from the OTIS antidepressants study. *Research in Nursing & Health. 35,* 363-375. doi:10.1002/nur.21482

Karasz, A. (2005). Cultural differences in conceptual models of depression. *Social Science & Medicine, 60,* 1625–1635. doi:10.1016/j.socscimed.2004.08.011

Kemppinen, K., Kumpulainen, K., Raita-Hasu, J., Moilanen, I., & Ebeling, H. (2006). The continuity of maternal sensitivity from infancy to toddler age. *Journal of Reproductive and Infant Psychology, 24,* 199-212. doi: 10.1080/02646830600821249

Kenny, D.A. (1975). Cross-lagged panel correlation: A test for spuriousness. *Psychological Bulletin, 82*, 887-903. doi: 10.1037/h0038045

Kenny, D.A., & Campbell, D.T. (1989). On the measurement of stability in over-time data. *Journal of Personality, 57*, 445–481. doi: 10.1111/j.1467-6494.1989.tb00489.x

Kessler, R.C. (1997). The effects of stressful life events on depression. *Annual Review of Psychology, 48,* 191-214. doi: 10.1146/annurev.psych.48.1.191

Knudsen, E.I. (2004). Sensitive periods in the development of the brain and behavior. *Journal of Cognitive Neuroscience, 16,* 1412-1425. doi: 10.1162/0898929042304796

Krieg, D.B. (2007). Does motherhood get easier the second-time around? Examining parenting stress and marital quality in mothers having their first or second child. *Parenting: Science and Practice, 7,* 149-175. doi: 10.1080/15295190701306912

Kuiper, N.A., Olinger, L.J., & Lyons, L.M. (1986). Global perceived stress level as a moderator of the relationship between negative life events and depression. *Journal of Human Stress, 12*, 149-153. doi: 10.1080/0097840X.1986.9936781

Kurstjens, S., & Wolke, D. (2001). Effects of maternal depression on cognitive development of children over the first 7 years of life. *Journal of Child Psychology and Psychiatry, 42,* 623-636. *doi: 10.1111/1469-7610.00758*

Landry, S.H., Smith, K.E., Miller-Loncar, C.L., & Swank, P.R. (1997). Predicting cognitive-language and social growth curves from early maternal behaviors in children at varying degrees of biological risk. *Developmental Psychology,* 33, 1040–1053. doi: 10.1037/0012-1649.33.6.1040

Landry, S.H., Smith, K.E., Swank, P.R., Assel, M.A., & Vellet, S. (2001). Does early responsive parenting have a special importance for children's development or is consistency across early childhood necessary? *Developmental Psychology, 37*, 387-403. doi: 10.1037/0012-1649.37

Lazarus, R.S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.

Leerkes, E.M., Blankson, A.N., & O'Brien, M. (2009). Differential effects of maternal sensitivity to infant distress and nondistress on social-emotional functioning. *Child Development, 80,* 762-775. doi: 10.1111/j.1467-8624.2009

Leerkes, E.M., Weaver, J.M., & O'Brien, M. (2012). Differentiating maternal sensitivity to infant distress and non-distress cues. *Parenting: Science and Practice, 12*, 175-184. doi: 10.1080/15295192.2012.683353

Letourneau, N., Salmani, M. & Duffett-Leger, L. (2010). Maternal depressive symptoms and parenting of children from birth to 12 years of age. *Western Journal of Nursing Research, 32*, 662-685. doi: 10.1177/0193945909359409

Lewinsohn, P.M., Rohde, P., Seeley, J.R., Klein, D.N., & Gotlib, I.H. (2000). Natural course of adolescent major depressive disorder in a community sample: Predictors of recurrence in young adults. *American Journal of Psychiatry*, *157*, 1584–1591. doi:10.1176/appi.ajp.157.10.1584

Liu, R.T., & Alloy, L.B. (2010). Stress generation in depression: A systematic review of the empirical literature and recommendations for future study. *Clinical Psychological Review, 5,* 582-593. doi: 10.1016/j.cpr.2010.04.010

Lohaus, A., Keller, H., Ball, J., Voelker, S., & Elben, C. (2004). Maternal sensitivity in interactions with three- and 12-month-old infants: Stability, structural composition, and developmental consequences. *Infant and Child Development, 13*, 235-252. doi: 10.1002/icd.351

Lorber, M.F., & Egeland, B. (2011). Parenting and infant difficulty: Testing a mutual exacerbation hypothesis to predict early onset conduct problems. *Child Development, 82*. 2006-2020. doi: 10.1111/j.1467-8624.2011.01652.x

Lovejoy, M.C., Graczyk, P.A., O'Hare, E., & Neuman, G. (2000). Maternal depression and parenting behavior: A meta-analytic review. *Clinical Psychology Review, 20*, 561-592. doi: 10.1016/S0272-7358(98)00100-7

MacCallum, R.C., Zhang, S., Preacher, K.J., & Rucker, D.D. (2002). On the practice of dichotomization of quantitative variables. *Psychological Methods, 7*, 19-40. doi: 10.1037//1082-989X.7.1.19

MacDonald, K. B. (1992). Warmth as a developmental construct: An evolutionary analysis. *Child Development, 63*, 753-773. doi: 10.1111/j.1467-8624.1992.tb01659.x

MacKinnon, D.P. (2008). *Introduction to statistical mediation analysis*. Mahwah, NJ: Erlbaum.

Marchand, J.F., Hock, E., & Widaman, K. (2002). Mutual relations between mothers' depressive symptoms and hostile-controlling behavior and young children's externalizing and internalizing behavior problems. *Parenting Science and Practice,* 2, 335–353. doi: 10.1207/S15327922PAR0204_01

Martin, C., Fisher, P., & Kim, H.K. (2012). Risk for maternal harsh parenting in high-risk families from birth to age three: Does ethnicity matter? *Prevention Science, 13,* 64-74. doi: 10.1007/s11121-011-0247-0

Maughan, A., Cicchetti, D., Toth, S.L., & Rogosch, F.A. (2007). Early-occurring maternal depression and maternal negativity in predicting young children's emotion regulation and socioemotional difficulties. *Journal of Abnormal Child Psychology, 35,* 685-703. doi: 10.1007/s10802-007-9129-0

Mayberry, L.J., & Affonso, D.D. (1993). Infant temperament and postpartum depression: a review. *Health Care for Women International, 14,* 201-211. doi: 10.1080/07399339309516041

McCarty, C.A., McMahon, R.J., & Conduct Problems Prevention Research Group. (2003). Mediators of the relation between maternal depressive symptoms and child internalizing and disruptive behavior disorders. *Journal of Family Psychology, 17,* 545-556. doi: 10.1037/0893-3200.17.4.545

McKelvey, L., Fitzgerald, H., Schiffman, R., & Von Eye, A. (2002). Family stress and parent-infant interaction: The mediating role of coping. *Infant Mental Health Journal, 23*, 164–181. doi: 10.1002/imhj.10010

Mendelson, T., Rehkopf, D., & Kubzansky, L.D. (2008) Depression among Latinos in the United States: A meta-analytic review. *Journal of Consulting and Clinical Psychology, 76,* 355-366. doi: 10.1037/0022-006X.76.3.355

Mesman, J., Van IJzendoorn, M.H., & Bakermans-Kranenburg, M.J. (2012). Unequal in opportunity, equal in process: Parental sensitivity promotes positive child

development in ethnic minority families. *Child Development Perspectives, 6*, 239-250. doi: 10.1111/j.1750-8606.2011.00223.x

Milgrom, J., Gemmill, A.W., Bilszta, J.L., Hayes, B., Barnett, B., Brooks, J., Ericksen, J., Ellwood, D., & Buist, A. (2008). Antenatal risk factors for postnatal depression: a large prospective study. *Journal of Affective Disorders, 108*, 147–157. doi: 10.1016/j.jad.2007.10.014

Mills-Koonce, W.R., Gariepy, J.L., Sutton, K., & Cox, M.J. (2008). Changes in maternal sensitivity across the first three years: are mothers from different attachment dyads differentially influenced by depressive symptomatology? *Attachment & Human Development, 10,* 299-317. doi: 10.1080/14616730802113612

Mistry, R.S., Biesanz, J.C., Taylor, L.C., Burchinal, M., & Cox, M.J. (2004). Family income and its relation to preschool children's adjustment for families in the NICHD study of early child care. *Developmental Psychology, 40*, 727-745. doi:10.1037/0012-1649.40.5.727

Moore, G., & Calkins, S.D. (2004) Maternal behavior mediates the relation between infant physiological and behavioral distress in the Still-Face paradigm. *Developmental Psychology, 40,* 1068-1080. doi: 10.1111/j.1467-9507.2011.00593.xt

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

Morris-Rush, J.K., Freda, M.C., & Bernstein, P.S. (2003). Screening for postpartum depression in an inner-city populations. *American Journal of Obstetric Gynecology, 188,* 1217-1219. doi: 10.1067/mob.2003.279

Munk-Olsen, T., Munk Laursen, T., Bøcker Pedersen, C., Mor, O., & Mortensen, P.B. (2006). New parents and mental disorders: A population-based register study. *The Journal of the American Medical Association, 296,* 2582-2589. doi: 10.1097/01.AOG.0000244713.73279.7b

Murray, L. (1992). The impact of postnatal depression on infant development. *Journal of Child Psychology and Psychiatry, 33,* 543–561. doi: 10.1111/j.1469-7610.1992.tb00890.x

Murray, L., Cooper, P.J., Wilson, A., & Romaniuk, H. (2003). Controlled trial of the short- and long-term effect of psychological treatment of postpartum depression: Impact on the mother-child relationship and child outcome. *The British Journal of Psychiatry, 182,* 420-427. doi: 10.1192/bjp.02.178

Murray, D., & Cox, J.L. (1990). Screening for depression during pregnancy with the Edinburgh Depression Scale (EPDS). *Journal of Reproductive and Infant Psychology. Special Issue: Psychiatric Disorders Associated with Childbearing, 8*, 99-107. doi: 10.3109/01674820903230708

Murray, L., Fiori-Cowley, A., Hooper, R., Cooper, P. (1996). The impact of postnatal depression and associated adversity on early mother-infant interactions and later infant outcome. *Child Development, 67,* 2512-2526. doi: 10.1111/j.1467-8624.1996.tb01871.x

Murray, L., Kempton, C., Woolgar, M., & Hooper, R. (1993). Depressed mothers' speech to their infants and its relation to infant gender and cognitive development. *Journal of Child Psychology and Psychiatry, 34,* 1083-1101. doi: 10.1111/j.1469-7610.1993.tb01775.x

Murray, L., Sinclair, D., Cooper, P., Ducournau, P., Turner, P., & Stein, A. (1999). Socioemotional development of 5-year-old children of postnatally depressed mothers. *Journal of Child Psychology and Psychiatry, 40,* 1259-1271. doi:10.1111/1469-7610.00542

Muthén, L.K., & Muthén, B.O. (1998-2010). *Mplus User's Guid*e, (6th Ed.). Los Angeles: Muthén & Muthén.

National Institute of Child Health and Human Development Early Child Care Research Network. (1999). Chronicity of maternal depressive symptoms, maternal sensitivity, and child functioning at 36 months. *Developmental Psychology, 35,* 1297-1310. doi: 10.1037/0012-1649.35.5.1297

Norr, K.F., Crittenden, K.S., Lehrer, E.L., Reyes, O., Boyd, C.B., Nacion, K.W., & Watanabe, K. (2003). Maternal and infant outcomes at one year for a nurse-health advocate home visiting program serving African Americans and Mexican Americans. *Public Health Nursing, 20,* 190-203. doi: 10.1046/j.0737-1209.2003.20306.x

O'Connor, T.G. (2003). Early experiences and psychological development: Conceptual questions, empirical illustrations, and implications for intervention. *Development and Psychopathology, 15,* 671-690. doi: 10.1017.S0954579403000336

O'Hara, M.W., Hoffman, J.G., Philipps, L.H.C., & Wright, E.J. (1992). Adjustment in childbearing women: The Postpartum Adjustment Questionnaire. *Psychological Assessment, 4*, 160-169. doi: 10.1037/0033-2909.104.1.97

O'Hara, M.W. (2009). Postpartum depression: What we know. *Journal of Clinical Psychology, 65*, 1258-1269. doi: 10.1002/jclp.20644

O'Hara, M.W., & Swain, A.M. (1996). Rates and risk of postpartum depression – a meta analysis. *International Review of Psychiatry, 8,* 37-54. doi: 10.3109/09540269609037816

O'Hara, M.W., Zekoski, E.M., Phillipps, L.H., & Wright, E.J. (1990). Controlled prospective study of postpartum mood disorders: comparison of childbearing and nonchildbearing women. *Journal of Abnormal Psychology, 99,* 3-15. doi: 10.1037//0021-843X.99.1.3

Olds, D., Eckenrode, J., Henderson, C.R., Jr., Kitzman, H., Powers, J., Cole, R., Sidora, K., Morris, P., Pettitt, L., & Luckey, D. (1997). Long-term effects of home visitation on maternal life course and child abuse and neglect: 15-year follow up of a randomized trial. *Journal of the American Medical Association, 278, 637-643.* doi: 10.1001/jama.1997.03550080047038

Otto, M.W., Fava, M., Penava, S.J., Bless, E., Muller, R.T., & Rosenbaum, J.F. (1997). Life event, mood, and cognitive predictors of perceived stress before and after treatment for major depression. *Cognitive Therapy and Research, 21*, 409-420. doi: 0.1023/A:1021980209878

Page, M., & Wilhelm, M. (2007). Postpartum daily stress, relationship quality, and depressive symptoms. *Contemporary Family Therapy, 29*, 237-251. doi: 10.1007/s10591-007-9043-1

Papp, L.M., Cummings, E.M., & Goeke-Morey, M.C. (2005). Parental psychological distress, parent-child relationship qualities, and child adjustment: Direct, mediating, and reciprocal pathways. *Parenting: Science and Practice, 5*, 249-283. doi: 10.1207/s15327922par0503_2

Parke, R.D., Coltrane, S., Duffy, S., Buriel, R., Dennis, J., Powers, J., French, S., & Widaman, K.F. (2004). Economic stress, parenting, and child adjustment in Mexican American and European American families. *Child Development, 75*, 1-25. doi: 10.1111/j.1467-8624.2004.00807.x

Pereira, M., Negrão, M. Soares, I., & Mesman, J. (2013). Predicting harsh discipline in at-risk mothers: the moderating effect of socioeconomic deprivation severity. *Journal of Child and Family Studies*, published online. doi: 10.1007/S10826-013-9883-2

Perry, D.F., Ettinger, A.K., Mendelson, T., & Le, H.N. (2011). Prenatal depression predicts postpartum maternal attachment in low-income Latina mothers with infants. *Infant Behavior and Development, 34,* 339-350. doi: 10.1016/j.infbeh.2011.02.005

Pianta, R., & Egeland, B. (1990). Life stress and parenting outcomes in a disadvantaged sample: Results of the Mother-Child Interaction Project. *Journal of Clinical Child Psychology, 19*, 329-336. doi: 10.1207/s15374424jccp1904_4

Poehlmann, J., Schwichtenberg, A.J.M., Bolt, D., & Dilworth-Bart, J. (2009). Predictors of depressive symptom trajectories in mothers of infants born preterm or low birthweight. *Journal of Family Psychology, 23*, 690-704. doi: 10.1037/a0016117

Prelow, H.M., Weaver, S.R., Bowman, M.A., & Swenson, R.R. (2010). Predictors of parenting among economically disadvantaged Latina mothers: Mediating and moderating factors. *Journal of Community Psychology, 38,* 858-873. doi: 10.1002/jcop.20400

Pungello, E.P., Iruka, I.U., Dotterer, A.M., Mills-Koonce, R., & Reznick, J.S. (2009). The effects of socioeconomic status, race, and parenting on language development in early childhood. *Developmental Psychology, 45*, 544-557. doi:10.1037/a0013917

Raposa, E., Hammen, C., & Brennan, P. (2011). Effects of child psychopathology on maternal depression: The mediating role of child-related acute and chronic stressors. *Journal of Abnormal Child Psychology*, *39,* 1177-1186. doi: 10.1007/s10802-011-9536-0

Raudenbush, S.W. and Bryk, A.S. (2002). *Hierarchical Linear Models (Second Edition)*. Thousand Oaks: Sage Publications.

Razurel, C., Kaiser, B., Dupuis, M., Antonietti, J.P., Sellenet, C., & Epiney, M. (2013). Validation of the postnatal perceived stress inventory in a French speaking population of primiparous women. *Journal of Obstetric, Gynecologic, & Neonatal Nursing, ahead of print,* doi: 10.1111/1552-6909

Rhoades, K.A., Leve, L.D., Harold, G.T., Neiderhiser, J.M., Shaw, D.S., & Reiss, D. (2011). Longitudinal pathways from marital hostility to child anger during toddlerhood: Genetic susceptibility and indirect effects via harsh parenting. *Journal of Family Psychology. 25*, 282–291. doi: 10.1037/a0022886

Riley, A.W., Coiro, M.J., Broitman, M., Colantuoni, E., Hurley, K.M., Bandeen-Roche, K., & Miranda, J. (2009). Mental health of children of low-income depressed mothers: influences on parenting, family environment, and raters. *Psychiatric Service, 60,* 329-336. doi: 10.1176/appi.ps.60.3.329

Rink, S.M., Ardoino, G., Queirolo, E.I., Cicariello, D., Manay, N., & Kordas, K. (2014). Associations between hair manganese levels and cognitive, language, and motor development in preschool children from Montevideo, Uruguay. *Archives of*

Environmental and Occupational Health, 69, 46-54. doi: 0.1080/19338244.2012.725229

Rodrigues, M., Patel, V., Jaswal, S., & DeSouza, N. (2003) Listening to mothers: Qualitative studies on motherhood and depression from Goa, India. *Social Science & Medicine, 57*, 1797-1806. doi:10.1016/S0277-9536(03)00062-5

Ruttenberg, W.B., Finello, K.M., & Cordeiro, A.K. (1997). Interactions between depressed and nondepressed Latina mothers and their premature infants. *Infant Mental Health Journal, 18,* 364–377. doi: 10.1002/(SICI)1097-0355(199724)18:4<364::AID-IMHJ4>3.0.CO;2-L

Ryu, E., West, S.G., & Sousa, K.H. (2012). Distinguishing between‐person and within‐person relationships in longitudinal health research: arthritis and quality of life. *Annals of Behavioral Medicine, 43,* 330-342. doi: 10.1007/s12160-011-9341-6

Sameroff, A.J., & Fiese, B.H. (2000). Transactional regulation: The developmental ecology of early intervention. In J.P. Schonkoff & S.J. Meisels (Eds.), *Handbook of early childhood intervention* (Vol. 2, pp. 135-159). New York: Cambridge University Press.

Schafer, J.L. & Graham, J.W. (2002). Missing data: Our view of the state of the art. *Psychological Methods, 7*, 147-177. doi: 10.1037//1082-989X.7.2.147

Seguin, L., Potvin, L., St-Denis, M., & Loiselle, J. (1999). Socio-environmental factors and postnatal depressive symptomatology: A longitudinal study. *Women and Health, 29*, 57 - 72. doi: 10.1300/J013v29n01_05

Sellers, R., Harold, G.T., Elam, K., Rhoades, K.A., Potter, R., Mars, B., Craddock, N., Thapar, A., & Collishaw, S. (2013). Maternal depression and co-occurring antisocial behavior: Testing maternal hostility and warmth as mediators of risk for offspring psychopathology. *Journal of Child Psychology and Psychiatry, 55,* 112-120. doi:10.1111/jcpp.12111

Shih, J.H., & Eberhart, N.K. (2008). Understanding the impact of prior depression on stress generation: Examining the roles of current depressive symptoms and interpersonal behaviors. *British Journal of Psychology*, *99*, 413-426. doi: 10.1348/000712607X243341

Sigman, M., Cohen, S.E., & Beckwith, L. (1997). Why does infant attention predict adolescent intelligence? *Infant Behavior and Development, 20,* 133-140. doi: 10.1016/S0163-6383(97)90016-3

Sobel, M.E. (1982). Asymptotic intervals for indirect effects in structural equations models. In S. Leinhart (Ed.), *Sociological Methodology,* (pp.290-312). San Francisco: Jossey-Bass.

Sroufe, L.A., Coffino, B., & Carlson, E.A. (2010). Conceptualizing the role of early experience: Lessons from the Minnesota Longitudinal Study. *Developmental Review, 30*, 36-51. doi: 10.1016/j.dr.2009.12.002

Statistics Netherlands. (2000-2004). *Blaise® Survey Processing System, Version 4.5*. Netherlands, Statistics Netherlands.

Sutter-Dallay, A.L., Murray, L., Dequae-Merchadou, L., Glatigny-Dallay, E., Bourgeois, M.L., & Verdoux, H. (2011). A prospective longitudinal study of the impact of early postnatal vs. chronic maternal depressive symptoms on child development. *European Psychiatry, 26,* 484-489. doi: 10.1016/j.eurpsy.2010.05.004

Swendsen, J.D., & Mazure, C.M. (2000). Life stress as a risk factor for postpartum depression: Current research and methodological issues. *Clinical Psychology: Science and Practice, 7,* 17-31. doi: 10.1093/clipsy.7.1.17

Teti D.M., Gelfand D.M., Messinger D.S., Isabella R. (1995). Maternal depression and the quality of early attachment: an examination of infants, preschoolers, and their mothers. *Developmental Psychology, 31,* 364–376. doi: 10.1037/0012-1649.31.3.364

Tabachnick, B.G., & Fidell, L.S. (2013). *Using Multivariate Statistics*, (6th ed.). Boston : Allyn and Bacon.

Tomasello, M., & Farrar, J. (1986). Joint attention and early language. *Child Development, 57*, 1454-1463. doi:10.2307/1130423

Tronick, E.Z. (1989). Emotions and emotional communication in infants. *American Psychologist, 44,* 112-119. doi: 10.1037/0003-066X.44.2.112

van den Boom, D.C. (1995). Do first-year intervention effects endure? Follow-up during toddlerhood of sample of Dutch irritable infants. *Child Development, 66,* 1798-1816. doi:10.1177/1077559505283699

van den Boom, D.C., & Hoeksma, J.B. (1994). The effect of infant irritability on mother-infant interaction: A growth-curve analysis. *Developmental Psychology, 30*, 581-590. doi: 10.1037/0012-1649.30.4.581

Varela, R.E., Steele, R.G., & Benson, E.R. (2007). The contribution of ethnic minority status to adaptive style: A comparison of Mexican, Mexican American, and European American children. *Journal of Cross Cultural Psychology*, 38, 26-33. doi: 10.1177/0022022106295439

Wadhwa, P.D. (2005). Psychoneuroendocrine processes in human pregnancy influence fetal development and health. *Psychoneuroendocrinology, 30,* 724-743. doi:10.1016/j.psyneuen.2005.02.004

Weinstock, M. (2005). The potential influence of maternal stress hormones on development and mental health of the offspring. *Brain, Behavior, and Immunity, 19,* 296-308. DOI: 10.1016/j.bbi.2004.09.006

White, R.M.B., Roosa, M.W., Weaver, S., & Nair, R.L. (2009). Cultural and contextual influences on parenting in Mexican American families. *Journal of Marriage and Family, 71*, 61-79. doi: 10.1111/j.1741-3737.2008.00580.x

Wierson, M., & Forehand, R. (1992). Family stressors and deficits in adolescent functioning: A consideration of models for early versus middle adolescence. *Behavior Therapy, 23*, 671–688. doi: 10.1037/h0079442

Wisner, K.L., Moses-Kolko, E.L., & Sit, D.K.Y. (2010). Postpartum depression: A disorder in search of a definition. *Archives of Women's Mental Health, 13,* 37-40. doi: 10.1007/s00737-009-0119-9

Wisner, K.L., Parry, B.L., & Piontek, C.M. (2002). Postpartum depression. *The New England Journal of Medicine, 347,* 194-199. doi: 10.1056/NEJMcp011542

Wisner, K.L, Sit, D.K.Y., McShea, M.C., Rizzo, D.M., Zoretich, R.A., Hughes, C.L., Eng, H.F., Luther, J.F., Wisniewski, S.R., Costantino, M.L., Confer, A.L, Moses-Kolko, E.L., Famy, C.S., & Hanusa, B.H. (2013). Onset timing, thoughts of self harm, and diagnoses in postpartum women with screen-positive depression findings. *JAMA Psychiatry, 70,* 490-498. doi: 10.1001/jamapsychiatry.2013.87

Wu, Y.P., Selig, J.P., Roberts, M.C., & Steele, R.G. (2011). Trajectories of postpartum maternal depressive symptoms and children's social skills. *Journal of Child and Family Studies*, *4*, 414-423. doi: 10.1007/s10826-010-9407-2

Yeung, W.J., Linver, M.R., Brooks-Gunn, J. (2002). How money matters for young children's development: Parental investment and family processes. *Child Development, 73,* 1861-1879. doi: 10.1111/1467-8624.t01-1-00511

Zahn-Waxler, C., Cummings, E.M., McKnew, D.H., & Radke-Yarrow, M. (1984). Problem behaviors and peer interactions of young children with a manic-depressive parent. *American Journal of Psychiatry, 141*, 236-240. Retrieved from http://ajp.psychiatryonline.org/article.aspx?articleID=161376&resultClick=3

Zambrana, R.E., Scrimshaw, S.C.M., Collins, N., & Dunkel-Schetter, C. (1997). Prenatal health behaviors and psychosocial risk factors in pregnant women of Mexican

origin: The role of acculturation. *American Journal of Public Health, 87,* 1022-1026. doi: 10.2105/AJPH.87.6.1022

Zayas, L.H., Cunningham, M., McKee, M.D., & Jankowski, K.R.B. (2002). Depression and negative life events among pregnant African-American and Hispanic women. *Women's Health Issues, 12*, 16-22. doi: 10.1016/S1049-3867(01)00138-4

Zelkowitz, P., Schinazi, J., Katofsky, L., Saucier, J.F., Valenzuela, M., Westreich, R., & Dayan, J. (2004). Factors associated with depression in pregnant immigrant women. *Transcultural Psychiatry, 41,* 445-464. doi: 10.1177/1363461504047929

Zimmer-Gembeck, M.J., & Thomas, R. (2010). Parents, parenting and toddler functioning: Evidence from a national longitudinal study of Australian children. *Infant Behavior and Development, 33*, 518-529. doi:10.1016/j.infbeh.2010.07.004

Table 1. *Sample Demographics*

Sample Variables	
Mean Age	28 years
Born in Mexico	85.5%
Spanish-speaking	81.3%
Did not graduate high school	59.3%
Unemployed	82.2%
< $15,000 annual income	63.2%
Mean household size	4 persons
Baby boys	49%

Table 2. *Indirect Effects Tested in Aim 3*

Indirect Effects
Depression12 → Stress18 → Parenting24 → Infant Development52
Stress12 → Depression18 → Parenting24 → Infant Development52
Stress12 → Stress18 → Parenting24 → Infant Development52
Depression12 → Depression18 → Parenting24 → Infant Development52
Stress12 → Parenting18 → Parenting24 → Infant Development52
Depression12 → Parenting18 → Parenting24 → Infant Development52

Table 3. *Descriptive Statistics and Correlations Between Pairs of Study Variables at 12 Weeks*

	n	Mean(SD)	1.	2.	3.	4.	5.	6.	7.
1. EPDS 12	202	3.8(4.5)	-						
2. PSS 12	202	4.4(2.8)	**.58**	-					
3. SENS 12	63	4.7(1.2)	.05	.05	-				
4. NonHOS 12	63	5.9(.93)	.15	**.26**	**.77**	-			
5. NonINTRU 12	63	4.8(.84)	-.02	.01	**.65**	**.62**	-		
6. STRC 12	63	4.2(1.0)	.01	.03	**.91**	**.71**	**.59**	-	
7. Spanish Lang	214	81.3%	.00	-.02	**.36**	**.44**	**.35**	**.32**	-

Note. EPDS = Edinburgh Postnatal Depression Scale; PSS = Perceived Stress Scale; SENS = Maternal Sensitivity; NonHOS= Maternal Non-Hostility; NonINTRU = Maternal Non-Intrusiveness; STRC = Maternal Structuring; Spanish Lang = Spanish is primary language.

Table 4. *Descriptive Statistics and Correlations Between Pairs of Study Variables at 18 Weeks*

	n	Mean(SD)	1.	2.	3.	4.	5.	6.	7.
1. EPDS 18	199	4.0(4.6)	-						
2. PSS 18	199	4.0(3.0)	**.59**	-					
3. SENS 18	63	4.5(0.9)	.05	-.06	-				
4. NonHOS 18	63	6.0(0.8)	.10	**-.20**	**.72**	-			
5. NonINTRU 18	63	4.4(0.7)	.09	.18	**.39**	**.27**	-		
6. STRC 18	63	6.0(0.8)	.09	-.02	**.90**	**.63**	**.46**	-	
7. Spanish Lang	214	81.3%	.11	.06	.04	.22	-.04	.00	-

Note. EPDS = Edinburgh Postnatal Depression Scale; PSS = Perceived Stress Scale; SENS = Maternal Sensitivity; NonHOS= Maternal Non-Hostility; NonINTRU = Maternal Non-Intrusiveness; STRC = Maternal Structuring; Spanish Lang = Spanish is primary language.

Table 5. *Descriptive Statistics and Correlations Between Pairs of Study Variables at 24 Weeks*

	n	Mean(SD)	1.	2.	3.	4.	5.	6.	7.
1. EPDS 24	194	3.5(4.5)	-						
2. PSS 24	194	4.0(3.0)	**.53**	-					
3. SENS 24	63	4.6(1.0)	**-.41**	**-.29**	-				
4. NonHOS 24	63	6.0(0.8)	**-.27**	-.17	**.74**	-			
5. NonINTRU 24	63	4.5(0.8)	-.19	.00	**.61**	**.54**	-		
6. STRC 24	63	4.1(1.0)	**-.32**	-.17	**.86**	**.70**	**.56**	-	
7. Spanish Lang	214	81.3%	.03	.07	**-.32**	-.06	-.12	-.23	-

Note. EPDS = Edinburgh Postnatal Depression Scale; PSS = Perceived Stress Scale; SENS = Maternal Sensitivity; NonHOS= Maternal Non-Hostility; NonINTRU = Maternal Non-Intrusiveness; STRC = Maternal Structuring; Spanish Lang = Spanish is primary language.

Table 6. *Estimated Between- and Within-Person Variances from Random Intercept Models*

	Depressive Symptoms	Perceived Stress	Sensitivity	Non-Hostility	Structuring	Non-Intrusiveness
Intercept	3.96 (0.27)*	4.12 (0.17)*	4.51 (0.10)*	5.87 (0.10)*	4.55 (0.08)*	4.12 (0.09)*
Var(Between)	12.91 (1.49)*	4.81 (0.60)*	0.75 (0.16)*	0.93 (0.14)*	0.48 (0.10)*	0.63 (0.13)*
Var(Within)	8.89 (0.52)*	3.64 (0.26)*	0.58 (0.11)*	0.24 (0.05)*	0.44 (0.08)*	0.46 (0.09)*
SD(Between)	3.59	2.19	0.86	0.96	0.69	0.79
SD(Within)	2.98	1.91	0.76	0.49	0.66	0.68

Note. Standard errors are shown in parentheses. SD = standard deviations. SDs are the square roots of the variance estimates.
*$p < .05$

Table 7. *Estimated Means, Between-Person and Within-Person Variances, Covariances, and Correlations of Depressive Symptoms, Perceived Stress, and Maternal Sensitivity*

	Means	Between-person			Within Person		
		Depressive Symptoms	Perceived Stress	Sensitivity	Depressive Symptoms	Perceived Stress	Sensitivity
Depressive Symptoms	3.96	4.64*	*0.82**	*-0.00*	8.90*	*0.22**	*-0.03*
Perceived Stress	4.10	6.34*	12.87*	*0.13*	1.25*	3.64*	*-0.10*
Sensitivity	4.51	-0.01	0.24	0.75*	-0.07	-0.12	0.59*

Note. The covariance estimates are shown in the lower triangle and the correlation estimates are shown in the upper triangle, italicized.
*$p < .05$.

Table 8. *Estimated Means, Between-Person and Within-Person Variances, Covariances, and Correlations of Depressive Symptoms, Perceived Stress, and Maternal Non-Hostility*

	Means	Between-person			Within Person		
		Depressive Symptoms	Perceived Stress	Non-Hostility	Depressive Symptoms	Perceived Stress	Non-Hostility
Depressive Symptoms	3.96	4.64*	*0.82*	*-0.03*	8.90*	*0.22**	*0.15*
Perceived Stress	4.10	6.34*	12.87*	*0.10*	1.25*	3.64*	*0.10*
Non-Hostility	4.86	-0.09	0.21	0.92*	0.23	0.09	0.24*

Note. The covariance estimates are shown in the lower triangle and the correlation estimates are shown in the upper triangle, italicized.
*$p < .05$.

Table 9. *Estimated Means, Between-Person, and Within-Person Variances, Covariances, and Correlations of Depressive Symptoms, Perceived Stress, and Maternal Non-Intrusiveness*

	Means	Between-person			Within Person		
		Depressive Symptoms	Perceived Stress	Non-Intrusiveness	Depressive Symptoms	Perceived Stress	Non-Intrusiveness
Depressive Symptoms	3.96	4.64*	*0.82**	*0.08*	8.90*	*0.22*	*0.08*
Perceived Stress	4.10	6.34*	12.87*	*0.22*	1.25*	3.64*	*0.16*
Non-Intrusiveness	4.54	0.20	0.33	0.48*	0.17	0.20	0.44*

Note. The covariance estimates are shown in the lower triangle and the correlation estimates are shown in the upper triangle, italicized.
*$p < .05$.

Table 10. *Estimated Means, Between-Person, and Within-Person Variances, Covariances, and Correlations of Depressive Symptoms, Perceived Stress, and Maternal Structuring*

	Means	Between-person			Within Person		
		Depressive Symptoms	Perceived Stress	Structuring	Depressive Symptoms	Perceived Stress	Structuring
Depressive Symptoms	3.96	4.64*	*0.82**	*-0.01*	8.90*	*0.22**	*-0.04*
Perceived Stress	4.10	6.34*	12.87*	*0.16*	1.25*	3.64*	*-0.11*
Structuring	4.12	-0.04	0.27	0.63*	-0.08	-0.14	0.46*

Note. The covariance estimates are shown in the lower triangle and the correlation estimates are shown in the upper triangle, italicized.
*$p < .05$.

Table 11. *Correlations Between Depressive Symptoms (EPDS), Perceived Stress (PSS), and Maternal Sensitivity (Sens) at 12, 18, and 24 Weeks*

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. EPDS 12	-								
2. PSS 12	**.58**	-							
3. Sens 12	.05	.04	-						
4. EPDS 18	**.66**	**.49**	.00	-					
5. PSS 18	**.54**	**.55**	.17	**.59**	-				
6. Sens 18	.12	.16	.35	.05	-.06	-			
7. EPDS 24	**.61**	**.45**	-.02	**.67**	**.53**	.06	-		
8. PSS 24	**.51**	**.73**	.07	**.55**	**.64**	**-.40**	**.53**	-	
9. Sens 24	-.24	**-.49**	.39	-.26	-.34	**.62**	**-.41**	**-.29**	-

Note. Bolded estimates are significant at $p < .05$.

Table 12. *Correlations Between Depressive Symptoms (EPDS), Perceived Stress (PSS), and Maternal Non-Hostility (NonH) at 12, 18, and 24 Weeks*

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. EPDS 12	-								
2. PSS 12	**.58**	-							
3. NonH 12	.15	**.26**	-						
4. EPDS 18	**.66**	**.49**	-.02	-					
5. PSS 18	**.54**	**.55**	.17	**.59**	-				
6. NonH 18	.17	.06	.45	.10	-.19	-			
7. EPDS 24	**.61**	**.45**	.03	**.67**	**.53**	.08	-		
8. PSS 24	**.51**	**.73**	.07	**.55**	**.64**	**-.53**	**.53**	-	
9. NonH 24	**-.39**	-.31	**.62**	-.24	-.23	.51	**-.28**	-.17	-

Note. Bolded estimates are significant at $p < .05$.

Table 13. *Correlations Between Depressive Symptoms (EPDS), Perceived Stress (PSS), and Maternal Non-Intrusiveness (NonI) at 12, 18, and 24 weeks*

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. EPDS 12	-								
2. PSS 12	**.58**	-							
3. NonI 12	-.02	.01	-						
4. EPDS 18	**.66**	**.49**	-.15	-					
5. PSS 18	**.54**	**.55**	-.36	**.59**	-				
6. NonI 18	.16	.24	-.30	.09	.18	-			
7. EPDS 24	**.61**	**.45**	-.08	**.67**	**.53**	.06	-		
8. PSS 24	**.51**	**.73**	.01	**.55**	**.64**	.02	**.53**	-	
9. NonI 24	-.28	**-.45**	.10	.06	.09	**.65**	**-.19**	.00	-

Note. Bolded estimates are significant at $p < .05$.

Table 14. *Correlations Between Depressive Symptoms (EPDS), Perceived Stress (PSS), and Maternal Structuring (STRC) at 12, 18, and 24 weeks*

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. EPDS 12	-								
2. PSS 12	**.58**	-							
3. STRC 12	.01	.03	-						
4. EPDS 18	**.66**	**.49**	-.06	-					
5. PSS 18	**.54**	**.55**	.20	**.59**	-				
6. STRC 18	.16	.25	.41	.09	-.02	-			
7. EPDS 24	**.61**	**.45**	.01	**.67**	**.53**	.07	-		
8. PSS 24	**.51**	**.73**	.09	**.55**	**.64**	**-.35**	**.53**	-	
9. STRC 24	-.22	-.34	.14	-.19	-.20	**.59**	**-.32**	-.18	-

Note. Bolded estimates are significant at $p < .05$.

Table 15. *Specified Paths, Estimates, and Confidence Intervals for the Autoregressive Cross-Lagged Models Including Maternal Sensitivity and Infant Cognitive Scale Score*

Model	Paths	B(*SE*)	95% CI
1. Stability Model			
Direct Paths – Autoregressive			
	Perceived Stress 12 → Perceived Stress 18	.64 (.07)*	[.48, .76]
	Perceived Stress 18 → Perceived Stress 24	.66 (.08)*	[.51, .81]
	Depressive Symptoms 12 → Depressive Symptoms 18	.63 (.06)*	[.51, .75]
	Depressive Symptoms 18 → Depressive Symptoms 24	.64 (.07)*	[.51, .76]
	Sensitivity 12 → Sensitivity 18	.44 (.28)	[-.62, .71]
	Sensitivity 18 → Sensitivity 24	.82 (.22)*	[.23, 1.06]
Direct Paths – Prediction to final outcome			
	Sensitivity 24 → Cognitive Scale Score 52	.88 (.43)*	[.004, 1.53]
	Perceived Stress 12 → Cognitive Scale Score 52	.15 (.14)	[-.13, .47]
	Depressive Symptoms 12 → Cognitive Scale Score 52	-.04 (.07)	[-.18, .10]
Covariances			
	Perceived Stress 12 ←→ Depressive Symptoms 12	7.39 (1.05)*	[5.53, 9.53]
	Perceived Stress 12 ←→ Sensitivity 12	.39 (.43)	[-.44, 1.22]
	Sensitivity 12 ←→ Depressive Symptoms 12	.49 (.56)	[-.61, 1.57]
	Perceived Stress 18 ←→ Depressive Symptoms 18	3.07 (.85)*	[1.40, 4.75]
	Perceived Stress 18 ←→ Sensitivity 18	-.16 (.39)	[-.99, .56]
	Sensitivity 18 ←→ Depressive Symptoms 18	-.12 (.38)	[-.89, .62]
	Perceived Stress 24 ←→ Depressive Symptoms 24	1.67 (.69)*	[.31, 3.01]
	Perceived Stress 24 ←→ Sensitivity 24	-.38 (.27)	[-.91, .17]
	Sensitivity 24 ←→ Depressive Symptoms 24	-.64 (.46)	[-1.69, .16]
2. Stress Lead Model			
Model 1 v. Model 2 - χ^2diff(4) = 7.68, p = .08			
	Perceived Stress 12 → Depressive Symptoms 18	.22 (.13)	[-.03, .48]
	Perceived Stress 18 → Depressive Symptoms 24	.24 (.13)	[-.03, .50]
	Depressive Symptoms 12 → Sensitivity 18	.01 (.03)	[-.06, .06]
	Depressive Symptoms 18 → Sensitivity 24	-.03 (.04)	[-.11, .04]
3. Depression Lead Model			
Model 1 v. Model 3 - χ^2diff(4) = 20.48, p < .001			
	Depressive Symptoms 12 → Perceived Stress 18	.18 (.07)*	[.05, .32]
	Depressive Symptoms 18 → Perceived Stress 24	.16 (.06)*	[.04, .27]
	Perceived Stress 12 → Sensitivity 18	-.00 (.06)	[-.12, .10]
	Perceived Stress 18 → Sensitivity 24	-.02 (.07)	[-.15, .12]
4. **Reciprocal Model (Coefficients as in Model 2 and Model 3)**			
Model 3 v. Model 4 - χ^2diff(4) = 9.9, p < .05			

*p < .05.

Table 16. *Specified Paths, Estimates, and Confidence Intervals for the Autoregressive Cross-Lagged Models Including Maternal Sensitivity and Infant Social-Emotional Problems on the BITSEA*

Model	Paths	B(*SE*)	95% CI
1. Stability Model			
Direct Paths			
	Perceived Stress 12 → Perceived Stress 18	.64 (.07)*	[.41, .76]
	Perceived Stress 18 → Perceived Stress 24	.62 (.07)*	[.42, .76]
	Depressive Symptoms 12 → Depressive Symptoms 18	.63 (.06)*	[.47, .75]
	Depressive Symptoms 18 → Depressive Symptoms 24	.61 (.07)*	[.45, .74]
	Sensitivity 12 → Sensitivity 18	.42 (.31)	[-.66, .72]
	Sensitivity 18 → Sensitivity 24	.84 (.22)*	[.28, 1.10]
Direct Paths – Prediction to final outcome			
	Sensitivity 24 → BITSEA Problems 52	-1.12 (1.3)	[-4.19, .85]
	Perceived Stress 12 → BITSEA Problems 52	.32 (.33)	[-.27, .95]
	Depressive Symptoms 12 → BITSEA Problems 52	.08 (.19)	[-.26, .46]
Covariances			
	Perceived Stress 12 ←→ Depressive Symptoms 12	7.37 (1.05)*	[5.53, 9.55]
	Perceived Stress 12 ←→ Sensitivity 12	.40 (.43)	[-.43, 1.25]
	Sensitivity 12 ←→ Depressive Symptoms 12	.48 (.56)	[-.96, 1.59]
	Perceived Stress 18 ←→ Depressive Symptoms 18	3.16 (.85)*	[1.58, 4.82]
	Perceived Stress 18 ←→ Sensitivity 18	-.09 (.44)	[-.94, .78]
	Sensitivity 18 ←→ Depressive Symptoms 18	-.12 (.38)	[-.89, .63]
	Perceived Stress 24 ←→ Depressive Symptoms 24	1.88 (.69)*	[.59, 3.26]
	Perceived Stress 24 ←→ Sensitivity 24	-.40 (.31)	[-.95, .24]
	Sensitivity 24 ←→ Depressive Symptoms 24	-.79 (.47)	[-1.76, .07]
2. Stress Lead Model			
Model 1 v. Model 2 - χ^2diff(4) = 7.68, p = .10			
	Perceived Stress 12 → Depressive Symptoms 18	.22 (.14)	[-.04, .49]
	Perceived Stress 18 → Depressive Symptoms 24	.19 (.15)	[-.07, .50]
	Depressive Symptoms 12 → Sensitivity 18	.01 (.03)	[-.07, .06]
	Depressive Symptoms 18 → Sensitivity 24	-.05 (.04)	[-.13, .03]
3. Depression Lead Model			
Model 1 v. Model 3 - χ^2diff(4) = 18.11, p < .01			
	Depressive Symptoms 12 → Perceived Stress 18	.17 (.07)*	[.04, .32]
	Depressive Symptoms 18 → Perceived Stress 24	.14 (.06)*	[.02, .25]
	Perceived Stress 12 → Sensitivity 18	-.00 (.06)	[-.12, .11]
	Perceived Stress 18 → Sensitivity 24	-.05 (.08)	[-.17, .15]
4. **Reciprocal Model (Coefficients as in Model 2 and Model 3)**			
Model 3 v. Model 4 - χ^2diff(4) = 8.96, p = .06			

*p < .05.

Table 17. *Specified Paths, Estimates, and Confidence Intervals for the Autoregressive Cross-Lagged Models Including Maternal Sensitivity and Infant Social-Emotional Competencies on the BITSEA*

Model	Paths	B(*SE*)	95% CI
1. Stability Model			
Direct Paths			
	Perceived Stress 12 → Perceived Stress 18	.63 (.07)*	[.47, .76]
	Perceived Stress 18 → Perceived Stress 24	.66 (.08)*	[.50, .80]
	Depressive Symptoms 12 → Depressive Symptoms 18	.63 (.06)*	[.51, .75]
	Depressive Symptoms 18 → Depressive Symptoms 24	.62 (.07)*	[.49, .76]
	Sensitivity 12 → Sensitivity 18	.42 (.26)	[-.56, .70]
	Sensitivity 18 → Sensitivity 24	.84 (.17)*	[.48, 1.09]
Direct Paths – Prediction to final outcome			
	Sensitivity 24 → BITSEA Competencies 52	1.87 (.46)*	[.89, 2.63]
	Perceived Stress 12 → BITSEA Competencies 52	.35 (.21)	[-.02, .78]
	Depressive Symptoms 12 → BITSEA Competencies 52	-.09 (.09)	[.30, .09]
Covariances			
	Perceived Stress 12 ←→ Depressive Symptoms 12	7.40 (1.05)*	[5.58, 9.57]
	Perceived Stress 12 ←→ Sensitivity 12	.43 (.43)	[-.38, 1.32]
	Sensitivity 12 ←→ Depressive Symptoms 12	.48 (.55)	[-.59, 1.60]
	Perceived Stress 18 ←→ Depressive Symptoms 18	3.12 (.85)*	[1.50, 4.79]
	Perceived Stress 18 ←→ Sensitivity 18	-.05 (.35)	[-.75, .63]
	Sensitivity 18 ←→ Depressive Symptoms 18	-.16 (.36)	[-.92, .53]
	Perceived Stress 24 ←→ Depressive Symptoms 24	1.76 (.26)*	[.38, 3.15]
	Perceived Stress 24 ←→ Sensitivity 24	-.44 (1.05)	[-1.00, .06]
	Sensitivity 24 ←→ Depressive Symptoms 24	-.71 (.42)	[-1.68, .02]
2. Stress Lead Model			
Model 1 v. Model 2 - χ^2diff(4) = 7.78, p = .10			
	Perceived Stress 12 → Depressive Symptoms 18	.22 (.14)	[-.03, .49]
	Perceived Stress 18 → Depressive Symptoms 24	.24 (.14)	[-.02, .53]
	Depressive Symptoms 12 → Sensitivity 18	.01 (.41)	[-.06, .06]
	Depressive Symptoms 18 → Sensitivity 24	-.03 (.03)	[-.09, .05]
3. Depression Lead Model			
Model 1 v. Model 3 - χ^2diff(4) = 20.65, p < .001			
	Depressive Symptoms 12 → Perceived Stress 18	.18 (.07)*	[.05, .34]
	Depressive Symptoms 18 → Perceived Stress 24	.16 (.06)*	[.04, .27]
	Perceived Stress 12 → Sensitivity 18	.01 (.05)	[-.09, .11]
	Perceived Stress 18 → Sensitivity 24	-.02 (.06)	[-.13, .10]
4. **Reciprocal Model (Coefficients as in Model 2 and Model 3)**			
Model 3 v. Model 4 - χ^2diff(4) = 9.13, p = .05			

*p < .05.

Table 18. *Specified Paths, Estimates, and Confidence Intervals for the Autoregressive Cross-Lagged Models Including Maternal Non-Hostility and Infant Cognitive Scale Score*

Model	Paths	B(*SE*)	95% CI
1. Stability Model			
Direct Paths			
	Perceived Stress 12 → Perceived Stress 18	.63 (.08)*	[.46, .77]
	Perceived Stress 18 → Perceived Stress 24	.67 (.08)*	[.51, .81]
	Depressive Symptoms 12 → Depressive Symptoms 18	.63 (.06)*	[.51, .75]
	Depressive Symptoms 18 → Depressive Symptoms 24	.65 (.07)*	[.51, .77]
	Non-Hostility 12 → Non-Hostility 18	.80 (.23)*	[.22, 1.09]
	Non-Hostility 18 → Non-Hostility 24	.88 (.18)*	[.53, 1.12]
Direct Paths – Prediction to final outcome			
	Non-Hostility 24 → Cognitive Scale Score 52	1.13 (.35)*	[.19, 1.6]
	Perceived Stress 12 → Cognitive Scale Score 52	.09 (.15)	[-.21, .40]
	Depressive Symptoms 12 → Cognitive Scale Score 52	-.06 (.08)	[-.22, .09]
Covariances			
	Perceived Stress 12 ←→ Depressive Symptoms 12	7.37 (1.05)*	[5.52, 9.56]
	Perceived Stress 12 ←→ Non-Hostility 12	.65 (.38)	[-.15, 1.39]
	Non-Hostility 12 ←→ Depressive Symptoms 12	.54 (.47)	[-.47, 1.42]
	Perceived Stress 18 ←→ Depressive Symptoms 18	3.11 (.84)*	[1.52, 4.77]
	Perceived Stress 18 ←→ Non-Hostility 18	-.05 (.36)	[-.88, .53]
	Non-Hostility 18 ←→ Depressive Symptoms 18	-.09 (.32)	[-.49, .72]
	Perceived Stress 24 ←→ Depressive Symptoms 24	1.67 (.69)*	[.35, 3.03]
	Perceived Stress 24 ←→ Non-Hostility 24	-.17 (.21)	[-.59, .24]
	Non-Hostility 24 ←→ Depressive Symptoms 24	-.43 (.37)	[-1.14, .32]
2. Stress Lead Model			
Model 1 v. Model 2 - χ^2diff(4) = 8.43, p = .07			
	Perceived Stress 12 → Depressive Symptoms 18	.23 (.14)	[-.03, .51]
	Perceived Stress 18 → Depressive Symptoms 24	.26 (.13)	[-.02, .51]
	Depressive Symptoms 12 → Non-Hostility 18	-.01 (.03)	[-.08, .05]
	Depressive Symptoms 18 → Non-Hostility 24	-.02 (.03)	[-.08, .04]
3. Depression Lead Model			
Model 1 v. Model 3 - χ^2diff(4) = 26.59, p < .001			
	Depressive Symptoms 12 → Perceived Stress 18	.15 (.06)*	[.03, .26]
	Depressive Symptoms 18 → Perceived Stress 24	.18 (.07)*	[.05, .33]
	Perceived Stress 12 → Non-Hostility 18	-.10 (.05)*	[-.24, -.01]
	Perceived Stress 18 → Non-Hostility 24	.07 (.08)	[-.05, .28]
4. **Reciprocal Model (Coefficients as in Model 2 and Model 3)**			
Model 3 v. Model 4 - χ^2diff(4) = 15.29, p < .01			

*p < .05.

Table 19. *Specified Paths, Estimates, and Confidence Intervals for the Autoregressive Cross-Lagged Models Including Maternal Non-Hostility and Infant Social-Emotional Problems on the BITSEA*

Model	Paths	B(*SE*)	95% CI
1. Stability Model			
Direct Paths			
	Perceived Stress 12 → Perceived Stress 18	.64 (.08)*	[.47, .78]
	Perceived Stress 18 → Perceived Stress 24	.63 (.07)*	[.47, .77]
	Depressive Symptoms 12 → Depressive Symptoms 18	.63 (.06)*	[.52, .76]
	Depressive Symptoms 18 → Depressive Symptoms 24	.61 (.07)*	[.48, .74]
	Non-Hostility 12 → Non-Hostility 18	.81 (.27)*	[.07, 1.03]
	Non-Hostility 18 → Non-Hostility 24	.90 (.24)*	[.36, 1.19]
Direct Paths – Prediction to final outcome			
	Non-Hostility 24 → BITSEA Problems 52	.00 (1.37)	[-3.68, 1.54]
	Perceived Stress 12 → BITSEA Problems 52	.38 (.29)	[-.18, .94]
	Depressive Symptoms 12 → BITSEA Problems 52	.07 (.20)	[-.33, .44]
Covariances			
	Perceived Stress 12 ←→ Depressive Symptoms 12	7.36 (1.05)*	[5.45, 9.51]
	Perceived Stress 12 ←→ Non-Hostility 12	.64 (.39)	[-.19, 1.37]
	Non-Hostility 12 ←→ Depressive Symptoms 12	.51 (.49)	[-.58, 1.41]
	Perceived Stress 18 ←→ Depressive Symptoms 18	3.20 (.85)*	[1.57, 4.87]
	Perceived Stress 18 ←→ Non-Hostility 18	.13 (.44)	[-.94, .82]
	Non-Hostility 18 ←→ Depressive Symptoms 18	.14 (.33)	[-.49, .81]
	Perceived Stress 24 ←→ Depressive Symptoms 24	1.92 (.69)*	[.64, 3.35]
	Perceived Stress 24 ←→ Non-Hostility 24	-.28 (.23)	[-.71, .21]
	Non-Hostility 24 ←→ Depressive Symptoms 24	-.49 (.41)	[-1.43, .30]
2. Stress Lead Model			
Model 1 v. Model 2 - χ^2 diff(4) = 6.14, p = .19			
	Perceived Stress 12 → Depressive Symptoms 18	.22 (.14)	[-.05, .50]
	Perceived Stress 18 → Depressive Symptoms 24	.20 (.15)	[-.07, .49]
	Depressive Symptoms 12 → Non-Hostility 18	-.01 (.37)	[-.08, .05]
	Depressive Symptoms 18 → Non-Hostility 24	-.02 (.03)	[-.09, .05]
3. Depression Lead Model			
Model 1 v. Model 3 - χ^2 diff(4) = 22.79, p < .001			
	Depressive Symptoms 12 → Perceived Stress 18	.17 (.07)*	[.03, .32]
	Depressive Symptoms 18 → Perceived Stress 24	.13 (.06)*	[.01, .24]
	Perceived Stress 12 → Non-Hostility 18	-.10 (.06)*	[-.25, -.01]
	Perceived Stress 18 → Non-Hostility 24	.08 (.09)	[-.09, .27]
4. **Reciprocal Model (Coefficients as in Model 2 and Model 3)**			
Model 3 v. Model 4 - χ^2 diff(4) = 13.86, p < .01			

*p < .05.

Table 20. *Specified Paths, Estimates, and Confidence Intervals for the Autoregressive Cross-Lagged Models Including Maternal Non-Hostility and Infant Social-Emotional Competencies on the BITSEA*

Model	Paths	B(*SE*)	95% CI
1. Stability Model			
Direct Paths			
	Perceived Stress 12 → Perceived Stress 18	.63 (.07)*	[.47, .77]
	Perceived Stress 18 → Perceived Stress 24	.66 (.08)*	[.50, .81]
	Depressive Symptoms 12 → Depressive Symptoms 18	.63 (.06)*	[.51, .76]
	Depressive Symptoms 18 → Depressive Symptoms 24	.62 (.07)*	[.49, .76]
	Non-Hostility 12 → Non-Hostility 18	.76 (.23)*	[.18, 1.01]
	Non-Hostility 18 → Non-Hostility 24	.89 (.17)*	[.52, 1.15]
Direct Paths – Prediction to final outcome			
	Non-Hostility 24 → BITSEA Competency 52	2.04 (.46)*	[.80, 2.72]
	Perceived Stress 12 → BITSEA Competency 52	.22 (.20)	[-.14, .65]
	Depressive Symptoms 12 → BITSEA Competency 52	-.11 (.10)	[-.30, .09]
Covariances			
	Perceived Stress 12 ←→ Depressive Symptoms 12	7.37 (1.05)*	[5.50, 9.53]
	Perceived Stress 12 ←→ Non-Hostility 12	.66 (.37)	[-.11, 1.36]
	Non-Hostility 12 ←→ Depressive Symptoms 12	.49 (.47)	[-.49, 1.37]
	Perceived Stress 18 ←→ Depressive Symptoms 18	3.13 (.85)*	[1.49, 4.78]
	Perceived Stress 18 ←→ Non-Hostility 18	.04 (.33)	[-.66, .60]
	Non-Hostility 18 ←→ Depressive Symptoms 18	.06 (.30)	[-.49, .73]
	Perceived Stress 24 ←→ Depressive Symptoms 24	1.75 (.70)*	[.45, 3.13]
	Perceived Stress 24 ←→ Non-Hostility 24	-.24 (.22)	[-.71, .16]
	Non-Hostility 24 ←→ Depressive Symptoms 24	-.43 (.40)	[-1.21, .39]
2. Stress Lead Model			
Model 1 v. Model 2 - χ^2diff(4) = 8.27, p = .08			
	Perceived Stress 12 → Depressive Symptoms 18	.22 (.14)	[-.04, .50]
	Perceived Stress 18 → Depressive Symptoms 24	.26 (.14)	[-.02, .55]
	Depressive Symptoms 12 → Non-Hostility 18	-.01 (.03)	[-.07, .05]
	Depressive Symptoms 18 → Non-Hostility 24	-.02 (.03)	[-.08, .03]
3. Depression Lead Model			
Model 1 v. Model 3 - χ^2diff(4) = 25.3 p < .001			
	Depressive Symptoms 12 → Perceived Stress 18	.17 (.07)*	[.04, .32]
	Depressive Symptoms 18 → Perceived Stress 24	.16 (.06)*	[.03, .26]
	Perceived Stress 12 → Non-Hostility 18	-.09 (.05)*	[-.22, -.01]
	Perceived Stress 18 → Non-Hostility 24	.06 (.07)	[-.04, .25]
4. **Reciprocal Model (Coefficients as in Model 2 and Model 3)**			
Model 3 v. Model 4 - χ^2diff(4) = 13.3, p < .01			

*p < .05.

Table 21. *Indirect Paths, Sobel Tests of the Indirect Effects, and Bias-Corrected Bootstrap Confidence Intervals*

Indirect Effects	Sobel (SE)	*p*-value	Bias-corrected bootstrap Confidence Interval
Stress12 → NonH18 → NonH24 → Cognitive Development	-0.15	.07	[-0.38, -0.02]
Stress12 → NonH18 → NonH24 → Social-Emotional Competencies	-0.22	.044	[-0.50, -0.07]

Note. Stress12 = Perceived Stress at 12 weeks; NonH18 = Maternal Non-Hostility at 18 weeks; NonH24 = Maternal Non-Hostility at 24 weeks.

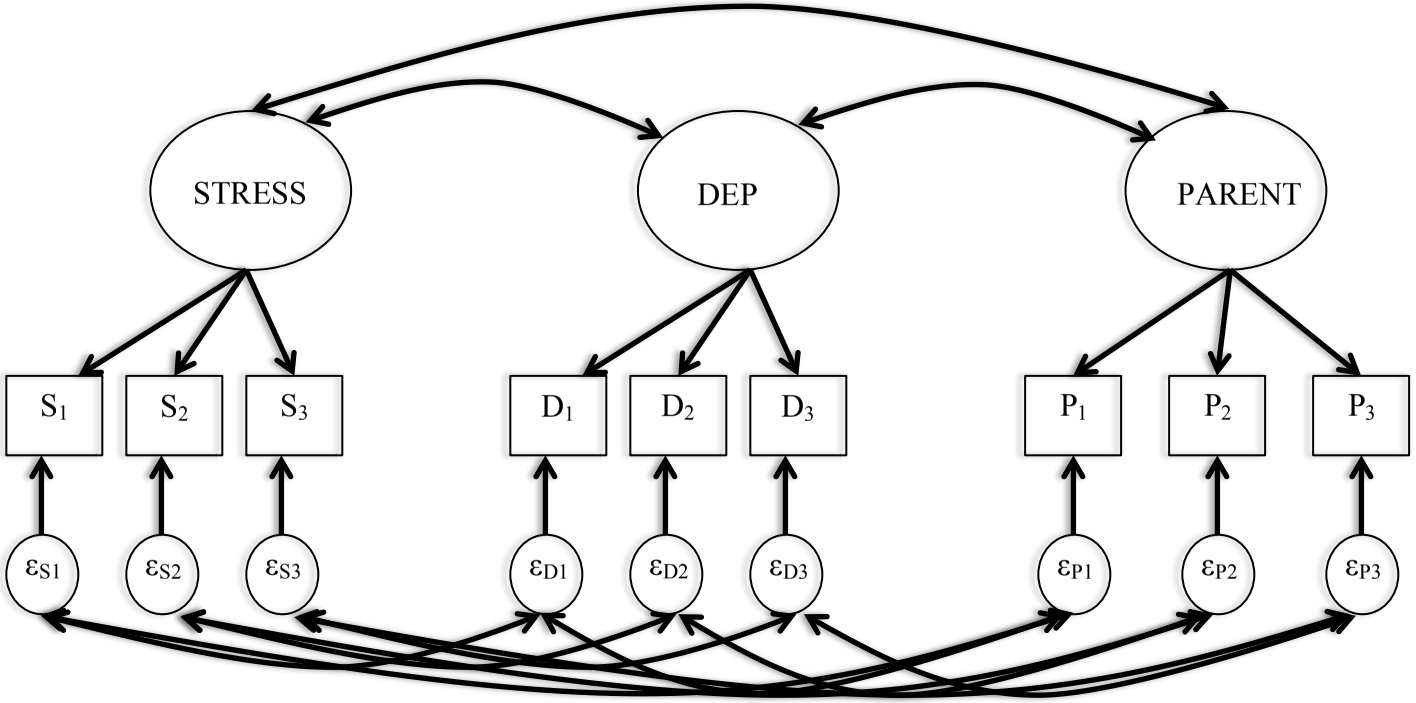

Figure 1.

Latent intercept model with correlated residuals for stress, depression, and maternal parenting behavior.
Note. DEP = Depressive Symptoms. $S_1 – S_3$ = Stress at measurement points 1-3.
$D_1 – D_3$ = Depressive Symptoms at measurement points 1-3.
$P_1 – P_3$ = Parenting at measurement points 1-3.
ε = Residual deviations from the mean.

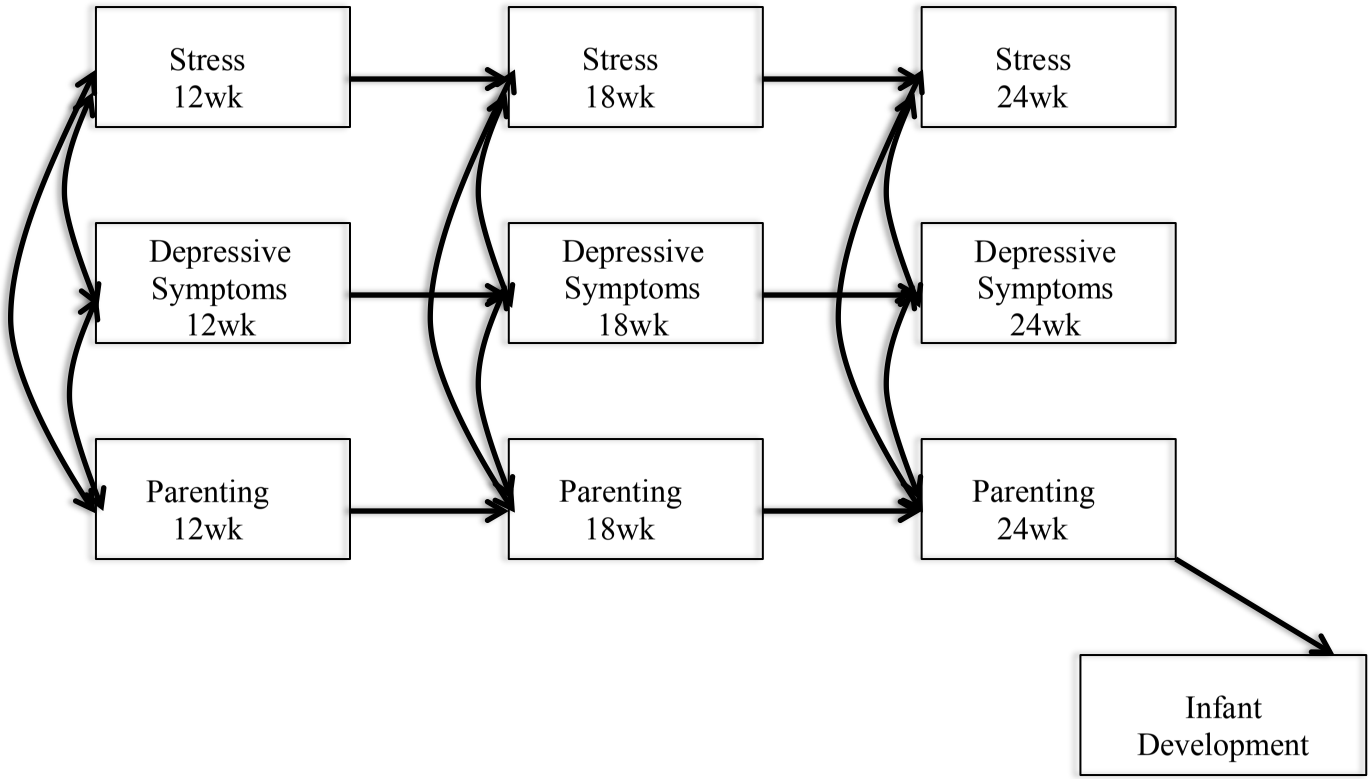

Figure 2.

Baseline stability model with infant developmental outcome in the autoregressive cross-lagged framework.

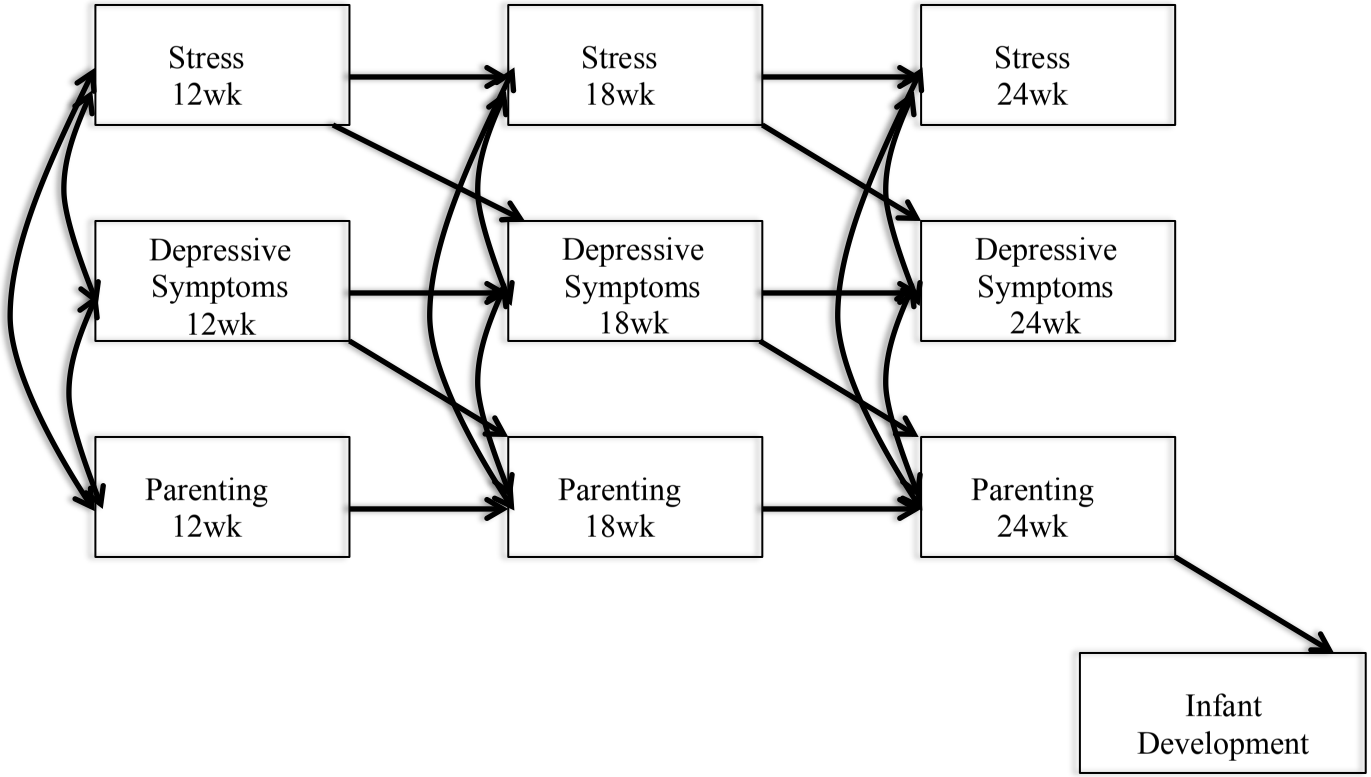

Figure 3.

Stress-led model with infant developmental outcome in the autoregressive cross-lagged framework.

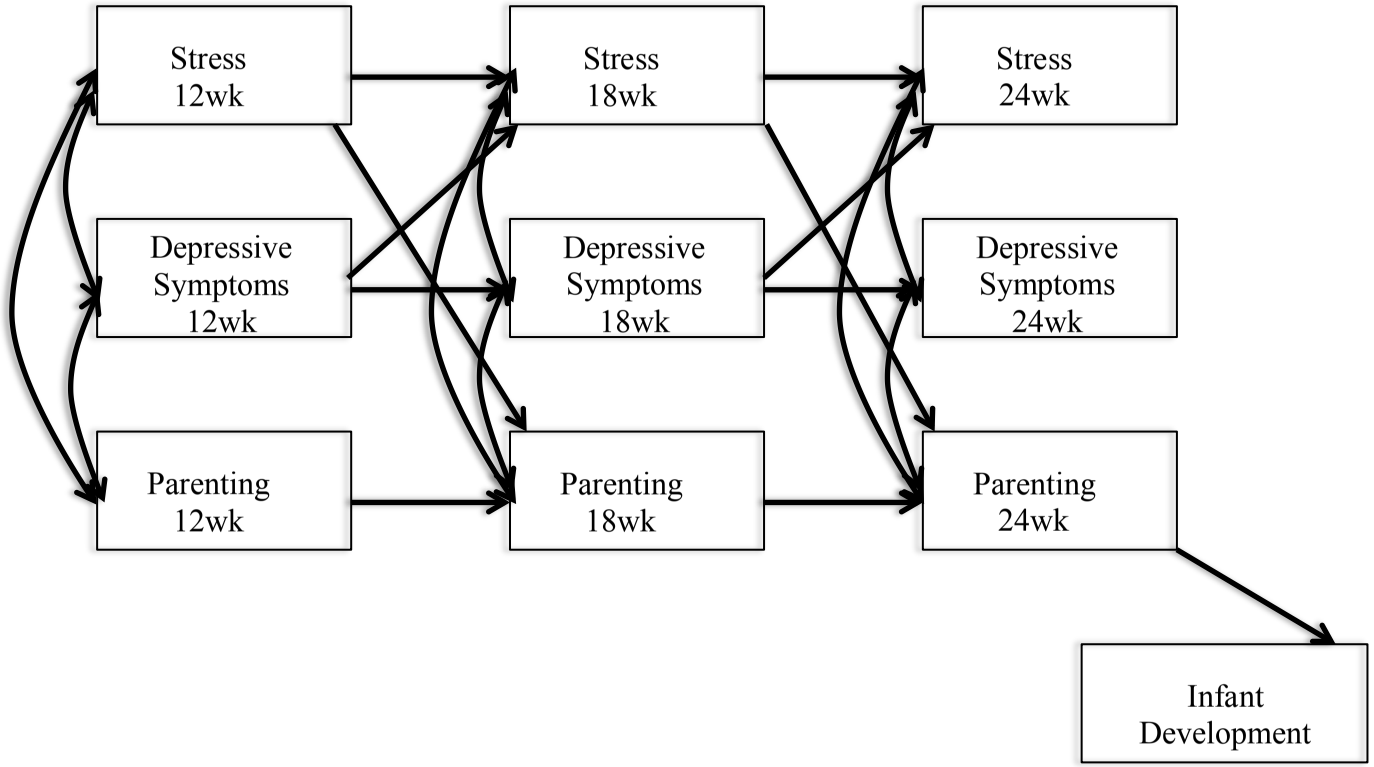

Figure 4.

Depression-led model with infant developmental outcome in the autoregressive cross-lagged framework.

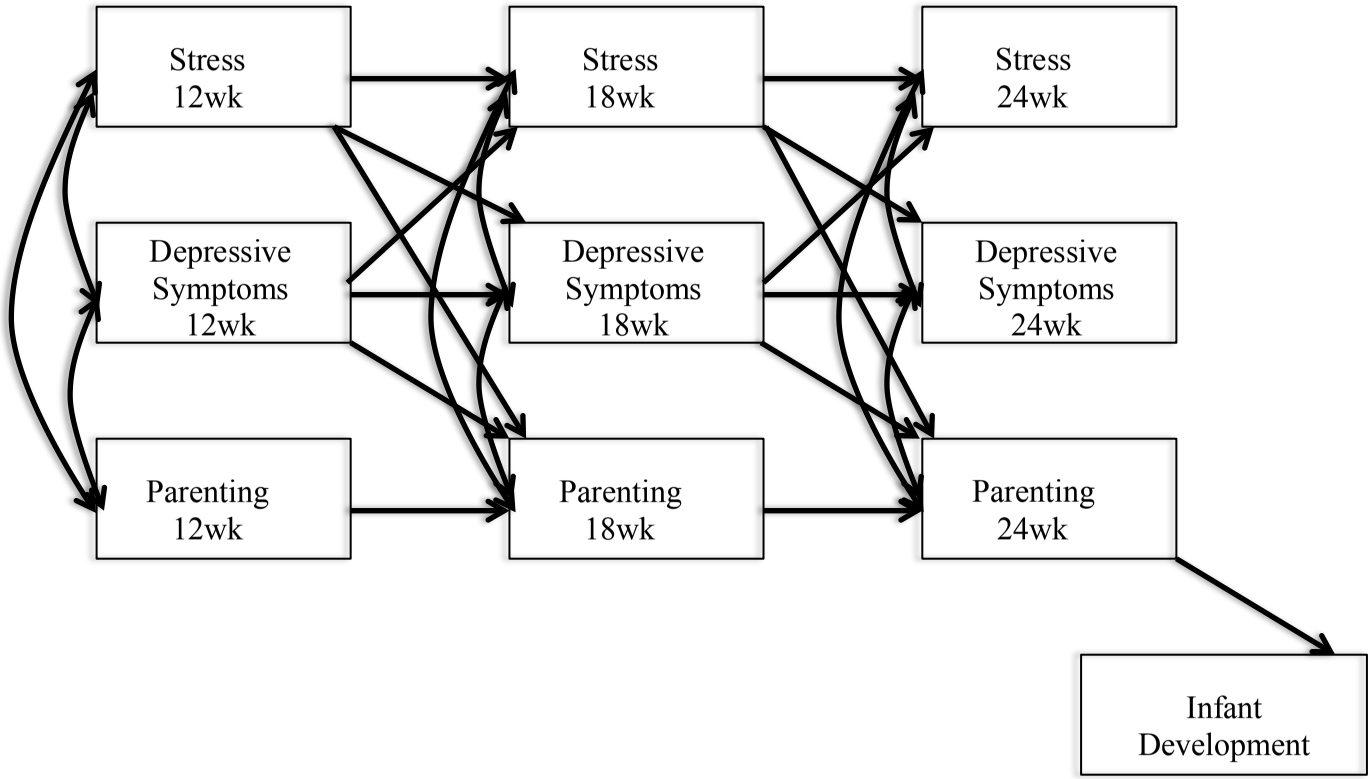

Figure 5.

Reciprocal autoregressive cross-lagged model with infant developmental outcome.

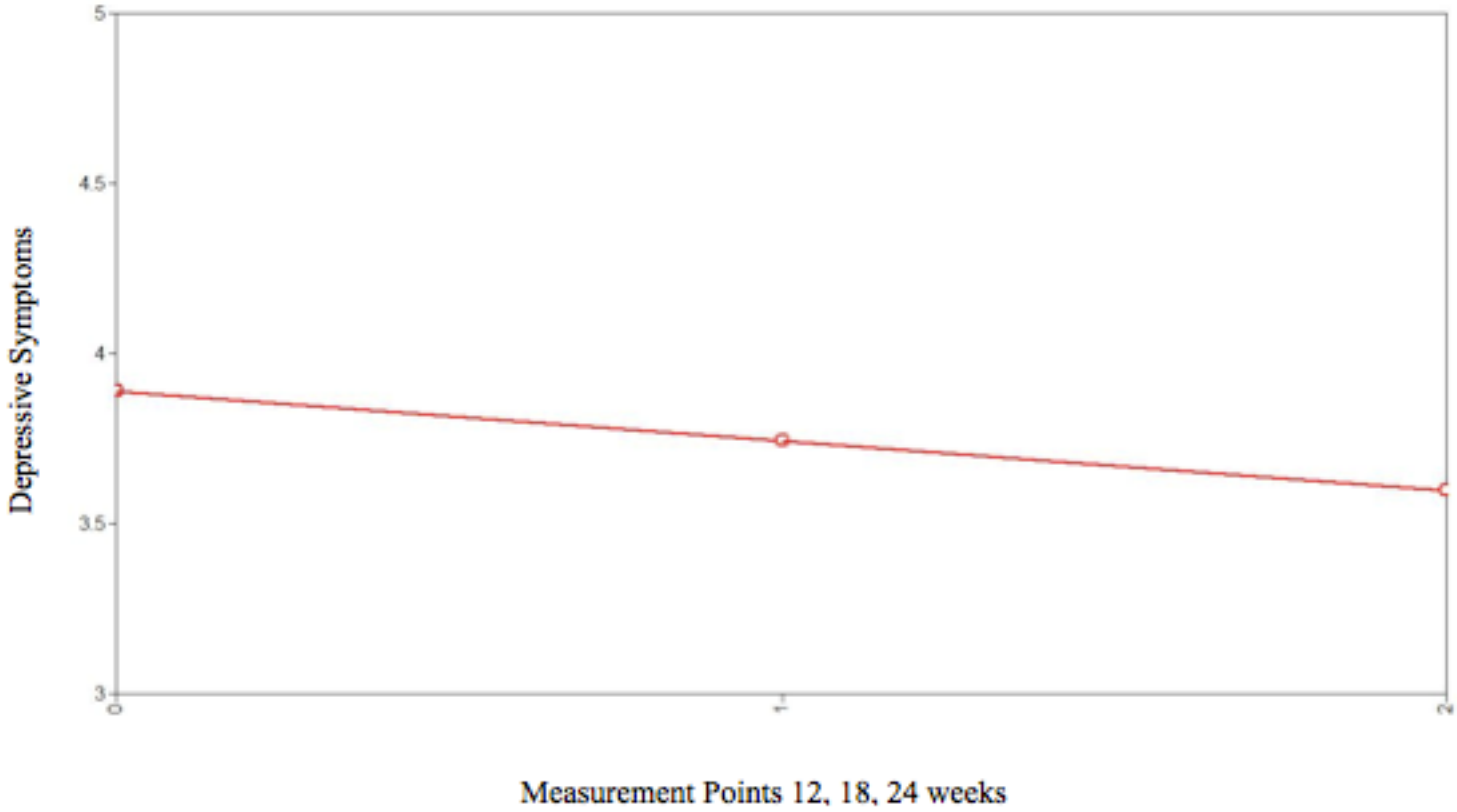

Figure 6.

Linear growth model of depressive symptoms from 12 to 24 weeks postpartum.