

THE CONTEXT AND EXPERIENCE OF NEW MOTHERS: POSTPARTUM  
DEPRESSION, FAMILY RELATIONSHIPS, KNOWLEDGE OF INFANT  
DEVELOPMENT, AND INFANT OUTCOMES

By

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## DEDICATION

I dedicate this dissertation to my children, James, David, Ashlyn, Elizabeth, and Jacob. May you always dream big, set your sights high, and be driven to achieve whatever goal your heart desires. You will always have my support and guidance should you ever need it.

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## ABSTRACT

Maternal psychological well-being is one of many factors that shape the interactions a woman has with her infant. According to Belsky's (1984) Determinants of Parenting Process Model, he suggests that maternal personality and psychological well-being play a significant role in the observation of parenting behaviors. This model was utilized as the overarching framework for this dissertation. The dissertation, in the form of three manuscripts, outlines important factors within the marital relationship that impact postpartum depression, then exploring the moderation of depression by knowledge of infant development in four behavioral scales observed during a mother-infant interaction. Finally, two maternal behaviors that impact child outcomes were utilized as predictors of infant social-emotional and cognitive outcome, while testing for moderation by infant age.

*Results.* In study one, women were more likely to report postpartum depression when they experienced more arguments with family and lower relationship depth. The second study found that knowledge of infant development moderated maternal reports of postpartum depression, thus allowing women with higher knowledge to maintain positive behaviors compared to women with low or average knowledge. The third study indicated that verbal stimulation resulted in higher scores for infant social-emotional and cognitive development, whereas maternal sensitivity was the only variable impacting social-emotional development. The test of moderation by infant age found mothers of older infants did speak more to their older infants, but the differences were minimal.

*Conclusion.* Marital relationships play a significant role in promoting healthy maternal psychological well-being during motherhood. When psychological well-being is compromised via postpartum depression, decreases in maternal behaviors result in lower scores during maternal-child interactions. Maternal sensitivity and verbal stimulation uniquely contributed to infant outcomes. In addition, infant age may impact the observance of these two maternal behaviors resulting in increased or decreased observances based on the infant's age.

Thus, use of Belsky's Determinants of Parenting Process Model within this dissertation confirmed the importance of maternal personality and psychological well-being in parenting behaviors. Mothers impacted by postpartum depression suffered a reduction in parenting behaviors, though higher knowledge appeared to buffer these negative effects. Implications for interventions and future work are discussed within each study.

## CHAPTER I.

### INTRODUCTION

The influence of maternal parenting behaviors on infant development has been a focal area of research for several decades. Research to date has contributed to an understanding of the contribution of multiple factors such as, knowledge of infant development as a component shaping maternal behaviors and the negative influence of postpartum depression on maternal-child interactions, and the various relationship factors that influence the mother in her daily life (Damast, Tamis-LeMonda, & Bornstein, 1996; Field, 1992; Page & Wilhelm, 2007; Purdom, Lucas, & Miller, 2006). In this early work, researchers examined maternal-child interactions and concluded that the development of a secure infant attachment was dependent on the display of maternal sensitivity, including responsiveness to the infant's needs, reading infant cues, showing empathy, and meeting the infant's physical and emotional needs (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1969; Cummings & Cummings, 2002). In regards to knowledge of infant development, researchers found that a parent's knowledge of infant development and parenting behaviors differ based on maternal age, parity, culture and ethnicity, and educational level which in turn affect parenting behaviors (Cooke, 1991; Damast et al., 1996; Huang, Caughy, Genevro, & Miller, 2005; Reis, 1988).

#### Guiding Framework

Both the parenting and child development literatures operate from multiple theoretical perspectives. Within this dissertation, the three papers will focus on maternal characteristics and aspects of her personal life that influence her parenting behavior.

Researchers have utilized guiding frameworks or multiple theories to address relevant research questions. Maternal behaviors typically reflect a multitude of factors ranging from childhood memories of her parents, previous experiences engaging with infants or young children, knowledge of infant development and typical milestones, educational resources, or observations of other parents interacting with young children. Thus, Belsky's (1984) Determinants of Parenting Process Model represents the overarching model to understand how maternal characteristics and contextual factors may impact parenting behaviors.

Research in the last 25 years has focused on identifying various influential aspects of the broader ecological system to understand behaviors and to draw conclusions about how the individual is influenced from interactions with others. This understanding can be utilized to construct prevention and intervention strategies to assist parents in their intra- or inter-personal skills, particularly those related to parenting. Belsky (1984) began work in this area by focusing on maternal characteristics, marital relations, infant characteristics, and the influence of maternal sources of stress and support such as social networks to determine the effects of these factors on parenting behaviors. Belsky's work has been used by others to frame new research questions and to add additional components to the basic framework. Abidin (1990) added to the framework by including parental factors of depression, sense of competence, parent attachment style, role restrictions, health, stress, and expanding on infant characteristics beyond temperament alone. In the second study, Abidin (1992) added parenting stressors (e.g., parent characteristics, work, environment, marital relationship, daily hassles, life events, and

child characteristics) as well as resources associated with social support, parenting alliances, parenting skills and competencies, material resources, and cognitive coping.

Extending findings from these previous studies, the three manuscripts will incorporate aspects from both Belsky's (1984) and Abidin's (1992) such as marital relations, developmental history including education, ethnicity, psychological well-being, with a specific focus on daily hassles, postpartum depression, knowledge of infant development, maternal sensitivity and verbal stimulation. These additional factors will be incorporated as predictors or sometimes as control variables in our analyses.

Daily hassles range from demands placed on us by family or others as well as arguments we have with family or others. Reports of daily hassles allows for a greater understanding of the mother within her daily life as compared to her identification of major life events that may not occur with any regularity. Arguments in particular affect the dynamics of the relationship with the other person, as well as, contributing to the mother's mood following the argument (Page & Wilhelm, 2007).

Research by Field (1992) and Gelfand and Teti (1990) increased the focus of maternal depression occurring during the pregnancy or postpartum period as a significant factor impacting infant development. Depression, as a major mental illness, increases negative maternal mood and compromises the mother's ability to provide positive stimulation to her child at all times. Left untreated, depression continues to negatively impact parenting behaviors (NICHD Early Child Care Research Network, 1999), and infants of depressed mothers score below their peers on tests for attachment, social-emotional, and cognitive development (Cummings & Davies, 1994; Gelfand & Teti,

1990; Murray, Fiori-Cowley, Hooper, & Cooper, 1996). Within the dissertation, the focus will be on identifying relationship factors that predict postpartum depression and the negative impacts of postpartum depression on parenting behaviors.

Knowledge of infant development is incorporated in this dissertation to assess parental beliefs and understandings of infant development which may inform the thought process of the mother, and in turn her behaviors with her infant. First, maternal knowledge of infant development increases the mother's ability to guide and direct her infant's behavior during the teaching task. Mothers who understand infant development are able to engage their infant and select tasks that are appropriate for the infant's expected achievement (Cooke, 1991; Damast et al., 1996). Second, mothers with greater knowledge create smoother interactions with their infant, whereas mothers reporting greater depressive symptoms hinder their infant's development by misreading cues, by not using infant development to interpret infant behaviors as normal or atypical, and to interfere with dyadic interactions by withdrawing from or intruding in the infant's play (Field, 1992; Gelfand & Teti, 1990).

Maternal behaviors inherently impact infant development in either a positive or negative way, thus understanding which maternal behavior may have relevance to infant outcomes bears mention and is the focus of the final paper. Maternal sensitivity refers to both the appropriate responsiveness and the contingency of the maternal behavior to cues provided by the infant (Ainsworth et al. 1978). Maternal sensitivity is one of many parenting skills and competencies of Abidin's model that is impacted by parenting stress and depression, which in turn influences parenting behavior. The second maternal

behavior is verbal stimulation. Early maternal dialogue has been shown to be a function of the mother's educational level, with mothers having fewer years of education speaking with less frequency to their infant, or not verbalizing to them until the infant begins vocalizing in the latter half of the first year (Beckwith & Rodning, 1996; Berlin, Brady-Smith, & Brooks-Gunn, 2002; Landry, Swank, Assel, Smith, & Vellet, 2001; Landry, Smith, & Swank, 2006). During maternal-infant interactions, mothers who used verbal or non-verbal behaviors that encouraged and maintained the infant's attention towards an object or task promoted infant vocabulary and overall cognitive ability (Landry et al., 2006; Ruddy & Bornstein, 1982).

#### Overview of Manuscripts

Utilizing Belsky's model (1984) as the guiding framework, the three studies included in this dissertation focus on influences on maternal behaviors; influences related to interactions within the marital system, contributions of experiences related to her own developmental history, and concurrent contextual influences. Yet another focus was on exploring the mothers' parenting behaviors as predictors of infant outcomes; behaviors observed during a maternal-child interaction. Key predictor variables for maternal behaviors include relationship quality of support and depth, daily hassles, postpartum depression, arguments, and knowledge of infant development; whereas maternal behaviors associated with infant outcomes include maternal sensitivity and verbal stimulation. Maternal characteristics such as age, education, ethnicity, income, as well as infant sex are included in the studies as control variables.

The first manuscript utilized a small sample focusing on the inter-relation of daily hassles, relationship quality, and postpartum depression as reported by the biological mother following delivery. The daily hassles scale included demands and arguments within relationships at home, at work, and with others. Relationship quality focused on the support and depth of the reported spousal or partner relationship, and postpartum depression was based on the number of depressive symptoms identified by the mother 6-weeks postpartum. These factors were expected to influence maternal behaviors within the parenting role and to impact dyadic interactions with her infant. Findings from the first study supported inclusion of the variables within the second manuscript to explore variation among maternal behaviors.

The second manuscript expanded the focus of the first manuscript to include more maternal characteristics such as family income, ethnicity, knowledge of infant development, as well as a report for frequency of arguments and postpartum depressive symptoms by using a large, nationally-representative dataset. In addition, due to different relational patterns, infant sex is included as a control variable. Major contributions from this manuscript include the intertwining of influences from the determinants of parenting process model. Controlling for infant sex, ethnicity, SES, and arguments with one's spouse, maternal depression and knowledge of infant development were tested as important predictors for variation among mothers for four standardized scales measuring maternal behavior during a maternal-child interaction. This manuscript specifically tested for moderation of postpartum depressive symptoms by knowledge of infant development.

The third manuscript used select components of the first two manuscripts to test the relation of maternal behaviors to two infant outcomes, again using the national dataset. The dyadic interaction provided the context in which observations of maternal sensitivity and verbal stimulation were assessed to predict infant social-emotional and cognitive development. Both of these maternal behaviors are correlated to the infant outcomes, so the unique contribution from this study was the test for moderation by infant age. Second, differing from the second manuscript, the two maternal behaviors were constructed from items within the maternal scale, but not identical to the scales created for the interaction.

#### Methodological Considerations

The first manuscript utilized a small sample of pregnant women to measure a variety of indicators associated with pregnancy and the early postpartum period. Maternal postpartum depression represented the dependent variable for this study whereas an average measure of depression collected during each trimester was used as a control variable. Other variables of interest included daily hassles and relationship quality. Because of the small sample size ( $N = 51$ ), only significant variables within the daily hassles (arguments with spouse) and relationship quality (depth) were utilized in the regression analysis.

Manuscripts two and three utilized a large, nationally representative dataset measuring maternal and infant characteristics when the infants were approximately 9 months of age. Findings from these studies are generalizable given that this sample is representative of United States infants living with their biological mother. These two

manuscripts further explored maternal behaviors during a teaching task, with each manuscript using a different representation of the maternal behaviors. Manuscript two broadens the contextual influence by incorporating factors from paper 1 (depression and arguments) and including mother's knowledge of infant development as key predictors known to influence maternal behaviors. In addition to these, control variables for SES, ethnicity, and infant sex were included. A test for moderation included an interaction variable for depression by knowledge of infant development in the expression of maternal behaviors (sensitivity to cues, response to distress, social-emotional growth fostering, and cognitive growth fostering).

Manuscript three focused on two maternal behaviors identified in the literature as influencing child outcomes for social-emotional and cognitive development. These behaviors were constructed from the maternal items within the teaching task to represent behaviors associated with maternal sensitivity and verbal stimulation. Again, moderation of these two behaviors included an interaction variable with each behavior and infant age.

Finally, to tie the conceptual thread from manuscript one which focused on biological mothers to conclusions drawn from manuscripts two and three, only biological mothers are utilized from the national dataset. This decision limited our generalization of interactions with infants to other primary caretakers, but strengthened the generalizations about the impact maternal behaviors of biological mothers.

CHAPTER II.  
POSTPARTUM DAILY STRESS, RELATIONSHIP QUALITY, AND  
DEPRESSIVE SYMPTOMS

Introduction

For some women, the changes and demands of pregnancy on the body as well as from the newborn and other family members may create vulnerability and an increased susceptibility to postpartum depressive symptoms. One of the strongest predictors of postpartum depression is a previous episode, usually during the pregnancy. However, a meta-analysis of the depression literature spanning 1990-1999 (Beck, 2001) identified a variety of other potential predictors of postpartum depression including individual characteristics, infant characteristics, and relational contexts. The goal of the current study was to explore whether reports of daily stressful experiences were predictive of postpartum depressive symptoms, and the extent to which characteristics of spousal relationships (support and depth) may influence the experience of daily stresses and reports of postpartum depressive symptoms, while controlling for reports of depressive symptoms during the pregnancy.

*Depressive Symptoms*

Women are twice as likely as men to report symptoms associated with depression (Immerman & Mackey, 2003). This difference between the sexes is particularly evident during the childbearing years (Burke, 2003; Seyfried & Marcus, 2003). In a study by Hoffman and Hatch (2000), 25% of women in their second trimester and 30% in the third trimester were found to have an elevated depressive symptom level. Additional studies of

prenatal depression found that stressful events and lack of social support were significantly correlated with elevated depressive symptoms (Marcus, Flynn, Blow, & Barry, 2003; Mercer & Ferketich, 1990).

Depressive symptoms both during and after pregnancy include tearfulness, hopelessness, feeling empty inside, a significant loss of pleasure in all or most daily activities, appetite and weight change, sleep problems (usually insomnia), extreme fatigue or loss of energy, feeling worthless or having inappropriate guilt, difficulty concentrating and making decisions, and thinking about death or suicide. The extent and severity of these symptoms distinguishes three types of depression associated with the postpartum period: postpartum blues, postpartum depression, and postpartum psychosis.

Postpartum blues, also known as baby blues, may occur three to five days after delivery and is believed to result from changes in a woman's hormonal levels following birth. Symptoms that typically resolve themselves within a few days to a week include tearfulness, moodiness, anxiety, irritability, and difficulty sleeping (Seyfried & Marcus, 2003; Williams & Casper, 1998). Postpartum depression, the second and most common form, can evolve from the baby blues, but typically begins within four to twelve weeks following the birth according to the DSM-IV (American Psychiatric Association, 1994), and also may occur due to additional fluctuations in the hormones when menstruation commences or when breastfeeding ceases (Clayton, 2004). Postpartum depression is distinguished from the baby blues and from a regular episode of depression primarily by the onset and duration of symptoms immediately following the birth up to one year (Clayton, 2004). Research has shown that mild to moderate depression is about three

times higher for postpartum women one month following delivery than in non-gestational controls (Buckwalter et al., 1999). The final classification of postpartum depression is postpartum psychosis, which in extreme cases results in an extremely rare form of depression that is characterized by thoughts of harming the baby or of committing suicide. This form of postpartum depression affects 1-2% of women and requires immediate medical attention and intervention (Seyfried & Marcus, 2003).

The cause of depressive symptoms includes a variety of factors, some of which are not changeable, and some that are amenable to change. Largely, ethnicity, age, educational attainment, income, marital status, and a genetic history of depression including family members and personality characteristics are identifiable risk factors that do not provide equivocal opportunities for change (Beck, 2001; Howell, Mora, & Leventhal, 2006; Seto, Cornelius, Goldschmidt, Morimoto, & Day, 2005). However, issues regarding self-esteem, coping abilities, anxiety and stress responses, level of relationship support, and health care of the mother during pregnancy are important variables to include in prevention and intervention services designed to reduce or prevent depressive symptoms (Boyce & Hickey, 2005; Howell, et al., 2006). While a variety of factors may contribute to depressive symptoms both during and after pregnancy, daily stress and relationship quality are the two factors that were explored in this study.

### *Daily Stresses*

Stress is known to affect individuals differentially, such that a stressful event for one person may barely bother another (Walsh, 1996). Boss (2002) suggests that it is the hardships or smaller struggles associated with life events that actually create the sense of

stress. This theory is supported by Da Costa, Brender, and Larouche (1998), who reported that utilizing a daily hassles scale resulted in a more sensitive and predictive measure of complications during the birth and postpartum period than does use of the major life events scale (Kanner, Coyne, Schaefer, & Lazarus, 1981).

The postpartum period comprises numerous changes that can create a sense of stress, including fluctuations in hormones, adapting to new sleep routines, and caring for the constant demands of a newborn, and perhaps other children. This notion receives support from researchers who have found that chronic or persistent stress in daily demands, as compared to the infrequent major life events (i.e., job changes, death of a loved one), contributed to adverse pregnancy outcomes such as postpartum depression (Crnic & Greenberg, 1990; Crnic & Low, 2002; Dunkel-Schetter & Lobel, 1998). While individual daily stress may not solely affect a woman's psychological well-being, the cumulative effect of multiple daily stresses occurring in multiple roles (mother, spouse, friend, and worker) potentially affects a woman's adaptability in the larger context of her environment (Bolger, DeLongis, Kessler, & Schilling, 1989; Crnic & Greenberg, 1990; Da Costa, Larouche, Dritsa, & Brender 2000).

Bolger and colleagues (1989) found interpersonal conflicts to be the most distressing of the daily stresses, resulting in mood variations within the general population. In self-report measures by postpartum women, those reporting interpersonal conflicts during the first month postpartum were more likely to experience and report at 6 months symptoms associated with postpartum depression (Seguin, Potvin, St. Denis, & Loiselle, 1999). Several more recent studies confirmed the increased risk of postpartum

depressive symptoms stemming from arguments with a partner (Dennis & Ross, 2006; Johnstone, Boyce, Hickey, Morris-Yates, & Harris, 2001), marital disharmony (Glasser, et al., 2000), and partner-associated stress (Gross, Well, Radigan-Garcia, & Dietz, 2002). Likewise, Honey, Morgan, and Bennett (2003) found that “after controlling for depression during pregnancy, a higher number of reported daily stressors were positively associated with low postpartum mood” (p. 139).

Marital conflict has been shown to be highly correlated with depression, and therefore can act as a catalyst for depressive symptoms (Boyce & Hickey, 2005; Zahn-Waxler, Duggal, & Gruber, 2002). When left unresolved, marital conflict can hinder the resolution of depressive symptoms despite efforts of the woman to seek medical or psychotherapy treatment. In addition, marital conflict indirectly impairs the parenting of the child through the establishment of a hostile social environment and the modeling of poor affective regulation (Zahn-Waxler et al., 2002). Similarly, researchers note that low energy and depressed mood can lead to an increase in marital conflict and disharmony (Burke, 2003; Seto et al., 2005). In sum, marital conflict promotes a vicious cycle for the woman and her family, and conflicts during pregnancy and the postpartum period may result in a higher risk for depressive symptoms. Despite marital conflicts, however, women who are securely married or have partner are less likely to be affected by the conflict in their relationship than women who are single.

### *Relationship Quality*

Support is an over-arching construct that can refer to support provided by a spouse, relative, friend, or other significant individual. Support can be instrumental

(goods or services) or emotional (love, understanding) (Beach & Gupta, 2006; Mickelson, Claffey, & Williams 2006). The type of support provided is most beneficial if it matches perceived need (Logsdon & Usui, 2001). In the Quality of Relationships Inventory (Pierce, 1994), relationship-specific support is defined as the perception the recipient places on the assistance available from the other person in a variety of situations. Empirical data have revealed that social support, and specifically spousal support, provides positive benefits for the recipient. Purdom, Lucas, and Miller (2006) found that spousal support contributed to a greater reduction in role-strain (wife, mother, and worker) by increasing marital quality and promoting general well-being, particularly when parenting young children as compared to older children or no children. Additionally, their study found that adequate spousal support leads to higher reports of marital satisfaction and fewer symptoms of depression (Alkar & Gençöz, 2005; Purdom, et al., 2006). Sagrestano, Felman, Rini, Woo, and Dunkel-Schetter (1999) found varying results for support during pregnancy from family and friends based on marital status, socio-economic status, and ethnicity.

Emotional support from a spouse was found to be a key factor in both marital satisfaction and decreased marital conflict, especially for women (Boyce & Hickey, 2005; Mickelson et al., 2006). With regard to directive and nondirective support, nondirective support resulted in greater benefits to both depressed and non-depressed partners. Nondirective support establishes confidence in one's ability to handle a situation while directive support suggests how to handle the situation (Beach & Gupta, 2006).

Nondirective support compares to emotional support and was reported to provide adequate support to the recipient regardless of the enactment of tangible support.

In studying the relationship of spousal support and postpartum depression, Seyfreid and Marcus (2003) found that higher levels of postpartum depressive symptoms were associated with poor marital relationships, lack of spousal support, and lack of a trusted confidante. Further, chronic depression can lead to marital distress, and in some cases, to divorce (Burke, 2003). Thus, chronic depression persisting at 9 and 12 months post delivery related more to a poor marital relationship and less to physiological symptoms such as hormonal changes associated with postpartum depression in the early weeks following delivery. Boyce and Hickey (2005), report that the perception of unsatisfactory support or no support increased the risk for postpartum depression. In sum, research findings suggest that spousal support can potentially decrease or prevent the onset of postpartum depressive symptoms in low risk pregnancies, while lack of support acts as a risk factor for development of postpartum depression (Besser, Priel, & Wiznitzer, 2002; Gotlib, Whiffen, Wallace, & Mount, 1991; Surkan, Peterson, Hughes, & Gottlieb, 2006; Vilhjalmsson, 1993).

Relationship depth as defined in the Quality of Relationships Inventory (Pierce, 1994; Verhofstadt, Buysse, Rosseel, & Peene, 2006) refers to the perception of a relationship as positive, important and secure. Depth places more emphasis on the quality of the relationship rather than the support or the perception of needed support one feels from a significant other. When the relationship is both positive and individuals feel secure with their partners, they report greater self-esteem and coping abilities, and fewer

feelings of loneliness, anxiety, or depression (Logsdon & Usui, 2001; Pierce, Sarason, Sarason, Solky-Butzel, & Nagle, 1997). The importance of depth in the relationship, particularly with a spouse or partner, benefits the individual during the transition to parenthood, which has been reported as a period of time known to result in a decline in marital satisfaction (Alkar & Gençöz, 2005; Belsky, Spanier, & Rovine, 1983).

In summary, the literature supports the idea that family related stressors, particularly conflicts with family members, may increase the risk for postpartum depressive symptoms in response to an environment that already may be stressed given a focus on adapting to the arrival and caretaking of a new infant. It is noted that relationship quality (support or depth) plays an important role with the stresses encountered during the postpartum period, resulting for some women in a potential decrease in reports of depressive symptoms. Thus, our research questioned whether the observance of depression during pregnancy would contribute to postpartum depression with an increase in the reports of depressive symptoms in the presence of daily hassles, and a decrease in reported symptoms based on the presence of relationship support and depth available to the postpartum mother. Correlation and regression analyses were used to confirm the proposed relationships. A test of moderation with each of the relationship quality variables with family arguments was included as an additional relationship variable in the regression analysis.

## Method

### *Procedures*

Data used for this article were collected as part of a study on pregnancy and postpartum well-being. Participants were recruited during their prenatal visit at three obstetrical clinics in a large Southwestern city. Additional participants were recruited by word of mouth and flyers. Consent forms to participate in the study were signed during the initial contact. Data from questionnaires completed six weeks postpartum were used in the following analysis, along with an average of the reported depressive symptoms collected from surveys during pregnancy. Upon completion of each questionnaire, participants received a \$5 gift certificate to a local vendor.

### *Measures*

Depressive symptoms were measured using the *Center for Epidemiological Studies Depression Scale* (CES-D) (Radloff, 1977). Respondents rated 20 items on a four-point Likert-type scale, with responses ranging from 0--less than one day to 3--five to seven days as they reported how they felt in the last week for questions such as “I felt lonely;” “My sleep was restless;” or “I felt hopeful about the future.” Positive items were reverse coded and sums of the items were computed. The possible range of scores is 0 to 60, with scores greater than 16 reflecting symptoms at risk for clinical depression among the general population. Cronbach’s alpha for the CES-D scale in our sample was .94. For the purpose of this study, reported postpartum depressive symptoms served as a continuous dependent measure in the regression analysis, while the average of depression during pregnancy was used as a covariate, or control variable.

*Daily Stresses* is a 20-item questionnaire (Bolger, et al., 1989) measuring respondents’ reactions to daily stress items such as “How often in the last week have you

felt. . . overload at home, overload at work, demands from family, demands from others, arguments with spouse, arguments with a child, arguments with others, and financial or transportation problems.” Participants responded to each statement by checking events occurring in the past week. Items checked were coded as 1 and items left blank were coded as 0. The 20 items were divided into the 5 subscales created by Bolger et al. (1989), and the scores summed for each scale. The five subscales included demands from home, demands from work, demands from others, arguments with family, and arguments with others. Cronbach’s alpha for all daily hassles items was .69 and ranged from .14-.60 for each of the five subscales in this sample population. A major focus of the study was to understand the extent to which daily hassles led to increased levels of postpartum depression. The mean score for each of the subscales is reported in Table 1.

The *Quality of Relationships Inventory* (Pierce, 1994) is a 25-item questionnaire utilized to obtain three aspects of relationships: support, conflict, and depth. The conflict scale was not utilized in this analysis due to its similarities with the arguments subscales within the daily hassles measure (arguments with family,  $r = .585, p < .001$  and arguments with others  $r = .324, p < .05$ ). Empirical data support the use of each subscale independently based on a confirmed three-factor structure (Verhofstadt et al., 2006). In our sample, the alpha reliability for the support scale (7 items) was .90 and .63 for the depth subscale (6 items). The respondents rated on a 1-4 Likert scale the degree to which their significant other met the criteria for each question. Items are scored from 1--not at all to 4--very much. For example, a support question asked, “To what extent could you turn to this person for advice about problems?” The depth scale asked, “How significant

is this relationship in your life?" The two subscales were each summed to create a scale score for use in the analyses.

### *Participants*

We utilized data provided by 51 women who completed postpartum surveys six weeks after delivery. Of the 51 postpartum surveys, the ethnic breakdown included 71% ( $n = 36$ ) Caucasian, 21% ( $n = 11$ ) Hispanic, 4% ( $n = 2$ ) Asian, and 4% ( $n = 2$ ) other. The age of the women ranged from 20-39 with a mean of 29.5. The level of education ranged from having completed high school to graduate school. The majority of women (86%,  $n = 44$ ) had completed college or some college. Eighty-four percent ( $n = 43$ ) of the women reported a spouse as their significant other, while the remaining 16% ( $n = 8$ ) reported a partner. The number of children living at home ranged from 0-6. A comparison of women with incomplete postpartum surveys ( $N = 20$ ) to the entire sample represented in Table 1, found education ( $M = 4.15$ ,  $p = .004$ ) as the only significant difference. Given the high correlation between depression during pregnancy and postpartum depressive symptoms, we constructed a contingency table (Table 2) to represent women who remained depressed throughout the study compared to those women whose depression resolved by the postpartum and those who reported depression only at the postpartum period. For our sample of 51 women, ten women reported depressive symptoms throughout their pregnancy and the postpartum period. A total of 15 women reported depressive symptoms during their pregnancy; and for six of those women, the depressive symptoms had resolved by the postpartum period. Six women reported depressive

symptoms during the postpartum period only, which resulted in a total of 15 women reporting symptoms postpartum.

## Results

This study focused on understanding the relationships among self-reported symptoms of postpartum depression, experience with daily stress, and relationship quality. Mean scores and bivariate correlations for relevant study variables are detailed in Tables 1 and 3 respectively. Based on the correlations among the study variables, only four variables were significantly associated with the outcome variable of postpartum depressive symptoms. The variables included depression during pregnancy, arguments with family, relationship support, and relationship depth. When both relationship quality variables were entered into the regression, the two variables were both non-significant. However, the high inter-correlation between relationship support and depth ( $r = .65, p < .01$ ) resulted in the decision to examine our research questions regarding spousal support. Given the vast amount of literature using the support variable (Alkar & Gençöz, 2005; Purdom et al., 2006), we decided to pursue further the depth of the relationship to determine the association of this variable to the other predictor and criterion variable within the regression model.

Overall, the participants in our study reported a mean level of 13.6 on the CES-D with a possible range of scores from 0 to 60. Fifteen of the 51 new mothers (29.4%) self-reported and identified symptoms scoring greater than 16 on the CES-D, which is consistent with prior reports of 3-33% for postpartum depression (Da Costa et al., 2000).

### *Regression Analysis*

In order to determine whether family arguments and relationship depth predicted postpartum depressive symptoms beyond that accounted for by reported depression during pregnancy, these two variables were entered in the second block of the regression analysis. The result of the regression analysis is shown in Table 4. Depression during pregnancy had the strongest beta weight in both blocks, confirming previous findings for depression during pregnancy as a primary predictor of postpartum depression (Beck, 2001). Arguments with family reached significance ( $\beta = .300, p < .01$ ) in the regression analysis, and was in the expected direction. Relationship depth reached significance ( $\beta = -.207, p < .05$ ) in the regression analysis after controlling for depression during pregnancy and entering it simultaneously with arguments with family, and it too was in the expected direction. A third block in the regression analysis included an interaction (or moderator) between arguments with family and relationship depth. The presence of the moderator reduced the significance of relationship depth, but failed to reach significance ( $p = .085$ ), even though this additional block explained 3% more of the variance in postpartum depressive symptoms. The regression block including the moderator is not shown. Further, the interaction variable between support and arguments with family was tested in the model and was not significant.

A power analysis was conducted to determine the strength of the findings for such a small sample size. Using the procedure outlined in Cohen, Cohen, West, & Aiken (2003), an  $R^2 = .561$  for the entire regression resulted in a power coefficient of 60.06 equivalent to a power level of .99 at  $\alpha = .01$ . A second power analysis was conducted to report on the variance attributed to arguments with family and relationship depth after

removing the variance attributed to depression during pregnancy by using the change in  $R^2$  from Step 1 to Step 2 ( $R^2 \Delta = .159$ ). The power for this variance of two predictors equaled 8.89, which provides a power of .76 at  $\alpha = .05$ .

### *Post Hoc Analysis*

Based on the postpartum depression literature, we decided to analyze and describe our non-clinical sample by utilizing the two cut-off points for the CES-D (16 and 24). We divided our sample into three groups: women scoring 0-15, women scoring 16-23, and women scoring 24-60. Table 5 includes the mean and standard deviation scores for the three subgroups, as well as t-test values located in the notes section. The sub-sample of 6 women scoring 16-23 represents 12% of the total sample ( $N = 51$ ) and 40% of the depressed sample ( $n = 15$ ). The sub-sample of 9 women scoring 24 or above represents 18% of the total sample ( $N = 51$ ) and 60% of the depressed sub-sample ( $n = 15$ ).

A *T*-test comparison of women scoring 0-15 and 16-23 on the CES-D resulted in two variables that were significantly different (postpartum depression,  $t = -6.261$ ,  $p < .001$ ; and relationship support,  $t = 3.48$ ,  $p < .01$ ).

The second *T*-test compared women scoring 0-15 with those scoring 24-60 and resulted in seven variables reaching significance (postpartum depression,  $t = -11.413$ ,  $p < .001$ , depression during pregnancy,  $t = -4.014$ ,  $p < .001$ , educational attainment,  $t = 3.222$ ,  $p < .01$ , demands from home,  $t = -2.352$ ,  $p < .05$ , arguments with family,  $t = -2.631$ ,  $p < .05$ , relationship support,  $t = 3.804$ ,  $p < .001$ , relationship depth,  $t = 3.456$ ,  $p < .01$ ). A third comparison was completed for women scoring 16-23 with those scoring greater than

24; the only variable significantly different between these two groups was the level of postpartum depression ( $t = -3.147, p < .01$ ).

### Discussion

In this exploratory study of 51 women, the impact of daily hassles, relationship support, and relationship depth were analyzed for their contribution in the observance of postpartum depressive symptoms, while controlling for depression reported during pregnancy. All four of the predictors included in our model are supported in the literature in association with postpartum depression (Beck, 2001). Beck reported effect sizes for childcare stress and life stress, social support, marital relationship, and prenatal depression. Variations from our study included the utilization of daily hassles, specifically arguments with family, and two scales from the Quality of Relationship Inventory: relationship support and depth.

#### *Self Reports of Depressive Symptoms*

Almost 30% of our sample self-reported depressive symptoms during the postpartum period. One note of concern is the scoring of a 0 on the CES-D scale by two women, which possibly pulled down the mean score for the entire sample shown in Table 1. However, despite a smaller sample size, there continues to be a modest rate of women reporting depressive symptoms. Because of the strong relationship between prenatal depression and postpartum depression, identifying and tracking women with depressive symptoms during their pregnancy is one way the healthcare system may work to reduce the prevalence of untreated women in the postpartum period. With 15 total women reporting depressive symptoms during pregnancy, it was not surprising that 9 women

reporting depressive symptoms during their pregnancy continued to report symptoms 6 weeks postpartum. It is interesting to note that six women no longer reported symptoms after the birth of the baby, and 6 new women had elevated symptoms during the postpartum period only.

#### *Impact of Daily Stress on Levels of Postpartum Depression*

The bivariate correlation of the five subscales of daily hassles and postpartum depression reached significance only for arguments with family members. This finding was not unexpected as there is a substantial literature base that posits a stronger relationship from arguments within interpersonal relationships than from demands or non-interpersonal interactions (Bolger et al., 1989; Dennis & Ross, 2006; Johnstone et al., 2000; Skärsäter, Ågren, & Dencker, 2001), as well as a specific association between marital conflicts and postpartum depression (Zahn-Waxler et al., 2002).

With regard to the other four daily stressors, it is likely that at six-weeks postpartum only a few women had returned to work, thus accounting for the low number of demands or arguments associated with work. While it seems unusual that demands from home were not significant in the correlations, the post hoc analysis found demands from home reached significance when comparing the mean scores from women scoring greater than 24 on the CES-D with those scoring less than 16, suggesting that women experiencing a higher number of depressive symptoms are reacting to more of the daily hassles than the rest of the sample. This finding was suppressed in the correlation with postpartum depression when using the entire sample. Reviewing the data, for the six women no longer depressed in the postpartum, four of the six reported fewer arguments

after the birth of the baby compared to during the pregnancy. One woman reported the same amount and one woman had more. In contrast to these results, of the 15 women reporting postpartum depressive symptoms, 11 also reported an increase in the number of family arguments.

#### *Spousal Support from Relationship Depth*

All of the women in our sample answered the Quality of Relationship Inventory by reporting about their spouse or partner. As a whole, the sample reported high levels of both support and depth. Despite a significant negative correlation with postpartum depression, when both relationship support and relationship depth were included in the regression model, high multi-collinearity obscured the significance of either variable. Depth, according to Pierce (1994), measures the extent to which the relationship exerts a significant impact on the person's life. So the key distinction focuses on the impact of the relationship rather than merely the presence or availability of support. In our study, both the correlation and regression for relationship depth were negatively related to postpartum depressive symptoms resulting in a decrease in depressive symptoms. However, contrary to our assumptions, relationship depth did not act as a moderator between arguments with family and the reporting of postpartum depressive symptoms. Likewise, the main effect and the interaction between relationship support and arguments with family were also non-significant. Even though the interaction was non-significant, however, the finding for a main effect of depth resulting in a reduction in symptoms should be noted for intervention and prevention of postpartum depression. Similar to the

findings reported above, for the 15 depressed women, 8 reported a reduction in the depth of their relationship, with an additional 3 reporting no change.

### *Post Hoc Analysis*

Findings from this study supported previous results that daily stress in the form of arguments may serve as predictors of postpartum depression as observed in regression analyses; likewise, relationship quality in the form of depth acted to reduce the reported symptoms for the sample as a whole. We were interested in looking more specifically at the characteristics of the women reporting depressive symptoms compared to those scoring below the cut-off. Interestingly in the post hoc analysis comparing mean scores on the study variables, the majority of significant findings came from the group of women reporting  $> 24$  on the CES-D. Of the women scoring greater than 24 on the CES-D, 5 of the 9 (56%) reported 3 arguments with family members, while only 2 of the women reported no arguments with family. Those same 5 women reported between 2-4 demands from home; and 4 of the women also experienced demands from others. As mentioned previously, demands from home appeared to be suppressed in the full sample, but the post hoc analysis revealed that women scoring greater than 24 reported a significantly different level of demands from home. Likewise, in this sub-sample of women, relationship depth and relationship support were significantly different than for women scoring less than 16 on the CES-D. Not surprisingly, both depression during pregnancy and during postpartum for this group were different from the group reporting the fewest symptoms, and the symptoms they reported during the postpartum period were

different from those of the middle group as well. Finally, the lower educational level is reflective of the younger age of the women in the most depressed sample.

### *Limitations*

As with any study, limitations pose a risk in interpretation of the data. First, the nature of our study was largely exploratory to determine the role of daily hassles and quality of relationships among postpartum women. The small sample size limited the types of analyses possible as well as the generalizability of our findings to the larger population. Our sample also differed from the general population in that there were no teenage mothers, the women as a whole were highly educated, and they were enrolled via their health clinics. Additionally, shared method variance from the use of self-reporting surveys can result in biased or inaccurate information, thus use of more than one reporter or source of data to triangulate the study variables would strengthen the findings. A longitudinal study with an ecological focus looking at marital quality before, during, and after pregnancy could examine changes to the marital environment, the stressors prior to and after delivery, and the role of education or therapeutic interventions.

### *Implications*

Individual therapy for the woman as well as couple or family therapy may allow for both traditional interventions as well as for creative strategies to alleviate postpartum depressive symptoms. Attention to relationship depth, arguments with family members, as well as demands from home may be helpful in this regard. Indeed, these relationship variables represent areas found to be amenable to intervention via psychotherapy, marital

therapy, or family therapy (Clark, Tluczek, & Wenzel, 2003; Gollan, Friedman, & Miller, 2002).

### Conclusion

In conclusion, this study controlled for depressive symptoms occurring during the pregnancy while exploring the relationship of daily stresses to reported levels of postpartum depressive symptoms in the presence of relationship support and relationship depth. The use of relationship depth was unique in our study, and the findings are promising and should be replicated in a larger sample. In our study, arguments with family and relationship depth were significantly related to the dependent variable, having opposite effects. Consistent with prior research findings, arguments with family members increased reported symptoms of depression, while our study utilized relationship depth to explore a decrease in reported symptoms. The majority of the 15 postpartum depressed women reported an increase in arguments and a decrease in depth after the birth of the baby, indicating an important area for prevention and intervention. Continued early identification of women reporting depressive symptoms can limit their potentially detrimental impact on the marital relationship by engaging the women in appropriate therapeutic interventions. Further exploration of the ecological context for the home environment and of the marital dyad could further the understanding of the variables explored in this study, particularly by incorporating relationship depth to replicate the findings presented here.

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Table 1

*Mean Scores for Control, Predictor, and Outcome Variables (N = 51)*

<u>Scale</u>	<u>M (SD)</u>	<u>Range</u>
Postpartum depression	13.16 (12.52)	[0-60]
Depression during pregnancy	13.36 (7.62)	[0-60]
Age	29.47 (4.73)	[20-39]
Number of pregnancies	2.59 (1.61)	[0-9]
Number of births	.91 (.94)	[0-3]
Educational attainment	1.63 (.49)	[0-2]
Demands from home	1.59 (1.19)	[0-4]
Demands from work	.20 (.40)	[0-1]
Demands from others	.86 (1.04)	[0-3]
Arguments with family	1.31 (1.05)	[0-6]
Arguments with others	.20 (.50)	[0-6]
Relationship support	3.48 (.59)	[0-4]
Relationship depth	3.57 (.36)	[0-4]

Table 2

*Summary of Depressive Symptoms During Pregnancy and in the Postpartum Period*

<u>Postpartum Depression</u>	<u>Depression During Pregnancy</u>		<u>Total</u>
	<u>Yes</u>	<u>No</u>	
Yes	9	6	15
No	6	30	36
Total	15	36	51

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Table 3

*Correlation Matrix of Control, Predictor, and Dependent Variables*

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Postpartum depression	--	.63**	-.12	-.41	.18	.03	.27	.42**	.26	-.46**	-.38**
2. Depression during pregnancy		--	-.38**	-.50**	.35*	.05	.42**	.11	.24	-.28*	-.13
3. Maternal age			--	.42**	-.29*	-.05	-.43**	-.09	-.11	-.01	-.16
4. Educational attainment				--	-.05	-.08	-.37**	-.14	-.14	.46**	.41**
5. Demands from home					--	.01	.38**	.36**	.18	-.19	-.14
6. Demands from work						--	.50**	.09	.31*	.07	.05
7. Demands from others							--	.24	.45**	-.21	-.13
8. Arguments with family								--	.31*	-.43**	-.22
9. Arguments with others									--	-.16	.07
10. Relationship support										--	.65**
11. Relationship depth											--

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Note. \*p<.05, \*\*p<.01

Table 4

Summary of Regression Analysis for Variables Predicting Postpartum DepressiveSymptoms (N = 51)

Variable	<i>B</i>	<i>SE B</i>	$\beta$
Step 1			
Depression during pregnancy	1.04	.182	.634***
Step 2			
Depression during pregnancy	.944	.161	.575***
Arguments with family	3.58	1.19	.300**
Relationship depth	-7.16	3.46	-.207*

Note.  $R^2 = .402$  for Step 1;  $R^2 = .561$  for Step 2;  $F_{(3, 47)} = 20.021, p < .001$

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table 5

*Mean Scores for Postpartum Depression Study Variables by Group Status*

Group Status	1. CES-D < 16 (N = 36)	2. CES-D 16-23 (N = 6)	3. CES-D > 24 (N = 9)
Scale [Range]	M (SD)	M (SD)	M (SD)
Postpartum depression [0-60] (11.63)	6.72 (4.75)	19.33 <sup>a</sup> (3.01)	34.78 <sup>b,c</sup>
Depression during pregnancy [0-60]	11.03 (5.11)	15.41 (4.63)	21.27 <sup>b</sup> (11.74)
Age [20-39]	29.86 (4.22)	29.83 (5.04)	27.67 (6.44)
Number of pregnancies [0-9]	2.31 (1.20)	3.00 (1.41)	3.38 (2.77)
Number of births [0-3]	.81 (.90)	1.00 (.89)	1.25 (1.17)
Educational attainment [0-2]	1.75 (.44)	1.50 (.55)	1.22 <sup>b</sup> (.44)
Demands from home [0-4]	1.50 (1.11)	1.50 (1.38)	2.00 <sup>b</sup> (1.41)
Demands from work [0-1]	.20 (.40)	.00 (.00)	.33 (.50)
Demands from others [0-3]	.67 (.86)	1.00 (.89)	1.56 (1.51)
Arguments with family [0-6]	1.06 (.86)	1.83 (1.17)	2.00 <sup>b</sup> (1.32)
Arguments with others [0-6]	.17 (.45)	.00 (.00)	.44 (.73)

Relationship support [0-4]	3.68 (.34)	3.07 <sup>a</sup> (.67)	2.98 <sup>b</sup> (.89)
Relationship depth [0-4]	3.66 (.25)	3.53 (.13)	3.21 <sup>b</sup> (.60)

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*Note.* <sup>a</sup> *T*-test between CES-D < 16 and CES-D = 16-23: postpartum depression,  $t = -6.261$ ,  $p < .001$ ; relationship support,  $t = 3.48$ ,  $p < .01$

<sup>b</sup> *T*-test between CES-D < 16 and CES-D > 24: postpartum depression,  $t = -11.413$ ,  $p < .001$ , depression during pregnancy,  $t = -4.014$ ,  $p < .001$ , educational attainment,  $t = 3.222$ ,  $p < .01$ , demands from home,  $t = -2.352$ ,  $p < .05$ , arguments with family,  $t = -2.631$ ,  $p < .05$ , relationship support,  $t = 3.804$ ,  $p < .001$ , relationship depth,  $t = 3.456$ ,  $p < .01$

<sup>c</sup> *T*-test between CES-D = 16-23 and CES-D > 24: postpartum depression,  $t = -3.147$ ,  $p < .01$

## CHAPTER III.

### IMPACTS OF POSTPARTUM DEPRESSION AND KNOWLEDGE OF INFANT DEVELOPMENT ON MATERNAL BEHAVIORS

#### Introduction

Belsky's Determinants of Parenting Process Model (1984) identifies parent and child characteristics, as well as stressors and supports, as predictors of parenting behaviors. The parenting characteristics deemed critical include: developmental history, personality, and psychological well-being. Child characteristics refer to the style(s) of infant temperament that makes parenting difficult. Sources of stress and support include qualities of the marital relationship, the social network and provision of support, and the parent's work. Based on his understanding of these factors, Belsky suggested a strengths/deficit model that ranked parenting behaviors by the presence and absence of the three factors; thus he suggests parenting as a buffered system based on the positive contributions. Ideally, positive contributions from all three subsystems results in the best parenting behaviors; however, when only one of the three factors was present, the mother's personality and psychological well-being ranked higher than infant characteristics or subsystems of support. Thus, a woman's healthy psychological well-being offers a stronger buffer to her parenting behaviors than child characteristics or sources of stress and support. This is an important principle to understand because of the many factors that exist that may contribute to lower psychological well-being that in turn may alter her perception of her infant or her parenting skills. Postpartum depression negatively affects psychological well-being and is reported to be one of the most

common changes to maternal mood following delivery. Depression ranges from the “baby blues” which resolve within days to the prolonged cases of depression that last from weeks to months. A few noted factors associated with lower psychological well-being include low levels of social support, arguments with family, and increased stressors (Bolger, DeLongis, Kessler, & Schilling, 1989; Page & Wilhelm, 2007; Purdom, Lucas, & Miller, 2006).

Abidin (1992) explored daily hassles, work, marital relationships, environment, and child characteristics that influenced the parent’s role by potentially increasing parenting stress. He also explored the parental use of internal and external resources as a buffer to alleviate the impact of stress on parenting behavior. Prior findings informed the focus of the present study to explore a stress buffering model (Belsky, 1984; Boss, 2002; Cummings & Davies, 1994) that enables researchers to examine factors that may reduce the symptoms of depression and allow the mother to operate within a normative range of behaviors.

One of the most notable of stressors is arguments with family or with a spouse. Women who argued and then interacted with their child showed more negative behaviors towards their child (Crnic & Low, 2002; Cummings & Davies, 1994). An argument with family increases the risk for postpartum depression, whereas marital depth acts to alleviate stress and/or depression (Page & Wilhelm, 2007). Another factor from the mother’s developmental history includes her knowledge of infant development. This knowledge acts as a guiding framework for a mother to tailor her behavior based on her understanding of normative development. Knowledge is most often based on childhood

experiences, experiences with children (Reis, 1988), or by reading and fostering an understanding of normative child development through informational sources (Vukelich & Kliman, 1985). Thus, the focus of this study will use Belsky's (and Abidin's) model to examine characteristics of the mother that affect her parenting skills and behaviors.

### *Postpartum Depression*

The literature is replete with examples of postpartum depression and its negative impact on parent and child outcomes. There are multiple factors known to contribute to depressive symptoms including maternal age (Berlin, Brady-Smith, & Brooks-Gunn, 2002), low levels of social support (Gelfand & Teti, 1990; NICHD Early Child Care Research Network, 1999), fewer years of maternal education (Teti, Gelfand, & Pompa, 1990; Roberts, Bornstein, Slater, & Barrett, 1999), marital status and marital conflicts (Dennis & Ross, 2006; Murray, Sinclair, Cooper, Ducournau, Turner, & Stein, 1999; Page & Wilhelm, 2007), low socioeconomic status (Gelfand & Teti, 1990; Teti, Gelfand, & Pompa, 1990; NICHD, 1999; Raviv, Kessenich, & Morrison, 2004), increased levels of stress (Crnic & Low, 2002; Gelfand, Teti, & Fox, 1992), infant sex (Cummings & Davies, 1994; Weinberg, Olson, Beeghly, & Tronick, 2006), and infant temperament (Calkins, Hungerford, & Dedmon, 2004; Cummings & Davies, 1994).

Given the findings of changes in maternal mood and behavior, the intermediary process by which depression alters specific maternal behaviors has been explored in recent years. Specifically, depressed mothers, relative to non-depressed mothers, exhibit fewer positive interactions, fewer vocal interactions, less contingency, less playfulness, and greater negativity or intrusiveness (Field, 1992; Righetti-Veltema, Bousquet, &

Manzano, 2003; Sohr-Preston & Scaramella, 2007) with their infants, as well as lower levels of sensitivity and pleasure within the relationship (Gelfand & Teti, 1990; van Doseum, Hosman, Riksen-Walraven, & Hoefnagels, 2007). Two distinct behavioral patterns observed for postpartum depressed women include 1) being withdrawn, preoccupied or inattentive, and 2) being intrusive, negative, or hostile (Berlin et al., 2002; Field, 1992; Gelfand & Teti, 1990; Hart, Jones, Field, & Lundy, 1999). Although these two patterns emerge for the majority of depressed women, some women exhibit fewer maladaptive parenting behaviors despite their depressive symptoms (Teti, Gelfand, & Pompa, 1990; van Doesum et al., 2007). In the study by Field (1992), a group of mothers referred to as “Zero Beck” mothers scored a zero on the depression scale, but their behavior during observation was clearly one of a depressed mother. Field suggests that these mothers are either denying their depression or trying to fake good behavior. This group of “Zero Beck” mothers displayed fewer sensitive behaviors than depressed mothers who acknowledged their depression. In summary of alterations to maternal behaviors from postpartum depression, the NICHD Early Child Care Research Network (1999) found behaviors of depressed mothers resulted in variation in infant development based more on the chronicity, severity, and type of depression, rather than on the presence of depression alone.

Central to the focus of the present study is the effect of depression on maternal behaviors exhibited during maternal-child interactions. Prior research found that depression altered maternal behaviors, such as sensitivity and responsiveness (Campbell, Matestic, von Stauffenberg, Mohan, & Kirchner, 2007; Field, 1992; McElwain & Booth-

Laforce, 2006; NICHD, 1999). Altered responses result in under- or over-stimulating interactions, inappropriate responses based on infant signaling or cues, use of more negative attributions, intrusive stimulation, and irritable and/or hostile behavior toward her infant (Cummings & Davies, 1994; Field, 1992; Wilfong, Saylor, & Elksnin, 1991).

A second behavior negatively affected by depression is the mother's ability to provide stimulation and to maintain her infant's attention during interactions. Behaviors typically associated with stimulation and attention included maternal verbal stimulation, scaffolding, modeling behaviors, and use of varied teaching styles (Hart et al., 1999; Hoffman, Crnic, & Baker, 2006; Ruddy & Bornstein, 1982). Verbal stimulation has been shown to promote language and cognitive development, but in the presence of depression resulted in mothers using fewer affirmations, less 'motherese' and more negative comments during interactions (Gelfand & Teti, 1990; Murray et al., 1996; Sohr-Preston & Scaramella, 2007; Weinberg et al., 2006). However, even without depression, the mother's ability to stimulate her infant stems from her knowledge of infant development and the importance she places on these behaviors and interactions.

#### *Knowledge of Infant Development*

Knowledge of infant development promotes positive relations such that mothers with higher knowledge engage their infant in age-appropriate activities that facilitate development and do not over-extend their infant's ability (Damast, Tamis-LeMonda, & Bornstein, 1996; Huang, Caughy, Genevro, & Miller, 2005). In contrast to mothers with greater knowledge, factors related to a mother's tendency to overestimate her child's developmental ability included lower levels of knowledge of infant development, fewer

years of education, lower socio-economic status, minority status, and depressive symptoms (Huang et al., 2005). In a review of multiple research studies, less maternal knowledge of infant development resulted in infants performing poorly during maternal-infant interactions or on developmental tests (Benaisch & Brooks-Gunn, 1996; Huang et al., 2005; Hunt & Paraskevopoulos, 1980; Parks & Smeriglio, 1986; Reich, 2005; Vukelich & Kliman, 1985). Specific behaviors observed in mothers with less knowledge resulting from an overestimate of developmental milestones found women were impatient, intolerant, and had a tendency to abuse or mistreat their infant speaking in a harsh or aggressive disciplinary tone (Culp, Culp, Blankemeyer, & Passmark, 1998; Reich, 2005; Reis, 1988). Mothers with greater knowledge of development and milestones provided more sensitive behaviors and structured the infant's environment to challenge the infant's potential, using child-focused goals rather than parent-focused goals seen in mothers with less knowledge (Cooke, 1991; Damast et al., 1996; Huang et al., 2005; Stevens, 1984). In a study by Cooke (1991), expert mothers utilized child-focused goals, as compared to novice mothers who utilized parent-focused goals. Further, behaviors of the expert mothers included observing, guiding, or verbalizing, compared to novice mothers who used showing of the toy, acting as a fellow player, observing, or modeling during an interaction. Teenage mothers in particular underestimated their infant's ability resulting in under-stimulation during interactions, but when these same teen mothers participated in interventions that included home visits, they increased their knowledge reducing the gap between their scores and those of older mothers (Culp et al., 1998; Hammond-Ratzlaff & Fulton, 2001).

Higher levels of knowledge of infant development have been shown to influence maternal behaviors resulting in the parent's ability to scaffold within the relationship (Hoffman et al., 2006). Conversely, depression often limits the mother's involvement during the interaction or negatively influences her expectations for her infant even if she has other children (Hess, Teti, & Hussey-Gardner, 2004; Vukelich & Kliman, 1985). In a study by Veddovi, Kenny, Gibson, Bowen, and Starte (2001), women with greater knowledge of infant development had fewer depressive symptoms even when their infant was born prematurely. Further, several studies have utilized knowledge of infant development as a moderator of maternal confidence (Conrad, Gross, Fogg, & Ruchala, 1992) and self-efficacy (Donovan, Taylor, & Leavitt, 2007; Hess et al., 2004). In all three studies, direct effects of the predictors were absent; however, the interaction of the two predictors resulted in significant moderation (Conrad et al., 1992; Donovan et al., 2007; Hess et al., 2004), though not always as expected. For instance, the moderator for quality parent-child interactions was present only when mothers had both high knowledge and high confidence, and when women reported high confidence but low knowledge, they were statistically different from the most knowledgeable group and were subsequently labeled "naively confident" (Conrad et al., 1992).

#### *Demographic control variables*

Within this study, four variables are used as control variables. The first is arguments with spouse/partner. As noted in previous studies (Page & Wilhelm, 2007), arguments with a spouse/partner was positively associated with the reported symptoms of postpartum depression. Thus, because postpartum depression serves as one of the

predictors for the present study, arguments will be controlled within the first block of the regression. The second control variable is socio-economic status. A higher SES has been associated with higher educational level and knowledge of infant development (Vukelich & Kliman, 1985).

As noted in the review of literature for knowledge of infant development, it was noted that minority mothers tended to incorrectly estimate child behaviors and developmental norms. Huang et al. (2005) notes that the NCATS may have limitations with minority populations, though NCATS has been used with minority populations resulting in similarities for the overall total score for the measure producing high Cronbach's alpha for White (.87), African-American (.90), and Hispanic (.88) populations (Sumner & Spietz, 1994). However, even with potential limitations, we expected that White mothers would score higher in the four maternal behaviors compared to minority women based on cultural differences and differences in teaching styles (Eshel, Daelman, de Mello, & Martines, 2006; Laosa, 1980). In addition to variations in parenting behaviors due to cultural differences, noted differences also occur in association with infant sex. Mothers tend to verbalize differently dependent upon the sex of their child. Mothers use more comments and descriptions with their sons, whereas they ask more questions of their daughters (Clearfield & Nelson, 2006). Researchers (Hinde & Stevenson-Hinde, 1987; Milgrom, Westley, & Gemmill, 2004) suggest mothers of boys tend to use more hostile behaviors compared to mothers of girls. For the present study, we expected that maternal behaviors would be lower for mothers of boys compared to mothers of girls based on previous findings that demonstrate differential treatment with

their infant and to expect or approve of certain types of behaviors based on their infant's gender.

### *Present Study*

Prior studies have focused on the direct effect of depression and knowledge of infant development on maternal behaviors as independent and co-predictors. Postpartum depression decreases a woman's well-being in her ability to manage her affective responses to varying stimuli. Further, postpartum depression alters the woman's view of her environment or how she processes information within a contextual situation regardless of her educational background. Thus based on results from Belsky's study which indicate that the woman's psychological well-being plays a key role in her parenting behaviors, this study will test the moderation of postpartum depression by knowledge of infant development while controlling for arguments, SES, ethnicity, and infant sex. The study will examine if knowledge of infant development buffers the reported depressive symptoms when observing parenting behaviors. We hypothesize that for each of the four maternal behaviors, women with higher knowledge of infant development regardless of depressive symptoms will maintain higher behavioral skills compared to women with low to moderate knowledge. Women with the lowest levels of knowledge would exhibit behaviors lower than other women at zero depression as well as at high levels of depression. Within each regression, we expected that depression would negatively impact maternal behaviors, whereas knowledge of infant development would positively contribute to maternal behaviors.

### Method

### *Participants*

The participants for the study were mothers who were observed in a mother-infant dyadic teaching interaction. The infants were born in 2001. The 10,688 participating families came from all 50 states and comprised the nationally representative sample for the Early Childhood Longitudinal Study-Birth cohort (ECLS-B). A secondary data analysis was conducted utilizing the first wave of infant data which was collected by the ECLS-B research team when the infant was 9-months old. Infants ranged in age from 8-months to 12-months. The sub-sample, whose data were analyzed for this study, included those biological mothers and infants who were evaluated with the complete Nursing Child Assessment Satellite Training Teaching Scale (NCAST), and the mothers who completed depression and knowledge of infant development questionnaires. This sub-sample consisted of 7,754 mothers with complete data on these three scales. Maternal characteristics for age, ethnicity, marital status, income, and arguments are as follows. Maternal age ranged from < 20 (7.8%), 20-24 (24.8%), 25-29 (24.2%), 30-34 (25.1%), 35-39 (14.4%), and > 40 (3.8%). Ethnic breakdown for the maternal sample was 49.3% non-Hispanic White, 16.3% African-American, 16.4% Hispanic, 11.6% Asian, 4.1% American Indian, and 3.0% Multi-ethnic, non-Hispanic. Marital status consisted of 65.7% married, 27.6% never married, and 6.7% other. Family SES scores ranged from low to high, representing the sample as follows: 17.8% for level 1, 19.5% for level 2, 20.0% for level 3, 19.7% for level 4, and 22.9% for level 5.

### *Procedure*

Primary data collection for the ECLS-B dataset was administered by the research team headed by Jennifer Park. For a full review of the data and measures collected, please refer to the website <http://nces.ed.gov/ecls/Birth.asp>.

### *Measures*

*Nursing Child Assessment Training Satellite Teaching Scale (NCAST)*. Kathryn Barnard (1978) created the Nursing Child Assessment Teaching Scale for children ranging in age from birth to 3 years to observe both maternal and infant behaviors during a teaching task that lasts from 1-5 minutes on average. Parents are instructed to select from a standardized list of 30 teaching tasks, designed for children from birth to 36 months of age. The task selected should exceed the infant's current ability or represent a skill that the infant has attempted but not yet mastered. The observer's training manual (Sumner & Spietz, 1994) includes approximate age ranges for each task if the parent has difficulty deciding. The teaching scale measures maternal behaviors, specifically that of maternal sensitivity, and the infant's social-emotional development in the context of a maternal-infant interaction. The task identifies areas of strengths and weaknesses in patterns of the dyadic interaction reflecting how the members are relating to and responding to one another which emerge regardless of the selected teaching task. Observers indicated whether or not (yes/no) mothers exhibited a series of 50 maternal behaviors associated with four scales (sensitivity to cues, response to infant's distress, social-emotional growth fostering, and cognitive growth fostering). The four scales are used in this study as dependent variables of interest.

*Sensitivity to cues* focuses on the mother's positioning the infant and cuing to start the teaching task, giving initial directions, allowing the infant time to explore materials, and praising her infant for success or partial success to name a few. This scale has 11 items and the range of scores for mothers is 0-11. Cronbach's alpha for this scale was .11 in our dataset and .52 as noted in the Teaching Manual published by NCAST (Sumner & Spietz, 1994). The *response to distress* begins with an un-scored item (response yes/no) for potent disengagement cues observed. Dependent upon this item, the response scale is scored in two ways. First, when infants do not display disengagement cues, the scale is then scored positively for all items resulting in a perfect score of 11 for the mother. Secondly, when the infant does show signs of disengagement, the observer then scores the mother on each item allowing for a range from 0-11. Items within this scale include stopping the teaching episode, use of soothing verbal, soothing non-verbal, diverting the child's attention, avoiding negative comments, and avoiding rough handling of the infant. Cronbach's alpha for this scale was .51 in our dataset and .80 as noted in the Teaching Manual published by NCAST (Sumner & Spietz, 1994). The *social-emotional growth fostering* scale uses caregiver positions, smiles, praises, touches, and avoidance of negative remarks to score mothers. The range for this scale is also 0-11. Cronbach's alpha for this scale was .33 in our dataset and .58 as noted in the Teaching Manual published by NCAST (Sumner & Spietz, 1994). *Cognitive growth fostering* includes items relating to the directions for the task, the description of the materials, modeling the task through use of verbal and non-verbal, encouraging words, praising and smiling after the infant's attempts, and stopping the task when the infant completes the task or becomes frustrated.

This scale ranges from 0-17. Cronbach's alpha for this scale was .45 in our dataset and .78 as noted in the Teaching Manual published by NCAST (Sumner & Spietz, 1994).

Sumner and Spietz (1994) address the issue of low alpha reliability by stating that for all 73 items (parent and child), the reliability score is adequate ( $\alpha = .87$ ) and represents parent and child behaviors appropriate of the teaching interaction, whereas individual subscales may vary more due to the various items within the scale. Several studies have utilized the individual scales from the NCAST as a predictor of infant outcomes (Bannerjee & Tamis-LeMonda, 2007; Gaffney, Kodadek, Meuse, & Jones, 2001) and of the maternal-infant interaction as a whole (Horodyski & Gibbons, 2004).

*Center for Epidemiologic Studies–Depression Scale (CES-D)*. A modified version of the Center for Epidemiologic Studies–Depression Scale (CES-D) was used by the ECLS-B cohort and included 12 of the 20 items from the standard version with Cronbach's alpha reliability of .75. The revised classifications and scores are represented as follows: Non-depressed (0–4), Mildly depressed (5–9), Moderately depressed (10–14), Severely depressed (15 or higher) (U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study, Birth Cohort, Nine-Month Data Collection, 2001–02). Items are scored 0-3, with 0 representing rarely or never (less than 1 day) and 3 representing most days (5-7 days). The sum for all items was used as the measure of depression with a range of scores from 0-36. For the present study, we also utilized 5 as the cut-off for depressive symptoms in descriptions of the women reported in the results section. We used the continuous variable within the regression

analyses, and because this variable was used as part of the moderator, the variable was centered according to procedures by Aiken and West (1991).

*Knowledge of Infant Development Inventory (KIDI).* The Knowledge of Infant Development Inventory (KIDI; MacPhee, 1981) consisted of 11 of the 75 items designed to assess knowledge of parental practices, developmental processes, and infant norms of behavior. The items were selected by the ECLS team based on recommendation by the measure's author as being the most successful for differentiating high versus low parenting knowledge. Each of the items on the KIDI questionnaire described either typical infant behaviors or aspects of parenting that could affect an infant's growth and behavior. Items include knowledge about infants' sleep needs, when children learn right from wrong, when infants typically say their first word, and so forth. The parent indicated where he or she "agrees," "disagrees," or "is not sure." Some of the items also ask the parent to specify whether the behavior in question can be expected of an older or a younger child. The 11 items used in the ECLS-B were identical to the original KIDI and resulted in an alpha reliability of .58. The KIDI items were used with the permission of its developer, Dr. David MacPhee (agreement dated January 28, 2003) who recommended the subset of KIDI items for use in the Early Childhood Longitudinal Study, Birth Cohort. Within the present study, a sum score was created for the 11 items for a range of 0-11. When items required a response of older or younger, choosing the correct response resulted in one point and incorrect or not-sure responses received zero points. For example, "Baby can respond to his/her name at 10 months" would be scored 1 for answering younger and 0 for older or not sure.

*Demographic Control Variables.* To isolate the effects of depression and knowledge, we utilized four control variables: family socio-economic status (SES), arguments with significant other, infant sex, and ethnicity. The SES variable represents five quintiles for household income with approximately 20% of the sample in each quintile. The arguments scale was created by summing responses to 10 items asking respondents about the frequency of arguments about items such as money, the child, leisure time, affection, in-laws, etc. The range of scores is 0-40 with higher scores indicating more arguments; alpha reliability equaled .96.

SES and arguments were utilized as continuous variables, whereas all ethnic minority groups were collapsed into a single group coded 0 for non-White minorities and 1 for non-Hispanic White. Infant sex was coded 0 for female and 1 for male.

## Results

Results are presented in two sections. Descriptive and bivariate correlations are presented in the first section followed by the results of the regression analyses for each of the four NCAST maternal behaviors. SPSS (SPSS, Inc., 2005, Version 14.0) was used for all data analyses.

### *Descriptive Data*

Tables 1 and 2 provide descriptive data. Table 1 provides the mean scores on control, independent, and dependent variables of interest in the study. Using the suggested cut-off score of 5.0 and above to indicate the presence of depressive symptoms, the sample included 4,341 women (56%) who were non-depressed scoring four or below, and 3,413 women (44%) scoring five or above on the depression scale. For

each sub-group of depression, 25.5% were mildly depressed (CES-D scores 5-9), 11.5% moderately depressed (scores 10-14), and 7% severely depressed (scores greater than 15). T-tests results for study variables (Table 1) indicated that depressed and non-depressed women differed for the majority of tested variables; mean score differences were statistically significant at the  $p < .001$  level, with  $p < .05$  for response to distress. For the two dichotomous variables, significant findings indicated that depressive symptoms were reported more often by minority mothers and mothers of boys.

Table 2 shows that the two predictor variables significantly correlated with both control and dependent variables. Depression was higher among minority women ( $r = -.07, p < .01$ ), lower for women with higher SES levels ( $r = -.03, p < .05$ ), and higher for women experiencing more arguments ( $r = .06, p < .01$ ). Further, there was an inverse association between depression and KIDI ( $r = -.07, p < .01$ ) and a negative correlation of depression to each of the four maternal behaviors (Table 2). Our second predictor, KIDI, was higher among White women ( $r = .42, p < .01$ ), women with higher SES levels ( $r = .03, p < .01$ ), women experiencing more arguments ( $r = .08, p < .01$ ), and each of the four dependent maternal behaviors.

### *Regression Analyses*

The hypothesis for our study focused on the moderation of depression based on the mother's knowledge of infant development for four maternal behaviors of a standardized teaching interaction. We expected main effects for maternal behaviors to find negative associations for depression and positive associations for knowledge of infant development. When we tested for knowledge as a moderator of depression, we

expected that women with higher levels of knowledge would buffer the negative display of maternal behaviors when reporting zero levels of depression through the highest levels of depression. Prior to the regression analysis, we centered the two predictor variables (depression and knowledge) to create the moderator by multiplying the two together (Aiken & West, 1991). Our outcome variables were the four maternal behaviors from the NCAST scale: sensitivity to cues, response to distress, social-emotional growth fostering, and cognitive growth fostering. Within each regression, the moderator was negatively associated though statistically significant for sensitivity to cues, social-emotional growth fostering, and cognitive growth fostering (Tables 3-5).

As shown in Table 3, after entering the control variables, depression and KIDI were uniquely associated with maternal behaviors for sensitivity to cues in the predicted directions as hypothesized. Further, the addition of the moderator significantly increased the prediction of sensitivity to cues,  $F_{(7, 7724)} = 17.16, p < .001$ . The full model explained 1.5% of the variance in sensitivity. The significant moderator ( $\beta = -.029, p < .05$ ) shown in Figure 1 indicates that, as hypothesized, women with higher levels of knowledge have the highest sensitivity scores regardless of depression levels. In other words, depression is most strongly related to higher sensitivity under conditions of high knowledge of development.

The regression for maternal social-emotional growth fostering found main effects in the expected direction for depression and KIDI after entering the control variables. Inclusion of the moderator improved the prediction of social-emotional growth fostering,  $F_{(7, 7724)} = 37.56, p < .000$  (See Table 4). The interaction of KIDI and depression again

resulted in decreased maternal social-emotional growth fostering ( $\beta = -.024, p < .05$ ). Figure 2 displays the decrease in social-emotional growth fostering for all women, and consistent with our stated hypothesis, women with the highest knowledge levels were able to maintain higher social-emotional behaviors compared to women with low or average knowledge when suffering from moderate to severe depression. The full model explained 3.3% of the variance in maternal behaviors for social-emotional growth fostering.

After entering the control variables, the regression analysis for maternal behaviors associated with cognitive growth fostering found significant main effects for depression and KIDI in the expected direction, and the addition of the significant interaction term improved the prediction of the model,  $F_{(7, 7724)} = 70.29, p < .001$ . The full model explained 6% of the variance in maternal behaviors associated with cognitive growth fostering (Table 5). The interaction term operated in the same direction as the previous two behaviors, with a decrease in cognitive growth fostering ( $\beta = -.050, p < .001$ ) for all women, but women with the highest knowledge were able to maintain a higher level of skill regardless of depression level (Figure 3).

Initially, no moderation was found for the maternal behavior for response to distress; however, a post hoc analysis focused on only the mothers whose infants displayed disengaging cues during the teaching task. These women were selected to eliminate the positive skew from mothers who received a perfect score by default of their infant not displaying any disengaging cues. In this smaller sample of mothers whose infants disengaged ( $N = 5,792$ ), the post hoc regression found the interaction term was

statistically significant (Table 6) and the direction of effect for women with higher knowledge levels was in the expected direction (Figure 4). The full model explained less than 1% of the variance  $F_{(7, 5785)} = 3.64$ . Interestingly, the women become closer in their display of response to distress when reporting the highest depressive symptoms.

When graphing the moderation, three levels of knowledge were created by using the mean score for knowledge, plus and minus one standard deviation for the high and low scores respectively. For all analyses, even though behavioral skills declined for all women as depression symptoms increased, mothers with the highest knowledge levels maintained higher behaviors (Figures 1-4), compared to mothers of low and average knowledge. The graphs shown in Figures 1-4 indicate knowledge provided the buffering effect hypothesized for women with the highest levels of knowledge when also reporting high depressive symptoms.

### Discussion

Postpartum depression impairs maternal behaviors and interactions placing the mother-infant dyad at risk for maladjustment. Through the present study, we examined the ability of a woman's knowledge of infant development to buffer the effects of the postpartum depression resulting in a smaller deficit within maternal behavioral skills. As expected, our research findings confirmed the trends for both depression and knowledge indicated in the literature. We found depression negatively associated with each of the four maternal behaviors, whereas knowledge of infant development positively predicted the four maternal behaviors. Knowledge of infant development has been shown to facilitate a greater understanding of infant behaviors that allow mothers with higher

levels of knowledge to interpret the infant's behavior associated with the infant age and environmental context in which the behavior is being displayed. Therefore, we expected that women with higher levels of knowledge would demonstrate more positive behavior and limit the negative behaviors (yelling, criticizing, making general negative comments) associated with a standardized teaching task regardless of their level of depression. We began this study by examining Belsky's Determinants of Parenting Process Model as a basis to explore the characteristics of mothers that contributed to her behaviors during maternal-child interactions occurring within the maternal-infant interaction. The present study focused on two predictor variables and the interaction of the two (moderation) to explain maternal behaviors above and beyond maternal characteristics of ethnicity and SES, arguments, and infant sex.

Consistent with our proposed hypothesis, both depression and knowledge significantly predicted each of the maternal behaviors, and the interaction of the two contributed to the further explanation of the variance in the three maternal behaviors of sensitivity to cues, social-emotional, and cognitive growth fostering. In addition, consistent with our hypothesis, higher knowledge levels resulted in mothers maintaining higher behavioral skills even when they reported higher depressive symptoms. Post hoc graphical representations indicated women with higher knowledge and experiencing greater depressive symptoms displayed higher behavioral skills for each of the maternal behaviors measured. This finding is contradictory to the reported studies that found women with the greatest knowledge and the greatest measure of self-efficacy or confidence (Conrad et al., 1992; Donovan et al., 2007; Hess et al., 2004) scored lower

than women with low or average levels of knowledge. One unique pattern that emerged was the significant reduction in maternal behaviors for the response to distress subscale indicating that when women reported higher depressive symptoms, knowledge acted as less of a buffer when trying to console their children. Thus, when infants display disengaging cues (e.g., crying, back arching, or temper tantrums), mothers suffering from depression tend to be more affected by their infants behavior than by the knowledge of infant development. This finding may indicate an area within Belsky's model to be addressed through education or interventions conducted at home or in a clinical setting.

As noted in the depression literature review, mothers' behaviors during infant interactions can be interpreted as appropriate, intrusive, or withdrawn (Field, 1992; Gelfand & Teti, 1990). Based on this understanding, we assumed that mothers who possessed greater knowledge about infant development would respond to infants by operating from their understanding of normative infant behavior. In the presence of depression, we expected knowledge to buffer the atypical behaviors displayed by depressed mothers. In each of the four analyses of maternal behaviors, our findings indicated that knowledge of infant development buffered the main effect of depression. However, despite these positive findings, we recognize the limited variance our models predicted; thus our findings must be interpreted cautiously. Future analyses should be conducted to explore additional factors and systems that contribute and influence maternal behaviors in the presence of both knowledge and depression.

Limitations of the study include the use of self-reported data from the mother regarding her frequency of arguments, depressive symptoms, and knowledge of infant

development. For the present study, observational data included the four maternal behaviors measured by the interactive teaching task, which could be considered a strength of the study. Longer periods of observation and in diverse parenting activities could allow for different coding of maternal behaviors. Additionally, observations in conjunction with reports from the mother's spouse or partner regarding her depressive symptoms, knowledge, and arguments could provide a triangulation of the data to strengthen the findings. Both observed measures and self-reported measures were concurrently sampled thus limiting the ability to test for causation or bi-directional interactions.

A second limitation was the use of biological mothers only. While this increases the ability to generalize the data, it limits our understanding of the influence of other family members (step-mother, father, or other primary caretaker) within the teaching interaction. Even though the dataset did contain reports from these other family members, the total numbers were small thus resulting in the decision to limit analyses to biological mothers which represented greater than 77% of the data. Further, based on literature support of and our interest in the effects of postpartum depression on maternal behaviors, we selected biological mothers because of the greater prevalence of postpartum depression among biological mothers, more so than for step-mothers, fathers, or other caretakers.

Finally, low reliabilities of the NCATS scales within the ECLS dataset may have impacted the low variance of each regression analysis. In particular, the binary measurement of these scales limits the variance within the items, and the scale as a

whole. As noted for the response to distress subscale, mothers of infants who did not disengage were removed from the analysis to limit the positive skew within the data. This potentially limits the interpretation of the findings to only those women whose infant displayed disengaging cues. Further, because the teaching interaction is designed to measure the dyad as a whole, we must use caution in only interpreting the mother's scores.

### Conclusion

Though not accounting for an exceptionally large amount of variance for each maternal behavior, this study did support previous findings for the positive contribution of knowledge of infant development to the expression of maternal behaviors, as well as the detrimental effects of depressive symptoms to these same behaviors. Further, the interaction of depression and knowledge supported our hypothesis that knowledge can buffer depressive symptoms during a teaching interaction. We believe these findings suggest the need for further exploration by including additional maternal characteristics that potentially impact the display of maternal behaviors during maternal-child interactions.

Suggested implications from this study include the potential for educational interventions to improve knowledge of infant development, but more importantly to screen for postpartum depression to allow for referrals for psychological intervention. Successful interventions addressing the needs of depressed mothers have resulted in a decrease in the negative behaviors associated with depression and have improved maternal-infant interactions (Field, 1992; Lyons-Ruth, Connell, & Grunebaum, 1990).

Other interventions have focused on educational outreach designed to address infant development and normative milestones (Culp, Culp, Blankemeyer, & Passmark, 1998; Hammond-Ratzlaff & Fulton, 2001). Prior use of the NCATS within a study sample found improved results for parent, child, and overall scores for the NCATS from 12-24 months (Horodyski & Gibbons, 2004). Results from this study can inform the educational, public health, and child development sectors so that educational programs and maternal-child interventions are made available to families at risk.

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Table 1

*Mean scores for Depressed (N = 3,413) and Non-Depressed (N = 4,341) Women*

Variable	Mean (SD)		Range	T-statistic
	Depressed	Non-Depressed		
Ethnicity	.47 (.50)	.54 (.50)	0/1	5.77***
Infant sex	.52 (.50)	.50 (.50)	0/1	-1.70
SES	3.07 (1.42)	3.12 (1.42)	1-5	1.38*
Arguments	10.17 (8.23)	7.52 (6.52)	0-40	-15.80***
KIDI	6.63 (2.13)	6.92 (2.12)	0-11	6.13***
Sensitivity to cues	7.94 (1.17)	8.04 (1.15)	0-11	3.66***
Response to distress	8.82 (1.72)	8.92 (1.71)	0-11	2.35*
Social-Emotional	6.99 (1.41)	7.12 (1.40)	0-11	4.19***
Cognitive	10.30 (2.42)	10.57 (2.39)	0-17	4.93***

*Note.* KIDI = knowledge of infant development

Maternal ethnicity coded 0 = non-White minority and 1 = non-Hispanic White. Infant sex coded 0 = girls and 1 = boys.

\* =  $p < .05$ ; \*\*\* =  $p < .001$

Table 2

*Correlation Matrix of Maternal Behaviors, Control, and Predictor Variables*

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Ethnicity	--									
2. Infant sex	-.01	--								
3. Arguments	.06**	.02	--							
4. SES	.03*	-.00	-.01	--						
5. KIDI	.42**	-.01	.08**	.03**	--					
6. Depression	-.07**	.02	.18**	-.03*	-.07**	--				
7. Sensitivity	.08**	-.02	.01	.00	.10**	-.05**	--			
8. Response	.03*	-.01	.02	-.00	.05**	-.03*	.14**	--		
9. Social-emotional	.11**	-.02*	.04**	.01	.14**	-.06**	.33**	.15**	--	
10. Cognitive	.19**	-.02*	.02*	.01	.20**	-.07**	.36**	.13**	.46**	--

*Note.* KIDI = knowledge of infant development.

Maternal ethnicity coded 0 = non-White minority and 1 = non-Hispanic White. Infant sex coded 0 = girls and 1 = boys.

$N = 7,731$

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

Table 3

*Regression Analysis for Maternal Sensitivity to Cues*

Variable	<i>B</i>	<i>SE B</i>	$\beta$	$\Delta R^2$
Step 1				.006***
Ethnicity	.164	.027	.070***	
Infant sex	-.049	.027	-.021	
Arguments	.001	.002	.006	
SES	-.006	.009	-.007	
Step 2				.008***
KIDI	.040	.007	.072***	
Depression	-.014	.002	-.067***	
Step 3				.001***
KIDI X Depression	-.003	.001	-.029*	

*Note.* Maternal ethnicity coded 0 = non-White minority and 1 = non-Hispanic White.

Infant sex coded 0 = girls and 1 = boys.

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

Table 4

*Regression Analysis for Social-Emotional Growth Fostering*

Variable	<i>B</i>	<i>SE B</i>	$\beta$	$\Delta R^2$
Step 1				.014***
Ethnicity	.285	.032	.100***	
Infant sex	-.071	.032	-.025*	
Arguments	.008	.002	.043***	
SES	.028	.012	.027*	
Step 2				.018***
KIDI	.092	.008	.137***	
Depression	-.013	.003	-.051***	
Step 3				.001***
KIDI X Depression	-.003	.001	-.024*	

*Note.* Maternal ethnicity coded 0 = non-White minority and 1 = non-Hispanic White.

Infant sex coded 0 = girls and 1 = boys.

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

Table 5

*Regression Analysis for Cognitive Growth Fostering*

Variable	<i>B</i>	<i>SE B</i>	$\beta$	$\Delta R^2$
Step 1				.037***
Ethnicity	.919	.054	.190***	
Infant sex	-.097	.054	-.020	
Arguments	.003	.004	.010	
SES	.008	.019	.005	
Step 2				.020***
KIDI	.168	.014	.147***	
Depression	-.021	.005	-.049***	
Step 3				.002***
KIDI X Depression	-.010	.002	-.050***	

*Note.* Maternal ethnicity coded 0 = non-White minority and 1 = non-Hispanic White.

Infant sex coded 0 = girls and 1 = boys.

\*\*\* $p < .001$

Table 6

*Post Hoc Regression Analysis for Response to Distress*

Variable	<i>B</i>	<i>SE B</i>	$\beta$	$\Delta R^2$
Step 1				.001*
Ethnicity	.141	.045	.042**	
Infant sex	.008	.045	.002	
Arguments	-.001	.003	-.005	
SES	.010	.016	.009	
Step 2				.002**
KIDI	.020	.012	.025	
Depression	-.010	.004	-.033*	
Step 3				.001**
KIDI X Depression	.004	.002	.031*	

*Note.* Reduced sample ( $N = 5,792$ ) represents mothers of infants that disengaged during the teaching task.

Maternal ethnicity coded 0 = non-White minority and 1 = non-Hispanic White. Infant sex coded 0 = girls and 1 = boys.

\*  $p < .05$ , \*\* $p < .01$

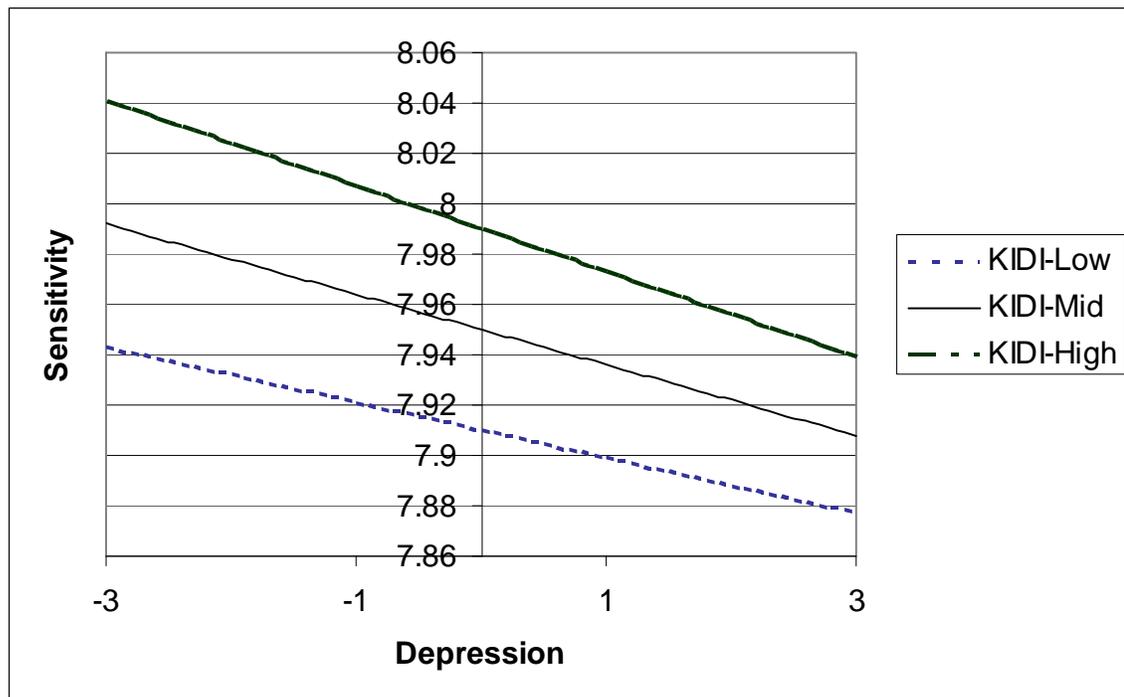
*Figure 1*Moderation of Sensitivity to Cues from Depression by Knowledge of Infant Development

Figure 2

Moderation of Social-Emotional Growth Fostering from Depression by Knowledge of Infant Development

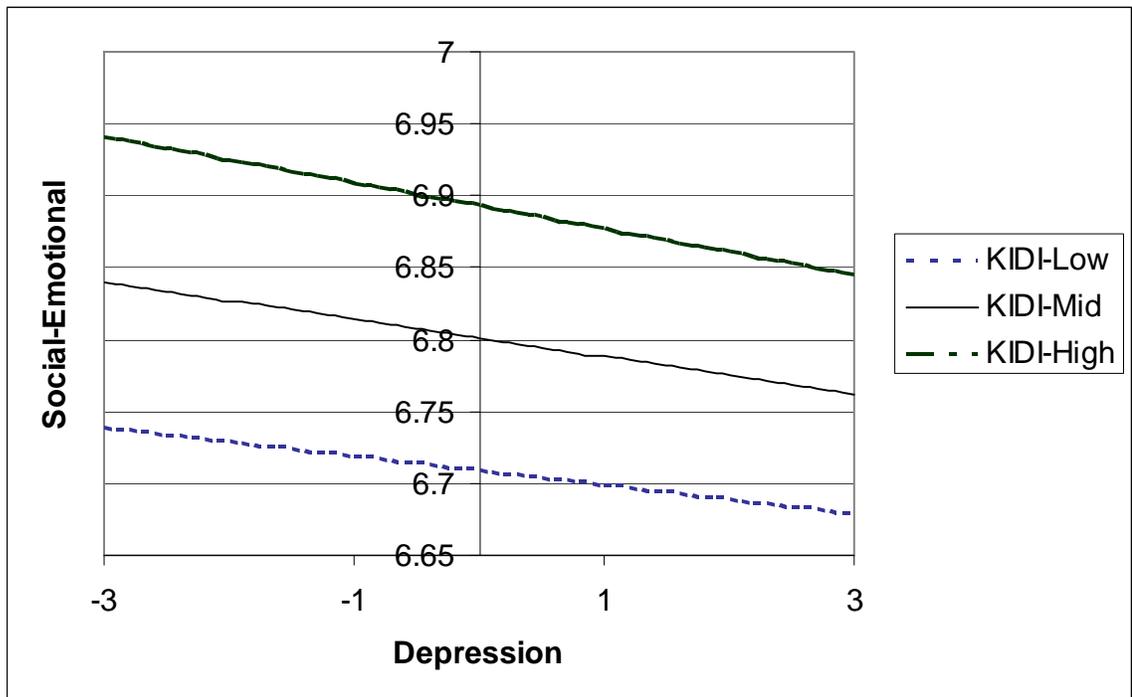


Figure 3

Moderation of Cognitive Growth Fostering from Depression by Knowledge of Infant Development

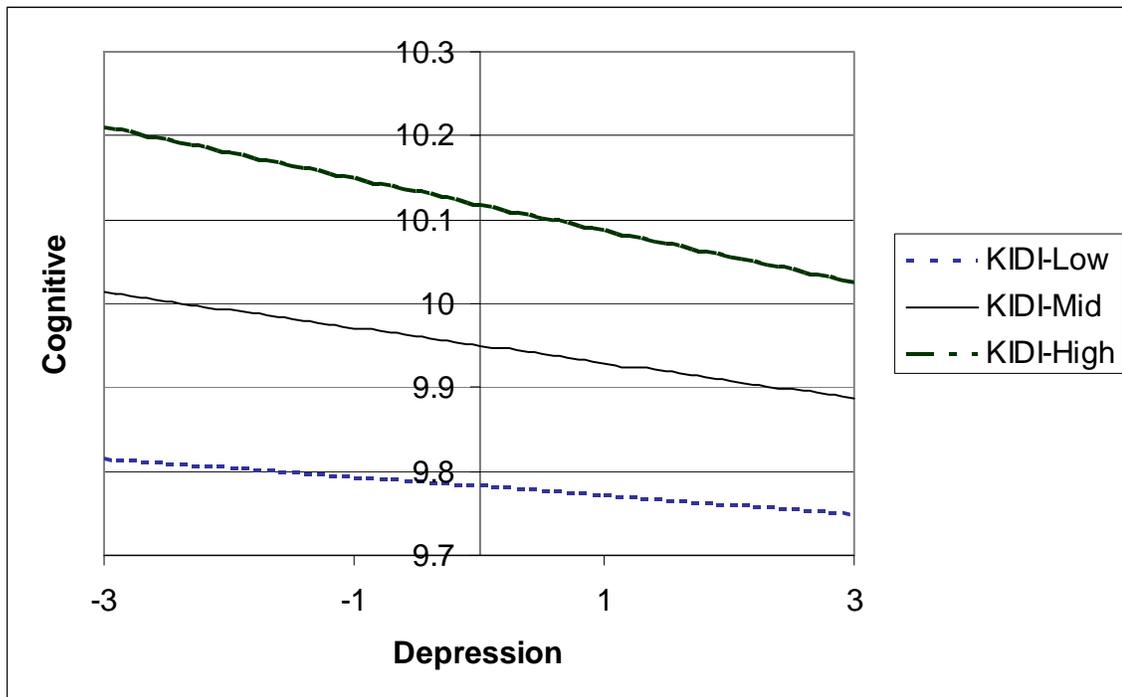
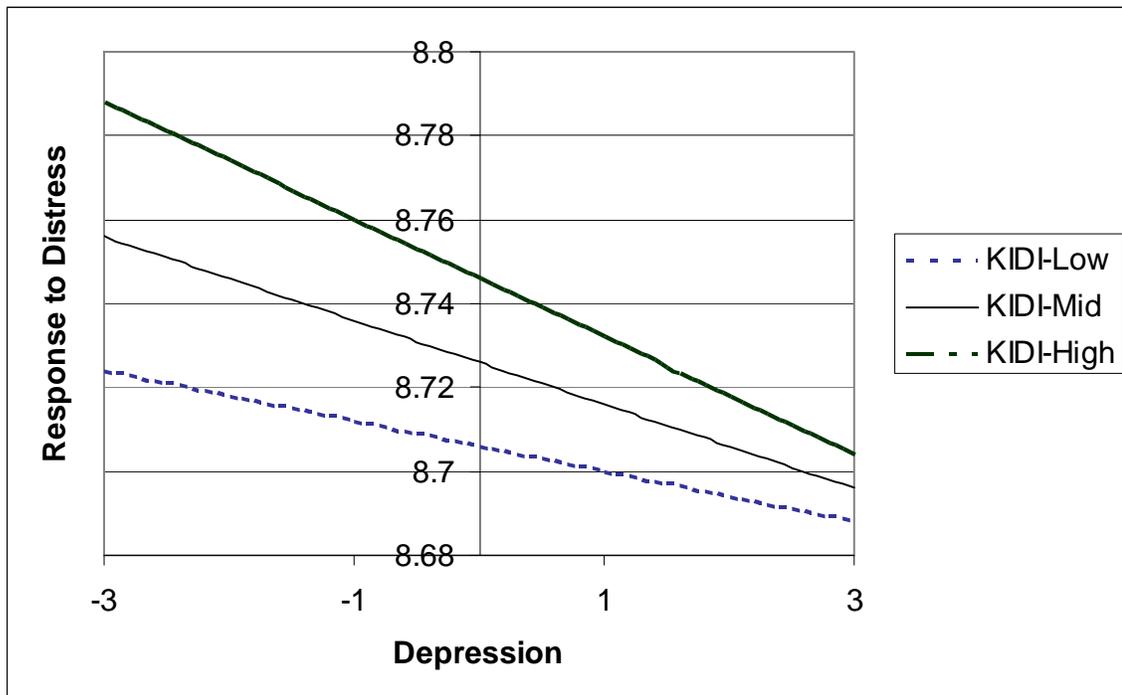


Figure 4

Post Hoc Moderation of Response to Distress from Depression by Knowledge of Infant Development Using a Reduced Sample of Mothers of Distressed Infants



## CHAPTER IV.

### A COMPARISON OF MATERNAL SENSITIVITY AND VERBAL STIMULATION AS UNIQUE PREDICTORS OF INFANT SOCIAL-EMOTIONAL AND COGNITIVE DEVELOPMENT

#### Introduction

It is well accepted that the family provides important relational contexts for infant and child development, and that positive parent-child interactions are critical for optimizing developmental outcomes including social, emotional, and cognitive growth. Because the mother-child relationship is uniquely close and long-term and has proven to significantly influence developmental outcomes, it has been under close scrutiny. Interest has often focused on the mother's physical health or psychological mood (Carter, Garrity-Rokous, Chazan-Cohen, Little, & Briggs-Gowan, 2001; Field, 1992) in explaining poor outcomes for children throughout their lives. Alternatively, others have investigated the specifics of the mother's cognitions when interacting with her infant (Meins, Fernyhough, Fradley, & Tuckey, 2001) and the impact of her verbal and nonverbal behaviors in stimulating the growth and development of her child (Landry, Smith, Miller-Loncar, & Swank, 1997). Observational research of mother-child interactions has focused on caregiving skills such as feeding, free play, teaching strategies, and behaviors that promote attachment security, as well as the mother's behaviors to soothe the infant during stressful and non-stressful events (Beckwith & Rodning, 1996; Field, Guy, & Umbel, 1985; Landry, Smith, & Swank, 2006; McElwain & Booth-LaForce, 2006).

Ainsworth and her colleagues noted that mothers of securely attached infants displayed behaviors defined by sensitivity, acceptance, cooperation, and accessibility (Ainsworth, Bell, & Stayton, 1971), leading to a definition of maternal sensitivity as “the perception and interpretation of infant signals by the mother, and her prompt and appropriate response to her infant’s need” (Ainsworth, Blehar, Waters, & Wall, 1978). Typical behaviors associated with maternal sensitivity included: 1) responding promptly to a cry recognized as signaling distress; 2) comforting the infant when upset; 3) being available for interaction; 4) interpreting the infant’s actions as meaningful; and 5) treating the infant as an intentional agent.

Meins (1997) considered the role of cognitions and intentional behaviors, both for the mother and the infant, during maternal-infant interactions. In contrast to Ainsworth’s definition of behaviors associated with maternal sensitivity, Meins (1997) purported that maternal behaviors must be appropriate for the situation; thus she began to focus more on the importance of the mother’s cognitions, and in particular her interpretation of her infant’s actions to determine the appropriateness of her behavior. Of the five sensitive behaviors indicated by Ainsworth, Meins (1997) believed that behaviors associated with responding, comforting, and availability promoted social and emotional development, whereas the behaviors associated with interpreting and treating the infant as an intentional agent promoted the development of cognitive growth in the infant.

It is our assumption, however, that within any context a mother is likely to exhibit a variety of behaviors. Unpacking the meaning and impact of each type of behavior as a unique influence on a specific infant outcome is difficult. Rather we assume that

maternal behaviors influence multiple outcomes such that maternal sensitivity contributes to cognitive development and verbal stimulation contributes to social-emotional development. The purpose of this study was to explore the role of maternal behaviors as they are related to both social-emotional and cognitive development. Specifically, we hoped to determine if behaviors more closely aligned with maternal sensitivity differentially impacted infant outcomes as compared to behaviors more closely aligned with cognitive stimulation via maternal verbal stimulation. In addition, we assumed that the age of the infant may play a role in maternal-child interactions, thus we explore infant age as a moderator of each maternal behavior.

#### *Maternal Behavior as a Foundation for Infant Social-Emotional Development*

Maternal behavior influences the social-emotional development of the infant through the development of an initial relationship based on trust that is necessary for reciprocal maternal-infant interactions (Landry, Swank, Assel, Smith, & Vellet, 2001). Two of the more commonly identified aspects of sensitive behaviors include responsiveness and contingency. Beckwith and Rodning (1996) found maternal responsiveness resulted in children's ability to discuss social problems at age 3 and to solve social problems at age 5. An intervention study (Landry et al., 2006) increasing maternal responsiveness was found to in turn increase infant's social communication and affective responses with the mother. Observations showed responsive mothers were prompt, sensitive, and contingent and treated their infants as capable of intentions (Landry et al.). A study of mothers in developed countries found maternal responsiveness led to greater attachment, but also further influenced social competence and was

associated with fewer behavioral problems at 3 years of age (Eshel, Daelman, de Mello, & Martines, 2006).

The second facet of maternal sensitivity focuses on the mother's contingent behavior during reciprocal interactions and basic caregiving. Contingent behavior suggests that the mother acknowledges and responds to the infant's needs within a reasonable period of time after the infant signals (e.g., crying, calling, or crawling after) (Eshel et al., 2006; Landry et al., 2001; Smith, Landry, & Swank, 2006). When maternal responses are contingent, the infant gains trust (Landry et al., 2001) in the mother, thus resulting in the formation of a trusting internal working model in connection with relationships. Further, maternal contingency has been associated with positive infant outcomes.

Recent work by McElwain and Booth-LaForce (2006) found that maternal contingent and responsive behaviors serve as a model for the child's own emotional development and regulation of emotions. Field, Guy, and Umbel (1985) noted that mother's contingent behavior during imitation, compared to behaviors during spontaneous interactions, result in greater infant smiles and vocalizations. Imitation of maternal behavior shape emotion regulation and infant mood as observed in dyadic interactions of infants with their depressed mothers (Field, 1992). Landry, Smith, and Swank (2006) suggested that, during the infant's formative years, maternal contingent responses are important behaviors for establishing a secure attachment, but also for promoting social development by emphasizing the rules of socialization within the interaction.

### *Maternal Behavior Associated with Infant Cognitive Development*

The amount of maternal responsiveness and contingent behavior, as well as verbal stimulation offered by the mother to her infant, has been shown to have a direct relation to both language development and overall cognitive ability (Beckwith & Rodning, 1996; Eshel et al., 2006; Field et al., 1985; Landry et al., 2006; Smith et al., 2006). Several factors impacting the amount of verbal communication between a mother and her infant in promoting cognitive growth include maternal education, sensitivity, verbal stimulation, imitation, and structuring of the environment (Eshel et al., 2006; Field, 1992; Laosa, 1980; Paavola, Kunnari, & Moilanen, 2005).

From birth, dialogue from the mother to her infant lays the foundation for dyadic interactions and for contributions to healthy cognitive outcomes (Landry et al., 2006), including language development. Early maternal dialogue has been shown to be a function of the mother's educational level, with mothers having fewer years of education being less verbal to their infant, or not verbalizing to them until the infant began vocalizing in the later half of the first year (Beckwith & Rodning, 1996; Berlin, Brady-Smith, & Brooks-Gunn, 2002; Landry et al., 2001; Landry et al., 2006).

During maternal-infant interactions, mothers who used verbal or non-verbal behaviors that encouraged and maintained the infant's attention towards an object or task promoted infant vocabulary and overall cognitive ability (Landry et al., 2006; Ruddy & Bornstein, 1982). Landy and colleagues (1997) indicated that mothers who worked to maintain their infant's attention and behavior or who maintained the dialogue, rather than restricting the behavior or dialogue, had infants with higher cognitive-language scores

compared to other infants of the same age. Similarly, when mothers utilized a directive skill in teaching, the infants had higher cognitive-language scores than comparison infants (Landry et al., 1997). In a study of teaching styles, Laosa (1980) found differences by ethnicity resulting in Anglo mothers using more inquiry and praise, whereas Chicano mothers used modeling and visual cues most frequently. However, for both Anglo and Chicano families, they utilized the same directive teaching style in addition to their aforementioned predominant styles.

#### *Maternal Sensitivity and Verbal Stimulation Associated with Infant Age*

Infant age has been shown to affect the type of interaction, as well as the level of involvement by both mother and infant, in regards to maternal behaviors of sensitivity and vocal stimulation and content of maternal dialogue. Researchers interested in maternal sensitivity observed patterns of stability as well as additional factors that altered levels of sensitivity over time. Isabella (1998) studied maternal sensitivity in both naturalistic and free-play contexts from 1-9 months with the naturalistic environment presenting the most consistent context for sensitivity. Consistency of sensitivity was highest at 4 months and decreased by the 9<sup>th</sup> month. Likewise, two recent studies found sensitivity decreased between four and eight months when infants exhibited greater levels of negative emotionality, when mothers reported lower levels of social support (Mertesacker, Bade, Haverkock, & Pauli-Pott, 2004), as well as when mothers experienced depression or anxiety symptoms (Campbell, Matestic, von Stauffenberg, Mohan, & Kirchner, 2007).

Infant age also played a role in early vocalizations with the mother and the content or structure of the conversation. Jones and Moss (1971) found infant vocalizations at 2 weeks of age were non-socially derived, whereas those at 3 months of age were associated with social interaction with the mother. Developmentally, researchers have identified the 10<sup>th</sup> month as the start of language expression, though some infants become verbal as early as 8 months with the average infant using some words by 13 months (Bloom, 1998). Early studies found both chronological and mental age dictated the level of interaction observed between mother and infant within a sample of developmentally-delayed infants (Francis & Jones, 1984), as well as with normally developing infants. In both studies, mothers increased their utterances and alternated vocalizations within a conversation style as their infant became older (Elias, Hayes, & Broerse, 1988; Francis & Jones).

Bornstein et al. (1992) found that the content of maternal speech changed from 5 to 13 months, with use of directive speech 2.5 times more often to the 13-month-olds, 2 times more questions, and 2.5 times more reports. In addition, mothers of 13-month-olds spoke more frequently, and used double the information-salient and one-third more affect-salient language to the older infants compared to language used with their 5-month-olds (Bornstein et al., 1992). Clearfield and Nelson (2006), similarly found mothers talked more with their 6-month olds in a narrative fashion talking about the child's play, decreasing when the infants were 9-months old and crawling about, and then increasing again at 14-months by including more directives regarding the child's play. Further, mothers with a greater understanding of infant developmental stages engaged

their infant in dialogue resulting in positive cognitive development (Wacharasin, Barnard, & Spieker, 2003).

### *Predisposing Characteristics for Infant Development*

Predisposing characteristics can include factors associated with the mother and/or the infant that potentially alter their patterns of interaction and ultimately the infant's development. We have identified several characteristics that will be included in our analysis that will serve as control variables to disentangle the main effects from these predisposing characteristics that are not amenable to change during a cross-sectional analysis. These include maternal education, age, ethnicity, and infant sex.

Maternal education, which may heighten general knowledge of infant development, influenced a mother's intentional behaviors (Roe, Roe, Drivas, & Bronstein, 1990), as well as potentially impacting the type of teaching behaviors she utilized with her infant (Eshel et al., 2006; Laosa, 1980). Women with higher educational attainment utilized a more formalized teaching method while women with lower education were less constrained to one teaching method (Laosa, 1980). Additionally, maternal age may contribute to the amount of experience the mother has had with infants (Berlin et al., 2002; Landry et al., 2001; Parks & Arndt, 1990; Roberts, Bornstein, Slater, & Barrett, 1999; Stevens, 1984). Studies by Berlin et al. (2002) and Parks and Arndt (1990) found younger mothers (those less than 19) tended to be more intrusive or hostile and to use fewer sensitive behaviors than older mothers when interacting with their infant.

Similarly, ethnicity and culture have been found to influence the use of certain teaching and interactive strategies, which in turn have been found to influence the development of infants. Both culture and ethnicity shape the maternal behaviors associated with interpretation and responsiveness to infant's cues (Bretherton, 1992; Feeney & Noller, 1996; Meins, 1997). Smith et al. (2006) found that White and Hispanic mothers, compared to Black mothers, demonstrated greater responsiveness during infancy and preschool. In regards to teaching and verbal interactions, Laosa (1980) observed teaching styles of Anglos and Hispanics and found Anglo mothers used more praise and inquiry-based strategies when teaching their children an unknown task compared to the non-verbal modeling and visual cues used by the Hispanic mothers. Similarly, Japanese mothers used more affect-salient language and Argentinian mothers used more information-salient compared to mothers from France and the US (Bornstein et al., 1992).

Our study controlled for infant sex given the propensity of the infant's sex to elicit variation in maternal behaviors observed during maternal-infant interactions (Carter et al., 2001; Grace, Evindar, & Stewart, 2003; Milgrom, Westley, & Gemmill, 2004). Two examples of sex-based variations include mothers' perception of shyness as an acceptable character trait in girls but not boys (Hinde & Stevenson-Hinde, 1987), and a differential use of questions with their daughters and more explanations to their sons (Clearfield & Nelson, 2006).

Research guides us to the complexity of understanding the specificity of the role of a mother's behaviors in achieving desired social-emotional and cognitive outcomes.

Sensitive behaviors have been identified as contributing to social-emotional development, whereas more intentional maternal behaviors, such as verbal stimulation, are typically associated with cognitive development. But the overlap between the two remains unclear, especially during the first year of a child's life. Additionally, as discussed, other characteristics of these partners such as mother's age, education, and ethnicity and the child's age and sex may influence the extent to which mothers perform certain behaviors and/or the infants are ready for certain aspects of development. The purpose of this study is to examine the extent to which maternal sensitivity and maternal verbal stimulation are associated with infant outcomes of social-emotional and cognitive development, with an interest in differential outcomes moderated by infant age.

### Hypotheses

In this study, maternal behaviors observed during maternal-infant teaching interactions provided a foundational context for exploring infant development. The current paper will address the following research questions: Do maternal behaviors characterized by sensitivity and including more verbal stimulation differentially predict infant outcomes for infant social-emotional and cognitive development, respectively; and are these associations moderated by infant age? Within each research question, the following hypotheses will be tested:

1a) Maternal behaviors associated with maternal sensitivity, as compared to maternal behaviors associated with verbal stimulation, will have a stronger predictive value for infant social-emotional development.

1b) Maternal sensitivity will decrease for older infants, whereas verbal stimulation will not be affected by infant age in relation to social-emotional development, and no main effects of age are expected within this analysis.

2a) Maternal behaviors associated with verbal stimulation, as compared to maternal behaviors associated with maternal sensitivity, will have a stronger predictive value for infant cognitive development.

2b) Maternal verbal stimulation will increase for older infants, while maternal sensitivity will not be affected by infant age in relation to cognitive development, though infant age as a main effect will positively associate with cognitive development.

## Method

### *Measures*

Primary data collection for the ECLS-B dataset was administered by the research team headed by Jennifer Park. For a full review of the data and measures collected, please refer to the website <http://nces.ed.gov/ecls/Birth.asp>. Two measures from this dataset were utilized and are described below as they pertain to this study.

*Nursing Child Assessment Training Satellite Teaching Scale.* Kathryn Barnard (1978) created the Nursing Child Assessment Teaching Scale for use with children ranging in age from birth to 3 years to observe both maternal and infant behaviors during a teaching task that lasts from 1-5 minutes on average. Outcomes associated with the teaching task include maternal sensitivity and infant social-emotional development. Parents are instructed to select from a standardized list of 30 teaching tasks, designed for children from birth to 36 months of age. The task selected should exceed the infant's

current ability or represent a skill that the infant has attempted but not yet mastered. The observer's training manual (Sumner & Spietz, 1994) includes approximate age ranges for each task if the parent has difficulty deciding. The teaching scale, as designed by the NCAST team, measures maternal behaviors and the infant's social-emotional development in the context of a maternal-infant interaction. Coding the observations of the infant and mother completing the task identifies areas of strengths and weaknesses in patterns of the dyadic interaction reflecting how the members are relating to and responding to one another. Observers indicated whether or not (yes/no) mothers exhibited a series of 50 maternal behaviors associated with four scales (sensitivity to cues, response to infant's distress, social-emotional growth fostering, and cognitive growth fostering). Infants were rated on 23 observed behaviors. The infant's total score was utilized as the dependent measure for social-emotional development with a range from 4-23, whereas the maternal items were constructed into two indicators of maternal behaviors: sensitivity in response to distress and verbal stimulation.

Even though numerous studies have utilized one or more of the NCATS maternal scales as a predictor variable (Bannerjee & Tamis-LeMonda, 2007; Gaffney, Kodadek, Meuse, & Jones, 2001; Horodyski & Gibbons, 2004), we were unable to find any that tried to isolate maternal behaviors from within the scales. Based on the literature findings supporting maternal sensitivity and verbal stimulation as maternal behaviors observable during interactions, we first reviewed the maternal items from the Nursing Child Assessment Teaching Scale for both face validity and response variance. The item response was a dichotomy for Yes/No, and we eliminated 15 items on which fewer than

5% of the mothers demonstrated or failed to demonstrate the behavior. Of the 35 remaining variables, a face validity analysis found that the 6 items from the Response to Distress subscale represented both responsive and contingent behaviors after the infant displayed distress (e.g., averting gaze, back arching, or crying) with Cronbach's alpha reliability of .76. McElwain and Booth-LaForce (2006) suggested maternal response to distress predicted a greater attachment, thus we felt confident in using these items as a measure of maternal sensitivity given 75% of our sample exhibited distress during the teaching task. Further, within the scoring of the NCAST, mothers of infants who did not show distress are coded in the affirmative for all response to distress behaviors.

Preliminary analysis of the sensitivity data revealed a skewed distribution for this variable due to the mothers of infants who were not distressed scoring six out of six on this scale. Thus, in order to fully explore the impact of maternal sensitivity, only mother-infant dyads that responded to distress will be used in the analysis ( $N = 6,377$ ).

The remaining 29 variables included many items associated with maternal verbal comments as would be expected within a teaching task, with the majority of the verbal items drawn from the cognitive growth fostering scale developed by NCAST. Twelve items were selected by face validity to represent verbal stimulation with an alpha reliability of .70. Table 2 lists the items for the two maternal behaviors.

*Bayley Mental Scale.* The 9-month Bayley Short Form-Research Edition (BSF-R) mental scale (BSID-II; Bayley, 1993) included 31 items designed to assess The mental scale of the BSID-II measures children's cognitive development, for example, memory, means-end behavior, exploratory competence, object permanence, expressive

communication, and receptive communication, among others. Infants were presented with tasks such as putting blocks in a cup, ringing a bell, and responding to a parent's request (e.g., peek-a-boo). For most items, infants were presented with objects and verbal instructions, and their behavior was observed and recorded. The Bayley Mental Scale Score was utilized as the dependent measure of infant cognitive ability (Sample range = 54-112).

*Demographic Control Variables.* Based on prior findings of differences in infant outcomes by demographic factors, we included three maternal variables and one infant variable as control items. Maternal age and education were utilized as continuous variables whereas all minority groups were collapsed into a single group coded 0 for non-white minorities and 1 for non-Hispanic white. Infant sex was coded 0 for female and 1 for male. Infant age (range 8.0 – 12.9) is included as a predictor variable as well as a moderator of maternal behaviors. Infant age was centered before creating the moderators for each maternal behavior.

### *Participants*

The participants for the study were mother-infant dyads. The infants were born in 2001. The 10,688 participating families came from all 50 states and comprised the nationally representative sample for the Early Childhood Longitudinal Study-Birth cohort (ECLS-B). A secondary data analysis was conducted utilizing the 9-month old data collection which included infants ranging in age from 8 months to 12 months. The subsample whose data were analyzed for this study included those biological mothers and infants who were evaluated with the completed Nursing Child Assessment Satellite

Training Teaching Scale (NCAST) and the infants' were assessed with the Bayley Mental Scale. This sub-sample consisted of 8,489 mother-infant dyads with complete data on these two scales; however, our sample was further reduced to those dyads in which the infant displayed distress during the teaching task ( $N = 6,377$ ). The infant sample consisted of 51.9% male ( $N = 3,311$ ). Maternal characteristics for age, ethnicity, and education are as follows. The mothers age ranged from less than 20 (8.2%), 20-24 (24.5%), 25-29 (24.3%), 30-34 (24.9%), 35-39 (14.4%), and greater than 40 (3.8%). Ethnic breakdown for the maternal sample was 47.1% non-Hispanic White, 17.3% Hispanic, 16.2% African-American, 12.6% Asian, 4.0% American Indian, and 2.9% Multi-ethnic, non-Hispanic. Mother's education ranged from less than high school (25.8%), high school or equivalent (21.1%), vocational (2.2%), some college (24.3%), and bachelor's degree or higher (26.6%). The mean scores for the infant outcomes were 15.95 ( $SD = 2.53$ ) for social-emotional as measured by the NCAST and 76.30 ( $SD = 7.0$ ) for cognitive as measured by the Bayley. The mean produced from maternal behaviors for sensitivity and verbal stimulation were 3.20 ( $SD = 1.36$ ) and 6.26 ( $SD = 2.39$ ) respectively. Table 1 provides the means and frequencies of all study variables.

## Results

Results are presented in two sections. The first section provides descriptive statistics regarding the study variables. The second section provides the results of the regression analyses associated with our hypotheses. SPSS (SPSS, Inc., 2005, Version 14.0) was used for all data analyses.

### *Descriptive Data and Bivariate Correlations*

Prior to further analyses, we considered the mean (Table 1) and bivariate correlations (Table 3) among control variables, predictor, and outcome study variables. Maternal age was positively correlated to maternal sensitivity ( $r = .07, p < .01$ ) and verbal stimulation ( $r = .13, p < .01$ ), and negatively correlated to infant cognitive development ( $r = -.04, p < .01$ ); maternal education was positively related to maternal sensitivity ( $r = .13, p < .01$ ), verbal stimulation ( $r = .25, p < .01$ ), and infant social-emotional development ( $r = .05, p < .01$ ). Maternal ethnicity was positively correlated with verbal stimulation only ( $r = .21, p < .01$ ). Infant sex, specifically for boys, was associated with a negative correlation with maternal verbal stimulation ( $r = -.03, p < .05$ ), cognitive development ( $r = -.05, p < .01$ ), and social-emotional development ( $r = -.05, p < .05$ ). Infant age was positively associated with verbal stimulation ( $r = .10, p < .01$ ), cognitive development ( $r = .70, p < .01$ ), and social-emotional development ( $r = .07, p < .01$ ). Maternal sensitivity was positively correlated with verbal stimulation ( $r = .17, p < .01$ ), infant cognitive development ( $r = .04, p < .01$ ), and infant social-emotional development ( $r = .24, p < .01$ ). Verbal stimulation was positively correlated to cognitive development ( $r = .16, p < .01$ ) and social-emotional development ( $r = .24, p < .01$ ) and the two infant outcomes were positively correlated with one another ( $r = .10, p < .01$ ).

### *Regression Analyses*

A series of regression analyses were conducted to address the hypotheses. The first hypothesis examined whether maternal behaviors associated with maternal sensitivity, as compared to maternal behaviors associated with verbal stimulation, acted as a stronger predictor of infant social-emotional development (1a). Testing for moderation, we

expected maternal sensitivity would decrease for older infants, whereas verbal stimulation would not be affected by infant age in relation to social-emotional development (1b). In contrast, for our second hypothesis, we expected that maternal behaviors associated with verbal stimulation, as compared to maternal behaviors associated with maternal sensitivity, would more strongly predict infant cognitive development (2a). As for moderation, we expected maternal verbal stimulation would increase for older infants, while maternal sensitivity would not be affected by infant age in relation to cognitive development (2b). For each analysis, control variables were entered at step 1, maternal behaviors and infant age were centered according to Aiken and West (1991) and entered at step 2, and the two moderators were created using the centered variables and entered at step 3.

*Maternal Behaviors Predicting Social-Emotional Development.* The result of the first hierarchical regression to determine the infant's social-emotional development found that standardized beta weights for maternal sensitivity ( $\beta = .208, p < .001$ ) and verbal stimulation ( $\beta = .219, p < .001$ ) were significant, whereas neither of the moderators were significant (Table 4). The reduced model without the moderators was significant and explained 10% of the child's social-emotional score,  $F_{(7, 6364)} = 104.71, p < .001$ . Results of this regression failed to support either hypothesis 1a or 1b.

*Maternal Behaviors Predicting Cognitive Development.* The second hypothesis addressed the impact of the mother's behaviors on the infant's cognitive development as a function of the infant's age. Results of the regression analysis evaluating this hypothesis are summarized in Table 5. Whereas maternal sensitivity ( $\beta = .015, p > .05$ )

and verbal stimulation ( $\beta = .073, p < .001$ ) both significantly predict the infant's cognitive score, the relative contribution of verbal stimulation is greater than for sensitivity supporting hypothesis 2a. The moderator for sensitivity was associated with a resulted in non-significant coefficient ( $\beta = .006, p > .05$ ) and the moderator for verbal stimulation reached significance ( $\beta = .027, p < .001$ ), thus supporting hypothesis 2b. The model explained 60% of the variance in the infant's cognitive score, with infant age contributing the most substantial beta weight for the full model,  $F_{(9, 6362)} = 1079.56, p < .001$ . In a post hoc analysis, Figure 1 shows the graphical representation for verbal stimulation suggesting distinct differences for each of three age ranges. Age groupings (older, middle, younger) were based on the mean (middle) plus or minus one standard deviation (older and younger respectively) for infant age. Results indicated that mothers of older infants spoke more to them than to the middle or younger age groups. Based on the graphical lines presented in Figure 1, differences in the verbal stimulation range for each age level were small but increased for each age group in a positive direction. Overall results for the cognitive outcomes were based more on infant age and less on the minimal increase in maternal verbal stimulation as a factor of infant age.

### Discussion

Extensive prior research has shown the importance of maternal behaviors for infant development. One unique contribution of the present study was to cluster individual maternal behaviors into two broad domains that were hypothesized to have a simultaneous influence on infant developmental outcomes. Both clusters of maternal behaviors (sensitivity and verbal stimulation) included items that were verbal statements

such as praising, soothing, explaining, or describing. Typically, verbal behaviors are thought to promote cognitive development, but our findings indicated that items associated with praising and cheerleading promoted social-emotional as well as cognitive development.

The current study adds to the literature by showing that specific maternal behaviors exhibited during maternal-child interactions are significantly associated with infant social-emotional and cognitive development. Our study focused on infants displaying distress during the teaching task in order to observe maternal behaviors in response to that distress. Within the NCAST scale, observed distress of the infant is coded as yes/no which prompts the observer to score each item when the infant shows distress and to score all items as yes when infants do not show distress. Further, the items within our sensitivity scale represent contingency items in the NCAST teaching task indicating that these items are part of a larger set that identify maternal responsiveness to the infant. Specific to this study, items for sensitive behaviors included both verbal and nonverbal actions such as soothing and verbally redirecting her distressed infant back to the teaching task (See Table 2 for item descriptions).

Our findings for the first hypothesis suggested that maternal verbal stimulation was an influential variable not only for the cognitive development of her infant, but for the infant's social-emotional development as well. Further, we note that verbal stimulation acts as a minimal component of maternal sensitivity indicated by the soothing verbal stimulation (63.7%) and change in voice pitch (80.6%) as observed behaviors within the sensitivity scale. Thus, findings from this study indicated maternal

verbalization to one's infant has the ability to shape and guide the infant's social-emotional and cognitive development. Further, based on the definition of maternal sensitivity, we believed that mother's exhibiting sensitivity would be both available and responsive to interpret and respond to the infant's signals and vocalizations during the teaching interaction. We found 90.1% of mothers stopped teaching when their infant displayed distress. Mothers with higher levels of sensitivity engaged in responsive and contingent behaviors following their infant's distress, including verbal behaviors to soothe and redirect the infant.

For the infant's social-emotional development using the infant's score on the NCAST, both maternal sensitivity and verbal stimulation were statistically significant, supporting existing literature that maternal sensitivity promotes social-emotional development. Further, the addition of verbal stimulation specifically including items designed to teach and encourage an infant to complete a task may act to promote social-emotional development, suggesting an awareness of all types of verbal stimulation to one's infant from birth. In our study, we found verbal stimulation contributed more to social-emotional development than our measure of sensitivity, and we proposed this difference to be attributed to an aspect of verbal stimulation within both scales, but to specific types of verbal statements seen in the verbal stimulation scale (e.g., praise or cheerleading) that also promote social-emotional development. Whereas prior research suggested sensitivity decreased over time (Isabella, 1998; Mertesacker et al., 2004), our study did not find moderation based on infant age. First, a potential explanation could be our use of cross-sectional data, thus we did not have data showing a prior or post measure

of sensitivity to detect the decrease as infants matured. Second, though not significant, the standardized beta weight for the moderator was negative ( $\beta = -.025, p = .070$ ) suggesting that there may be a trend for older infants to receive less sensitivity. Follow-up studies using longitudinal data would need to confirm this trend.

Our second hypothesis focused on the infant's scores in cognitive development as measured by the Bayley Mental Scale. We specifically hypothesized that maternal verbal stimulation would act as a key predictor in cognitive gains, particularly in the older group of infants. We found verbal stimulation did act as a significant predictor of cognitive development as hypothesized, as well as the moderation of verbal stimulation which showed an increase in verbal stimulation from the mother for the oldest infants; however, the infant's age explained the greatest amount of variance within the model. Regrettably, this sample is cross-sectional, so within-dyad changes are not available; but based on the literature, it seems likely that the increase in verbal stimulation was based on a mother's likelihood to speak more to her older infant (Bornstein et al., 1992; Clearfield & Nelson, 2006; Wacharasin et al., 2003). The direct relation of maternal behaviors to the infant's cognitive development found only maternal verbal stimulation contributed to overall cognitive ability, and as infants approached their first birthday, we found mothers engaged in more verbal stimulation, though this effect is minimal. The graphical range of verbal stimulation at younger, middle, and older ages indicated older infants received a slightly greater increase in verbal stimulation compared to the middle and younger infants, thus adding minimally to their overall higher score for cognitive development. The maternal verbal stimulation variable was created from the context of a teaching

interaction, thus many of the items are reflective of the mother's ability to teach her child a task using verbally based measures (i.e., use 2 different sentences was performed by 91.5% of mothers, 75.9% verbally described or modeled the task, and 95.2% used verbal and nonverbal methods to teach their child). Future research is needed to observe other types of care-giving interactions to determine if mothers who scored high in verbal stimulation consistently speak more to their infants throughout the day and through various types of interactions. Further, use of longitudinal data could substantiate an increase in greater verbal stimulation as the infant matures. Despite these minor issues, the use of a national dataset provided adequate representation, thus strengthening the findings from this study and allowing for generalizations to be made about maternal behaviors and child outcomes as observed within the dyadic teaching task.

In addition to the positive contributions of this study to the extant literature, several limitations merit consideration. First, our use of the data was based on secondary data analysis, thus our measures of maternal behaviors were limited to the only maternal-child interaction collected during the 9-month data collection. The NCAST has been used in many studies; however, we do not expect our findings to align with those reported previously given our reconstruction of two maternal behaviors from within the maternal items. Because the NCAST scale uses dichotomous responses limiting the ability to alter the data, we created two clusters of maternal behaviors based on face validity and variance of item responses, and established an alpha reliability for each scale. During initial analysis of the scales, it was necessary to reduce our sample to those infants who disengaged from the teaching task to limit the bias from mothers with perfect sensitivity,

which caused the sensitivity measure to appear in a cubic sideways ‘S’ shape. Removing mothers whose infants showed no distress resulted in a linear line with greater sensitivity positively correlating with greater social-emotional development.

Second, we believe other maternal behaviors may influence infant outcomes, but our use of the ECLS-B data limited our ability to test additional behaviors beyond those observed during the teaching interaction. Future research should include additional contextual factors as control variables such as the child’s participation in day care, maternal depression, number of children in the home, etc. Both Belsky (1984) and Abidin (1992) have focused on a broader ecological framework to identify influences affecting parenting behaviors.

Finally, our reliance on cross-sectional data precludes conclusions of direction of influence. Although we have framed our hypotheses on the assumption that maternal behaviors influence infant outcomes (e.g., Ainsworth et al., 1978), we must recognize that infants also influence their parents’ behaviors (e.g., Bell, 1968; Belsky, 1984). Additional analyses using subsequent waves of data are needed to evaluate the strength and direction of influence within maternal-child interactions.

### Conclusion

The importance of maternal behaviors to infant outcomes begins at birth and continues throughout the child’s life. Maternal sensitive behaviors can be observed after the birth as the mother responds to her infant’s needs through sensitivity and verbal stimulation. One could conjecture from the types of verbal statements present in each of the two maternal behaviors the contribution to infant outcomes: social-emotional

development from praise and soothing statements during distress as well as during the task associated with infant successes, and cognitive development from directions and descriptions of task materials and the teaching of conceptual tasks using verbal stimulation.

While data exists observing the vocalizations between mother and infant in the first few months after birth, few studies have focused on the specifics of maternal verbalizations to social-emotional development, as well as to cognitive development. Findings from the present study indicate maternal vocalizations exist within the maternal sensitivity construct, and independently contributed to social-emotional development. Both maternal sensitivity and verbal stimulation resulted in increases in the infant's social-emotional outcome. Contrary to our assumption that maternal behaviors have overlapping effects, verbal stimulation acted as a sole contributor of cognitive development, and was more influential when infants were older. Educational material and encouragement from hospital staff can impart the importance of maternal verbal stimulation to her infant immediately following the birth and continuing throughout the infant's development. Further, intervention-related material can be designed to address dyads that exhibit warning signs for at-risk status based on negative or ineffective maternal behaviors or infant responses to maternal interactions. Interventions supporting the increase in sensitive behaviors have shown promise in maternal-child interactions, suggesting subsequently that interventions that model the role of verbal stimulation may have the potential to alter the mother's view or comfort level regarding the impact of her communication with her infant.

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Table 1

*Mean and Standard Deviations for Predictor and Outcome Variables*

## Predictors

Maternal sensitivity	3.20 (1.36)
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Verbal stimulation	6.26 (2.39)
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## Infant outcomes

NCAST Score	15.95 (2.53)
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Bayley Scale Score	76.16 (7.00)
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*N* = 6,377

Table 2

*Maternal Behaviors from the Nursing Child Assessment Teaching Scale Comprising  
Sensitivity and Verbal Stimulation*

Maternal sensitivity

1. Caregiver (CG) stops teaching at potent disengagement cues.
2. CG makes positive, sympathetic, or soothing verbalization.
3. CG changes voice volume to softer or higher pitch, does not yell.
4. CG rearranges the child's position or task materials.
5. CG makes soothing nonverbal response, e.g. pat, touch, rock, caress, kiss.
6. CG diverts the child's attention by playing games, introduces a new toy.

Verbal stimulation

1. CG praises child's successes or partial successes.
2. CG praises child's efforts or behaviors broadly at least once during the episode.
3. CG makes cheerleading type statements to the child during the teaching interaction.
4. CG describes perceptual quality of the task materials to the child.
5. CG uses at least two different sentences or phrases to describe the task to the child.
6. CG uses explanatory verbal style more than imperative style in teaching the child.
7. CG's directions are stated in clear, unambiguous language.
8. CG uses verbal description and modeling simultaneously in teaching any part of the task.
9. CG verbally praises child after child has performed better or more successfully.
10. CG responds to the child's vocalizations with a verbal response.

11. CG uses both verbal and nonverbal instruction in teaching the child.
12. CG uses the teaching loop at least once (alerting, instruction, performance, feedback).

Table 3

*Correlation Matrix of Control, Predictor, and Outcome Variables*

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Infant age	--								
2. Infant sex	-.01	--							
3. Maternal age	-.02*	-.01	--						
4. Maternal ethnicity	-.01	-.01	.12**	--					
5. Maternal education	-.03*	.01	.44**	.20**	--				
6. Maternal sensitivity	.02	.02	.07**	.02	.13**	--			
7. Verbal stimulation	.09**	-.03*	.13**	.21**	.25**	.17**	--		
8. Bayley Mental Scale	.70**	-.05**	-.04**	.02	.01	.04**	.16**	--	
9. NCAST infant score	.07**	-.05**	.01	.01	.05**	.24**	.24**	.10**	--

Note. Infant sex was coded 0 = girls and 1 = boys. Maternal ethnicity was coded 0 = non-White ethnic minority and 1 = non-Hispanic White.

\* $p < .05$ , \*\* $p < .01$

Table 4

*Regression Analysis for Infant's NCAST Social-Emotional Score*

Variable	<i>B</i>	<i>SE B</i>	$\beta$	$\Delta R^2$
Step 1				.005***
Infant sex	-.222	.063	-.044***	
Maternal age	.000	.028	.000	
Maternal ethnicity	-.053	.067	-.010	
Maternal education	.090	.023	.057***	
Step 2				.098***
Sensitivity	.392	.023	.208***	
Verbal stimulation	.233	.014	.219***	
Infant age	.084	.022	.045***	
Step 3				.000
Age X Sensitivity	-.031	.017	-.025	
Age X Verbal stimulation	.000	.010	-.001	

*Note.* Infant sex was coded 0 = girls and 1 = boys.

Maternal ethnicity was coded 0 = non-White ethnic minority and 1 = non-Hispanic White.

\*\*\* $p < .001$

Table 5

*Regression Analysis for Bayley Mental Scale Score*

Variable	<i>B</i>	<i>SE B</i>	$\beta$	$\Delta R^2$
Step 1				.009***
Infant sex	-.839	.179	-.058***	
Maternal age	-.290	.080	-.051***	
Maternal ethnicity	.704	.192	.048***	
Maternal education	.194	.066	.043**	
Step 2				.595***
Maternal sensitivity	.079	.043	.015	
Verbal stimulation	.209	.026	.069***	
Infant age	4.08	.042	.762***	
Step 3				.001**
Age X Sensitivity	.022	.033	.006	
Age X Verbal stimulation	.062	.019	.027**	

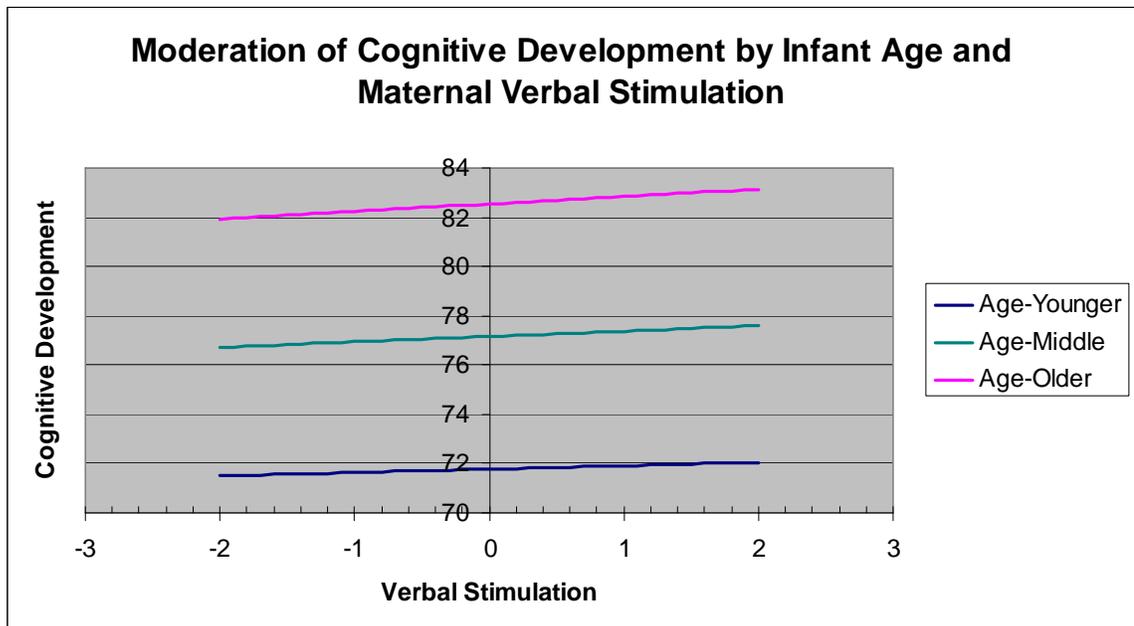
*Note.* Infant sex was coded 0 = girls and 1 = boys.

Maternal ethnicity was coded 0 = non-White ethnic minority and 1 = non-Hispanic White.

\*\* $p < .01$ , \*\*\* $p < .001$

Figure 1

Graphical Representation of Cognitive Development from Verbal Stimulation as Moderated by Infant Age (Younger, Middle, and Older Infants)



## CHAPTER V.

### CONCLUSION

#### Summary of Results

The importance placed on maternal-child interactions necessitates a greater understanding of the characteristics and processes that affect either the mother or her infant that result in varying outcomes for the dyad. The three manuscripts included in this dissertation explored three perspectives: exploring family predictors of maternal postpartum depression (Study 1), the interaction effect of postpartum depression and knowledge of infant development on maternal behaviors (Study 2), and maternal behaviors of sensitivity and verbal stimulation associated with infant social-emotional and cognitive development (Study 3). The dissertation title “The Context and Experience of New Mothers: Postpartum Depression, Family Relationships, Knowledge of Infant Development, and Infant Outcomes” suggests that mothers rely on previous and daily experiences as well as environmental influences that define parenting behaviors. The three manuscripts document varying factors in the mother’s environment that influence her well-being, such as arguments with family and relationship depth; postpartum depression and knowledge of infant development were found to shape her maternal behaviors. Finally, maternal behaviors of sensitivity and verbal stimulation were associated with infant developmental outcomes for social-emotional and cognitive development.

The first manuscript, “Postpartum Relationship Quality, Daily Hassles, and Depressive Symptoms”, focused on a small sample to explore maternal relations with her

partner or spouse, daily hassles, and the prevalence of depression six weeks postpartum. Findings from this study showed that among five types of daily hassles, arguments with family were the only hassle that uniquely predicted postpartum depression. Likewise, considering factors for relationship support and relationship depth, only depth was uniquely related to postpartum depression. These two factors explained an additional 26% of the variance in postpartum depression after controlling for depression during pregnancy. The test for moderation of arguments and relationship depth was not significant, though a trend towards moderation was observed. Overall, these findings suggest the importance of interactions within the marital system to the psychological well-being of the mother. Maternal psychological well-being in turn, impacts her ability to interact and engage with her infant in positive behaviors that promote infant development.

Within this same manuscript, post hoc analyses allowed for the exploration of subgroups of depressed women to identify more specifically factors associated with postpartum depression. Comparison of the non-depressed sample ( $N = 36$ ) with the most depressed subgroup ( $N = 9$ ) found multiple factors that distinguished these two groups. Consistent with the variables used in the regression were depression during pregnancy, arguments with family and relationship depth. Three other variables differed statistically, but were not correlated with the postpartum depression as the outcome variable. In a comparison of the two depressed subgroups, only level of postpartum depression differed statistically. In summary, these findings identify aspects of the mother's relational subsystem with her spouse or partner that can either facilitate or hinder her ability to

interact with her infant by impacting her psychological health. This manuscript included aspects of the marital system (arguments with family and relationship depth) that potentially impact parent-child interactions via maternal postpartum depression.

The second manuscript, “Impact of postpartum depression and knowledge of infant development on maternal behaviors”, evaluated maternal factors that influenced the display of behaviors with her infant during a teaching task. “Arguments” was included as a control variable based on findings from study 1, and postpartum depression and knowledge of infant development were included as predictor variables for maternal sensitivity to cues, response to distress, social-emotional growth fostering, and cognitive growth fostering. Further, an interaction variable was created with postpartum depression and knowledge to test the hypothesis that women with higher knowledge would be less impacted by postpartum depression.

Findings from this manuscript showed depression and knowledge predicted maternal behaviors as suggested. Additionally, knowledge of infant development was shown to act as a moderator of depression levels. Women with the highest knowledge levels displayed the highest levels of maternal behaviors in sensitivity to cues, social-emotional growth fostering, and cognitive growth fostering even when experiencing severe depression compared with women of low or average knowledge. For the fourth maternal behavior, response to distress, a post hoc analysis utilized a subset of women whose infants displayed disengaging cues during the teaching task to test for moderation. In this analysis, moderation was again supported, but all women showed a greater decline in their behaviors when experiencing moderate to severe depressive symptoms.

Overall, the amount of variance explained was small for the four maternal behaviors, but these findings suggest the beginning of future explorations to determine pathways through which depression negatively impacts maternal behavior. In this study, knowledge positively predicted the maternal behaviors, and was able to reduce the negative implications to maternal behaviors in the presence of moderate to severe depressive symptoms. Because knowledge was able to buffer the negative impacts of depression on actual maternal behaviors, an important implication of this study is the importance of early identification and treatment of women reporting postpartum depression. Educational or behavioral interventions could improve maternal-child interactions and the maternal behaviors associated with child outcomes.

Manuscript three, “A comparison of maternal sensitivity and verbal stimulation as unique predictors of infant social-emotional and cognitive development”, looked at child outcomes for social-emotional and cognitive development in a sample of 9-month-old infants. Maternal behaviors associated with a teaching task were constructed to represent two broad themes of sensitivity and verbal stimulation. Sensitivity has long been thought to be a major contributor of infant attachment and social-emotional development. Likewise, verbal stimulation has clear implications for cognitive development. Findings from this study suggest that both sensitivity and verbal stimulation positively influenced social-emotional development. This study also tested for moderation of the two maternal behaviors by infant age to test a hypothesis that maternal behaviors would have a stronger effect for older infants in the sample. No moderation was found for maternal behaviors associated with social-emotional development. For cognitive development, verbal

stimulation positively predicted cognitive development as expected; however, the interaction of infant age and verbal stimulation resulted in a significant moderator, but the effects were minimal among infant age differences.

Significant to this study is the implication that maternal behaviors do not act in isolation to a single outcome, but rather influence multiple outcomes throughout child development. Both verbal stimulation and sensitivity uniquely predicted social-emotional development. Even though sensitivity was not predictive of cognitive development, the finding for moderation by infant age identifies potential implications that mother's are more likely to talk to their infant as the infant approaches the first birthday and expected use of words by the infant increases. This finding bears significance in educating mothers about the importance of speaking with their infant, even from birth. Increasing maternal knowledge of infant development regarding the benefits of verbal stimulation serves as an important maternal behavior amenable to change to promote positive infant outcomes. Social cognitive theory suggests use of observational learning or reinforcement to facilitate behavioral development. Changes to maternal behaviors are then enacted during maternal-child interactions leading to either positive or negative child outcomes dependent upon the success of the mother's use of knowledge of infant development and her comfort level in use of sensitive or verbally stimulating behaviors.

#### Contributions and Implications

The sum of the three manuscripts represents contributions to the literature as well as implications for interventions regarding maternal psychological well-being, maternal behaviors, and maternal-infant interactions. In the first manuscript, relationship depth

emerged as a significant variable associated with postpartum depression. The majority of studies focusing on parenting or depression include a measure of relationship support, but few studies have included relationship depth either in the context of transitioning to parenting or in association with depression. The first manuscript included both support and depth, but of the two, only depth positively impacted a woman's psychological health by decreasing the depressive symptoms reported. Results from this study supported prior findings that arguments with family are negatively associated with postpartum depression.

The second manuscript tested for interactional effects of postpartum depression and knowledge of infant development as a moderator of maternal behaviors. Previous studies have utilized knowledge as a moderator, but no studies to date have tested knowledge as a moderator of postpartum depression. Thus based on results from Belsky's study which indicate that the woman's psychological well-being plays a key role in her parenting behaviors, this study tested the moderation of postpartum depression by knowledge of infant development. The study found knowledge of infant development buffered the reported depressive symptoms when observing parenting behaviors in a teaching task, though the overall prediction of the models were small. Future studies to explore additional factors or multiple interactions may improve the variance explained.

The maternal behaviors for sensitivity and verbal stimulation in the third manuscript were uniquely constructed based on face validity of the teaching task questions for items that best demonstrated sensitive behaviors of the mother and for statements containing verbal content. The response to distress subscale is only scored by

item when the infant disengages during the teaching task. Thus, mothers of infants who disengaged were selected to isolate sensitive behaviors of responsiveness by eliminating the positive skew of women with a perfect score based on their infants remaining engaged throughout the teaching task. Following creation of the two behavioral scales, the two behaviors were then utilized to test for infant outcomes to explore the notion that maternal behaviors are not completely isolated from the infant outcome they are most closely aligned with. Both sensitivity and verbal stimulation predicted the child's social-emotional development. These findings suggest that mothers should be encouraged to engage in sensitive responses as well as to provide verbal stimulation to their infant during distress and in general dialogue with her infant. The second question tested these same two behaviors with cognitive development and found only verbal stimulation positively predicted; further, maternal verbal stimulation was moderated by the infant's age resulting in greater verbal stimulation to older infants. This finding is one of many important implications surrounding maternal verbal stimulation. Educational awareness has promoted maternal bonding and attachment through sensitivity, but new educational campaigns should promote verbal stimulation through reading, singing, playing, and talking with one's infant, even before the infant develops expressive language around the first year of life. Increasing maternal knowledge will in turn positively impact the parent-child system and may also buffer the negative impacts of depressive symptoms.

Collectively, several implications can be derived from the three manuscripts. First, routine screenings of postpartum depression can identify women reporting clinically significant levels of depressive symptoms. More importantly, following

identification is the referral for treatment either through use of pharmaceuticals and/or psychotherapy. In addition, these women should be offered available resources such as parenting programs to promote healthy maternal-child interactions. The body of depression literature has noted the negative consequences for maternal health and well-being and the extended implications for infant outcomes such as decreased behaviors associated with social-emotional, cognitive, and infant attachment. Prior intervention work with depressed women has focused on improving sensitive behaviors associated with infant attachment and social-emotional development, and modeling behaviors to reduce the incidence of mothers who withdraw or intrude on their infants during feeding or play sessions.

Also noted in the findings of the first manuscript was the importance of relationship depth between the mother and her significant other. Strengthening of the marital subsystem may result in the mother's improved psychological well-being and her ability to parent her infant knowing she has a strong relationship with her spouse or partner. Further, the mother's ability to cope with daily stressors such as arguments with family potentially impacts her psychological well-being. Stress reduction and coping mechanisms should be employed to address these issues. Though arguments are not inherently destructive to relationships, the resolution of these arguments may be the greater factor at play in a woman's psychological well-being.

Manuscript two also identified postpartum depression as negatively impacting maternal behaviors. Of importance was the finding that knowledge of infant development moderated the depressive symptoms. Women with the greatest knowledge consistently

maintained higher behavioral skills when depressed for all four behavioral scales. Identification of postpartum depression and increasing knowledge are both important, and the interaction of the two may play a greater role in women who are able to exhibit normative behaviors even when suffering from depression. Educational interventions can address both issues of dealing with depression as well as modeling maternal behaviors that utilize knowledge about infant development to promote positive infant outcomes.

Finally, implications from manuscript three include the need to educate women about the importance of verbal stimulation as important to an infant's social-emotional and cognitive development. Further, verbal stimulation should begin early in life rather than waiting until the infant approaches the first birthday. Infants gain language and cognitive abilities by hearing maternal speech and interacting and complying with maternal directions in dyadic interactions. Mothers naturally increased their verbal stimulation as infants acquired their own language abilities, but the child development literature notes the importance of verbally stimulating infants from birth.

Belsky's Determinants of Parenting Process Model provided the overarching framework to address the research questions presented in this dissertation. Studies one and two confirmed the importance of maternal psychological well-being as an important predictor of maternal behaviors within maternal-child interactions. Further, marital sources of support, or the lack thereof, impacts both psychological well-being as well as parenting behaviors as modeled by Belsky. Study three focused on parenting behaviors and the direct impact to infant outcomes. Findings from all three studies support the

model and highlighted various linkages within to explore related factors that may alter parenting behaviors.

#### Limitations and Future Directions

The three studies used biological mothers as the unit of analysis in two of the studies and mother's scores during a dyadic interaction with her child for the third. This sample selection limits generalizations for fathers, step-mothers, or other primary caretakers. Future analyses can over-sample for these other caregivers to identify if similar findings exist regarding postpartum depressive symptoms, knowledge of infant development, and enactment of behaviors associated with infant outcomes. Second, cross-sectional analyses limit the causal relations among study variables. Specifically, paper three hypothesized that as infants matured throughout the first year of life that mothers would increase the amount of verbal stimulation accordingly. Within our sample, older infants did in fact receive greater verbal stimulation; however, conclusions cannot be made that within a dyad these same increases exist. Future longitudinal studies that include repeated data collection utilizing the same instruments can facilitate conclusions surrounding these research questions. Finally, the majority of instruments used in the three studies were self-report by the mothers, except for the teaching task scored by an observer. Additional reports from other family members, interviews, and further observations of items measured through surveys can strengthen the findings by allowing for triangulation of the data.

Though these limitations represent valid methodological concerns, the findings presented within each manuscript either supported prior research findings (arguments and

relationship quality impact mental health; and depression and knowledge act inversely upon maternal behaviors), added new variations to previous findings (interaction of depression and knowledge for maternal behaviors; and interaction of infant age and maternal verbal stimulation), or set the stage for additional analyses to confirm the stated findings (maternal characteristics that impact maternal behaviors and testing of specific maternal behaviors for implications to infant outcomes).

In summary, mothers play a significant role in providing for their infant and contributing to all aspects of infant development. Entering the role of mother with an established marital and social support system as well as a positive psychological well-being seem to be two of the most important factors in allowing mothers to display appropriate parenting behaviors. When possible, mothers continued educational and behavioral skills development will increase the opportunity for positive parenting behaviors to strengthen outcomes within the maternal-child subsystem.

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