

Factors Impacting Psychological and Health Outcomes in Mothers and Infants Following NICU
Hospitalization of the Infant

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ABSTRACT

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Purpose: There is evidence that mothers of infants hospitalized in the Neonatal Intensive Care Unit (NICU) experience elevated rates of psychopathology. However, most studies have focused on very preterm infants, with little attention to mothers of moderate- to late-preterm infants. In addition, the majority of previous research has been cross-sectional, which does not allow for the examination of symptoms over time. *Method:* The current study investigated whether rates of psychopathology are elevated in mothers of moderate- to late-preterm infants during/following infant hospitalization in the NICU, and associated protective and risk factors. Mothers completed self-report questionnaires during the infant's hospitalization and six months later. *Results:* Mothers of moderate- to late-preterm infants hospitalized in the NICU showed elevated rates of depression, anxiety, and PTSD compared to mothers of term infants at both baseline and six months post-birth. Importantly, no differences in psychopathology between mothers of moderate-preterm and late-preterm infants were found at either time point. A number of important risk factors were identified, including previous maternal mental illness, more severe infant health problems, and a lack of coping skills. Potential protective factors were also identified, including mother-infant contact, maternal optimism, and expectations about the infants potential for recovery. *Limitations:* The current study did not include mothers who were unable to visit the NICU or fathers/siblings, and future studies might include these groups to better understand familial adjustment to the NICU hospitalization of an infant. In addition, research in the future should examine a larger sample of NICU mothers in order to conduct more in-depth longitudinal analyses of risk and protective factors. Finally, future studies will need to pilot and test the efficacy of the proposed screening and programmatic components in order to assess feasibility, acceptability, and effectiveness with the target population. *Conclusions:* These results may inform the development of NICU programming aimed at buffering the development of psychopathology in mothers. Identified risk and protective factors could help in effectively targeting intervention programs to mothers most in need while the infant is in the hospital and over time.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES	ii
ACKNOWLEDGEMENTS	iii
DEDICATION	iv
INTRODUCTION	1
MATERNAL PSYCHOPATHOLOGY IN THE CONTEXT OF THE NICU	2
THE EXPERIENCE OF MOTHERHOOD IN THE CONTEXT OF THE NICU	5
POTENTIAL RISK AND PROTECTIVE FACTORS	6
THE IMPLEMENTATION OF NOVEL PROGRAM MODELS IN THE NICU	11
THE CURRENT STUDY	12
SPECULATIONS AND ANTICIPATED FINDINGS	13
METHOD	14
PARTICIPANTS	14
PROCEDURE	15
MEASURES	16
DATA ANALYTIC PLAN	20
RESULTS	21
INCIDENCE OF MATERNAL PSYCHOPATHOLOGY	21
VALIDATING MATERNAL NICU EXPERIENCE SELF-REPORT	21
COMPARING MOTHERS OF MODERATE-PRETERM AND LATE-PRETERM INFANTS	22
POTENTIAL RISK AND PROTECTIVE FACTORS (BASELINE)	23
NURSE REPORT (BASELINE)	25
MATERNAL PSYCHOPATHOLOGICAL OUTCOMES AT SIX MONTHS POST-BIRTH	25
MODERATORS OF MATERNAL PSYCHOPATHOLOGY AT SIX MONTHS POST-BIRTH	27
VERBAL INTERACTION WITH THE INFANT AS A PROTECTIVE FACTOR	29
DISCUSSION	30
IDENTIFYING MOTHERS AT RISK	30
IDENTIFYING PROTECTIVE FACTORS	32
NURSE IMPRESSIONS	34
RECOMMENDATIONS FOR NICU PROGRAMMING	35
LIMITATIONS & FUTURE DIRECTIONS	39
CONCLUSIONS	40
REFERENCES	42
TABLES & FIGURES	54
APPENDICES	75

List of Tables and Figures

Tables

<u>Table 1:</u> <i>Correlation matrix for mother-report and nurse-report of NICU experience</i>	p 44
<u>Table 2:</u> <i>Means and SDs of moderate- and late-preterm mothers for outcome variables</i>	p 45
<u>Table 3:</u> <i>Correlation matrix for baseline variables</i>	p 46
<u>Table 4:</u> <i>Moderation of mother-infant contact on previous mental illness at baseline</i>	p 47
<u>Table 5:</u> <i>Moderation of mother-infant contact on infant health problems at baseline</i>	p 48
<u>Table 6:</u> <i>Moderation of mother-infant contact on coping style at baseline</i>	p 49
<u>Table 7:</u> <i>Correlation matrix for nurse ratings</i>	p 50
<u>Table 8:</u> <i>Nurse report and six-month mother psychopathology</i>	p 51
<u>Table 9:</u> <i>Correlation matrix for six-month variables</i>	p 52
<u>Table 10:</u> <i>Moderators of risk factors associated with PTSD at six months post-birth</i>	p 53
<u>Table 11:</u> <i>Moderators of risk factors associated with anxiety at six months post-birth</i>	p 54
<u>Table 12:</u> <i>Moderators of risk factors associated with depression at six months post-birth</i>	p 55

Figures

<u>Figure 1:</u> <i>Baseline PTSD symptoms (mother-infant contact and previous diagnosis)</i>	p 56
<u>Figure 2:</u> <i>Baseline anxiety (mother-infant contact and infant health)</i>	p 57
<u>Figure 3:</u> <i>Baseline anxiety (mother-infant contact and coping style)</i>	p 58
<u>Figure 4:</u> <i>Six-month PTSD symptoms (pessimism and length of stay)</i>	p 59
<u>Figure 5:</u> <i>Six-month PTSD symptoms (mother-infant contact and infant health)</i>	p 60
<u>Figure 6:</u> <i>Six-month anxiety symptoms (optimism and length of stay)</i>	p 61
<u>Figure 7:</u> <i>Six-month depression symptoms (optimism and length of stay)</i>	p 62

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Dedication

I dedicate my dissertation to my husband, best friend, and teammate, Charlie Lotterman. If I hadn't been able to laugh with you, decompress after a long day with a TV marathon, and discuss my ideas on our nightly walks, I would never have completed this project. You have believed in me, supported me, and cheered me on every single day. I am endlessly thankful.

Factors Impacting Psychological and Health Outcomes in Mothers and Infants Following NICU Hospitalization of the Infant

The birth of a child is a challenging and emotionally charged time for any new mother. However, when an infant is born prematurely or experiences medical complications, the experience of birth and new motherhood may be characterized by confusion, helplessness, and distress (Beck, 2003; Holditch-Davis et al., 2003; Nystrom & Axelsson, 2002; Wigert et al., 2006). While there is evidence that mothers of infants hospitalized in the Neonatal Intensive Care Unit (NICU) experience higher rates of psychopathology than mothers of healthy infants (e.g., Beck, 2003; Carter et al., 2005; Davis et al., 2003; Lefkowitz et al., 2010), little is yet known about factors associated with these reactions or to what extent gestational age is relevant. In order to appropriately target interventions with mothers of infants in the NICU, it is necessary to learn more about mothers at risk for developing mental health problems and whether there are clear protective or risk factors that might inform their onset and course.

To date, most studies examining maternal reactions to the NICU hospitalization of an infant have either focused on mothers infants born at less than 32 weeks gestation, or have been over-inclusive, investigating maternal reactions regardless of gestational age. There has been little research focusing exclusively on moderate- to late-preterm infants and their mothers, despite this gestational age range accounting for approximately 83% of preterm births in the US (Martin et al., 2015). There is a general assumption that these mothers' experiences are less stressful because of a presumably less complicated medical course for moderate- to late-preterm, or "near term" infants (32 - < 37 weeks gestation; Engle, 2006; Fuchs & Gyamfi, 2008; Melamed et al., 2009); however, there is a great deal of variability in the conditions of these

infants, with some experiencing highly complicated medical problems and treatment courses (Engle, 2006; Engle et al., 2007; Melamed et al., 2009).

Maternal psychopathology in the context of the NICU

Depression. Current research on incidence of maternal depression during or following the NICU hospitalization of an infant is largely inconclusive due to the range of gestational age and medical complications included in most studies. There is some evidence to suggest that mothers of infants in the NICU experience postpartum depression at an increased rate as compared with mothers of healthy infants (Beck, 2003; Davis et al., 2003; Lefkowitz, Baxt, & Evans, 2010; Melnyk et al., 2006; O'Hara & Swain, 1996). A recent study found that 39% of mothers with infants hospitalized in the NICU met criteria for postpartum depression, compared with 10-15% of mothers of healthy babies. An additional 16.9% of NICU mothers met criteria for sub-syndromal postpartum depression, and 32.2% reported suicidal thoughts within the past two weeks (Lefkowitz, Baxt, & Evans, 2010). However, it is important to note that the majority of infants (though not all) included in this study were early/very preterm (< 30 weeks gestation), or endured severe complications or medical illnesses if born after 30 weeks gestation (Lefkowitz, Baxt, & Evans, 2010).

In contrast, there is also evidence that mothers of infants hospitalized in the NICU do not show rates of depression significantly higher than mothers of non-hospitalized babies. A study of parental psychopathology during an infant's hospitalization in the NICU found that rates of maternal depression were not significantly different between mothers with infants in the NICU and mothers of healthy infants, with 6% of NICU mothers and 4% of control mothers showing clinically relevant depression scores (Carter, Mulder, Bartram, & Darlow, 2004). Of note, this

study included a large range of gestational age, with infants ranging from 23 to 42 weeks gestation.

These mixed findings point to the likelihood that there is variation among NICU mothers in depression symptomatology. It is possible that mothers of very preterm infants hospitalized in the NICU *do* evidence higher rates of depression than mothers of healthy infants, but that mothers of moderate- to late-preterm infants do not (or potentially the other way around). It is additionally likely that multiple factors contribute to the development of depression in NICU mothers. Studies comparing rates of depression in mothers of healthy babies and mothers of babies in the NICU are helpful in assessing the need for intervention and treatment, but more focused studies are needed to clarify which factors may lead to elevated depression symptoms in these mothers.

Anxiety. There is surprisingly little research focused on postpartum anxiety in mothers, especially in the context of the NICU (Matthey et al., 2003). However, there is growing evidence that mothers of infants hospitalized in the NICU show higher rates of anxiety than mothers of healthy infants (Carter, Mulder, Bartram, & Darlow, 2004; Doering, Moser, & Dracup, 2000; Miles, Funk, & Kasper, 1991). In one study, 18% of NICU mothers and 7% of control mothers evidenced clinically relevant anxiety (Carter, Mulder, Bartram, & Darlow, 2004). Findings have indicated that low levels of social support and low perceived control are associated with higher levels of anxiety in mothers of NICU infants (Doering, Moser, & Dracup, 2000). Once again, most studies included a wide range of gestational age and severity of medical complications, opening the door for investigations of which factors contribute to increased anxiety among NICU mothers, and which factors may buffer against the development of anxiety.

Post-traumatic stress. In studies of parents of children in the Pediatric Intensive Care Unit (PICU; a unit treating children up to 17 years of age), symptoms of post-traumatic stress disorder (PTSD) were found to be elevated in comparison with parents of healthy children (Balluffi et al., 2004; Bronner et al., 2010; Colville & Gracey, 2006; Lefkowitz, Baxt, & Evans, 2010). A study examining rates of acute stress disorder in NICU parents found elevated rates in mothers, but not in fathers (Shaw et al., 2006). In another study of NICU parents, PTSD was elevated in parents of infants hospitalized in the NICU (Lefkowitz, Baxt, & Evans, 2010). Once again, studies that found increased rates of PTSD symptoms in NICU parents were based on samples where the majority of infants were extremely or very preterm (< 32 weeks gestation) or had severe medical complications (e.g., Lefkowitz, Baxt, & Evans, 2010; Shaw, 2006).

Taken together, results of studies examining the incidence of psychopathology in mothers of infants hospitalized in the NICU suggest that these mothers may experience psychopathology (e.g., depression, anxiety, PTSD) at higher rates than mothers of healthy babies who are not hospitalized after birth. However, current research on maternal psychopathology following NICU hospitalization leaves open a number of questions resulting from methodological limitations, including very broad inclusion criteria and cross-sectional design, which does not allow for assessment of maternal pathology over time. Unanswered questions include: which hospital or parent-related factors lead to the development or buffering of psychopathology? Does gestational age or medical condition of the infant predict the development of psychopathology in the mother? Do relationships with hospital staff affect these outcomes? There is a clear need for studies to investigate these specific questions in order to identify which mothers are at risk for developing psychopathological responses to their infant's hospitalization, and which are not.

Identifying mothers at risk for developing psychopathology will also aid in the creation of targeted NICU programs to assist these mothers.

The experience of motherhood in the context of the NICU

While there is little empirical literature investigating which NICU experiences most affect mothers, there exists a growing body of qualitative literature on this topic. A more systematic and structured investigation of the experience of motherhood in the context of the NICU would be of assistance in targeting interventions and connecting specific symptomatology to maternal and hospital-related risk factors. However, these qualitative investigations can help lead us toward asking the right questions and focusing on experiences that mothers actually report having while their infants are in the NICU.

In a small study involving lengthy interviews with ten mothers of full-term babies hospitalized in the NICU after birth, most mothers reported a sense of *exclusion* during the hospital stay (Wigert, Johansson, Berg, & Hellstrom, 2006). New mothers reported feeling out of place and a lack of belonging in the NICU setting. Additionally, mothers felt pushed aside during infant caretaking and were infrequently allowed to actually interact with their babies. The results of a similar study interviewing mothers after their infants were determined to be healthy and sent home from the NICU mirrored the experience of exclusion; mothers reported feeling like “an outsider” in the NICU, including a sense of despair and powerlessness (Nystrom & Axelsson, 2002). Lack of control, guilt, and insecurity were also at the center of these women’s experiences. Across studies, mothers reported anxiety and emotional distress during and following their infants’ hospitalization, especially when the hospital experience included multiple separations from the infant (Hughes, McCollom, Sheftel, & Sanchez, 1994; Nystrom & Axelsson, 2002; Wigert, Johansson, Berg, & Hellstrom, 2006).

On the other hand, qualitative studies have investigated aspects of the NICU experience that might help mothers to feel less anxious and emotionally distressed. Broadly, receiving explanations that they were able to understand was perceived as helpful and calming to mothers. In addition, being allowed to hold and feel close to their babies, being allowed to participate in the baby's care, and feeling attended to as a unique individual by hospital staff and doctors helped mothers to feel more comfortable and less anxious (Nystrom & Axelsson, 2002; Wigert, Johansson, Berg, & Hellstrom, 2006). In fact, another qualitative investigation focused on the use of *Kangaroo Care*, a program that allows mothers to hold their preterm infants underneath their clothing, providing skin-to-skin contact. Mothers reported an increased sense of *knowing* their infants and enhanced bonding and calm feelings (Roller, 2005).

These accounts are invaluable toward gaining an understanding of which hospital-related factors might contribute to the development of distress for mothers of NICU infants, and which factors may be protective against such responses. However, it is unclear whether these responses typify *all* maternal responses to the NICU hospitalization of an infant, or only some. Further, if these responses are not typical of every mother, which maternal or parent-related factors may contribute to the development of anxiety, depression, or posttraumatic stress symptoms? Although these qualitative investigations shed some light on the experiences of mothers with babies in the NICU, questions remain open regarding which factors contribute to which responses, and whether the experiences described above are characteristic of most, some, or only few mothers.

Potential Risk and Protective Factors

Infant health problems. Previous research suggests a link between infant health problems and maternal psychopathology. Maternal anxiety has been linked with poorer neonatal

health and greater risk of neurobiological problems (Misri et al., 2004; Schmucker et al., 2005). Additionally, infant sleep disturbance has been associated with greater maternal depression (Lam et al., 2003). These findings suggest that increased infant health problems may be associated with greater risk of maternal psychopathological reactions. However, few studies have directly linked infant health problems with maternal depression, and no studies have examined a potential relation specifically between infant health problems and maternal post-traumatic stress symptoms.

Gestational age. According to the World Health Organization, infants born under 28 weeks gestation are considered “extremely preterm,” infants born between 28 weeks and 31^{6/7} weeks are considered “very preterm,” and infants born between 32 and 36^{6/7} weeks are considered “moderate to late preterm” (World Health Organization, 2015). Further, late-preterm infants are frequently defined as being born between 34 and 36^{6/7} weeks gestation, and moderate-preterm infants between 32 and 33^{6/7} weeks gestation (Refuerzo et al., 2010). Given that *late-preterm infants* are similar in size and weight to term infants, medical professionals often treat them as developmentally mature or low-risk (Stark, 2004). While no research to our knowledge has compared rates of psychopathology in mothers of moderate-preterm infants to mothers of late-preterm infants, healthcare professionals tend to assume that given the lower risk of mortality for late-preterm infants (Bastek et al., 2008; Martin et al., 2006), mothers experience minimal emotional distress or upheaval (Brandon et al., 2011). Thus, there may be important differences in level of psychopathology for mothers of moderate-preterm versus late-preterm infants.

Previous mental illness. A pre-existing anxiety disorder has been shown to be a significant risk factor for the development of a postnatal mood disorder (Matthey et al., 2003). In

addition, ample evidence shows that preexisting psychiatric conditions, including schizophrenia and mood disorders, place mothers at increased risk of pregnancy, birth, and neonatal complications, including infant health problems and even infant death (Gold et al., 2007; Jablensky et al., 2005; Webb et al., 2008). Given research that links poorer infant health with increased maternal psychopathology (e.g., Misri et al., 2004), it stands to reason that the existence of a previous mental illness would increase the risk of infant health problems, thus further increasing the risk for cascading mental health problems in the mother. In addition, in different contexts such as the death of a loved one, it has been shown that preexisting psychopathology places individuals at greater risk of adverse reactions to stressors (e.g., Zisook et al., 1997; Zisook & Shuchter, 2001). In the case of an infant being hospitalized in the NICU, it is likely that a similar pattern would emerge: mothers with preexisting mental health problems would be at higher risk for psychopathological reactions.

Mother-infant contact. A number of NICU intervention programs have included mother-infant contact as a way to enhance bonding and protect against maternal psychopathology. One example is Kangaroo Care, in which mother-infant skin-to-skin contact is encouraged (e.g., Feldman et al., 2003). Studies have shown that mother-infant contact through touching results in greater maternal attachment and confidence, less infant negative affect, and increased family cohesion (Anderson, 1991; Feldman et al., 2003). Mother-infant contact in the NICU serves a protective function for mothers as well as for infants. However, certain medical conditions may make it difficult or impossible for mothers to touch or hold their infants, and no studies to date have examined whether *verbal interaction* (e.g., speaking, singing) with the infant might serve a similar protective function.

Patient-staff relationships. Patient relationships with hospital staff have been consistently shown to impact level of patient satisfaction and health outcomes following hospitalization (Cleveland, 2008; Loo, Espinosa, Tyler, & Howard, 2003; Rosenheck, Wilson, & Meterko, 1997; Wigert, Johansson, Berg, & Hellstrom, 2006). A meta-analysis investigating the experience of parenting in the Neonatal Intensive Care Unit (Cleveland, 2008) found that seventeen different studies cited a need for parents to develop a positive relationship with the NICU nurse (e.g., Bialoskursi et al., 2002; Fenwick et al., 2001a, 2001b; Holditch-Davis & Miles, 2000; Lam, Spence, & Halliday, 2007; Wigert, Johansson, Berg, & Hellstrom, 2006). Studies have shown that parenting efficacy is positively related to nurse support (Denney et al., 2006), and mothers of NICU infants reported greater family satisfaction if they evaluated their relationship with NICU staff as positive (van Riper, 2001).

While researchers identify a strong desire on the part of parents to collaborate with nurses (Bialoskurski et al., 2002; Hurst, 2001a; Lee et al., 2003; Mok & Leung 2006), parents of infants hospitalized in the NICU often reported experiencing power struggles with NICU nurses and feeling acutely aware of power differentials between themselves and hospital personnel (Fenwick et al., 2001a; Lupton & Fenwick, 2001; Hurst, 2001a). In one particular study, mothers reported viewing NICU nurses as “gatekeepers,” and felt pressure to gain permission from nurses to touch or hold their babies (Lupton & Fenwick, 2001). In the context of the NICU, there is evidence that mothers feel anxious about being labeled by nurses as “difficult,” and therefore may hold back from asking questions or voicing opinions (Cleveland, 2008; Hurst, 2001a, 2001b; Lupton & Fenwick, 2001). On the other hand, NICU nurses have reported a specific set of criteria by which they evaluate which mothers are “good mothers,” including asking many

questions and attempting to acquire more information about infant care (Lupton & Fenwick, 2001).

Given substantial evidence that patient-staff relationships, especially relationships between mothers and nurses in the NICU, are related to patient satisfaction and health outcomes, it is important to understand what constitutes a “good” relationship according to both mothers and hospital nurses. In addition, while prior research suggests that patient-staff relationships affect health outcomes of patients, there is little to no research documenting the effect of patient-staff relationships on the development of psychopathology post-hospitalization, especially in the context of the NICU. In order to delineate which factors increase or decrease the likelihood of mothers developing psychopathology following the hospitalization of their infant in the NICU, it is important to further investigate this area.

Causal attributions and expectations. Causal attributions for an adverse event include an individual’s perceived locus of causality, stability (expectations about change), and control. Past research has shown that self-blame, or an internal locus of causality, in the face of adversity or potentially traumatic events is associated with poorer recovery (Frazier & Schauben, 1994). In addition, stable-global attributions – or the perception that the problem is fixed and unchanging – have been associated with maladaptive outcomes following adverse events (Peterson & Seligman, 1987; Tennen & Affleck, 1987). For parents of preterm infants specifically, the perception of greater severity of the infant’s health problems (or more stable, fixed health problems) has been shown to lead to more self-blame (Tennen, Affleck, & Gershman, 1986). It stands to reason that maternal causal attributions – especially pessimism about the infant’s recovery – may play a role in the development of psychopathology during and following an infant’s NICU hospitalization.

Coping style and regulatory flexibility. Recent research highlights the role of regulatory flexibility in ongoing mental health and, in particular, in the capacity to cope with stress and adversity (Bonanno & Burton, 2013). While previous research has suggested that specific coping styles are healthy or adaptive across contexts and individuals, more recent findings have also highlighted the importance of flexibility in coping strategy depending on the individual and situation (e.g., Bonanno & Burton, 2013; Bonanno, Papa, Lalande, Westphal, & Coifman, 2004; Kashdan & Rottenberg, 2010). However, investigations of maternal coping during and following the hospitalization of an infant have failed to consider coping flexibility. The question remains open as to whether coping style and/or flexibility is related to the development of maternal psychopathology following the NICU hospitalization of an infant, and if so, how this relationship is characterized.

The implementation of novel program models in the NICU

From 1981 to 2015, there was a 19.9% increase in the number of premature births per year (Goldenberg, Culhane, Iams, & Romero, 2008; Martin et al., 2015), resulting in increased admissions to Neonatal Intensive Care Units across the United States. Given abundant research suggesting that many parents of infants hospitalized in the NICU experience distress or psychopathology, there have been multiple and varied attempts within the past several decades to develop novel programming for mothers with infants in the NICU in an effort to buffer the development of pathological responses. While many of these programs have shown some success, there remains difficulty in targeting these interventions given the lack of specificity in studies of maternal psychopathology during this difficult time. It is likely that the effectiveness of such programs would increase if they were targeted to subsets of mothers at risk for specific psychological problems.

A number of different programs across the United States have focused on providing emotional and informational support to parents of high-risk infants in the NICU by matching them with volunteer parents with previous NICU experience (e.g., Lindsay et al., 1993; Preyde & Ardal, 2003). Across studies, mothers matched with volunteers evidenced significantly better mood states, less stress, stronger mother-infant relationships, and more satisfaction with home environment compared with mothers who were not involved in these programs (Lindsay et al., 1993; Preyde & Ardal, 2003). While these outcomes are indeed encouraging, one study reported having included over 900 families in these services at the time the report was written, a huge demand of time and resources from the hospital and the volunteer parents (Lindsay et al., 1993). In fact, some studies suggest that interventions are *not* needed for every NICU parent (Carter, Mulder, Bartram, & Darlow, 2004). With more accurate information about which mothers are at risk for developing psychological problems, it would be possible to target this intervention to those who need it, rather than applying it broadly to every NICU mother.

Another promising intervention program, Creating Opportunities for Parent Empowerment (COPE), was tested to assess its influence on the development of maternal anxiety and depression after infants were discharged from the NICU (Melnyk et al., 2006). This educational and behavioral program was found to be associated with less maternal stress, depression, and anxiety during the NICU stay and post-discharge from the NICU, but *indirectly* via affecting maternal beliefs about their infants and their roles as mothers. Given these findings, it is clear that the COPE program would be best targeted to mothers with certain kinds of beliefs about their babies and themselves as mothers, rather than applied broadly to every mother of a NICU infant.

The majority of such programs have attempted to apply interventions to mothers of infants hospitalized in the NICU regardless of gestational age, medical condition, and maternal factors. More accurate assessments of hospital and mother-related factors that contribute to the development of psychopathology will also directly affect which interventions are targeted to which mothers, likely increasing the efficacy of these costly and time-intensive programs.

The current study

The current study used a longitudinal design in order to explore whether mothers of moderate- to late-preterm infants experienced elevated rates of psychopathology compared to normal samples, and to identify risk and protective factors associated with different maternal reactions both at baseline and six months later. We targeted *moderate- to late-preterm infants* (born 32^{0/7}-36^{6/7} weeks gestation), presently an understudied population despite representing 83% of preterm infants and being hospitalized at a high rate.

Current research focusing on the incidence of maternal psychopathology in the context of the NICU suggests that rates of depression, anxiety, and PTSD symptoms are higher in NICU mothers compared to mothers of healthy babies. However, the majority of these studies are cross-sectional in design, which does not allow for the examination of divergent responses to the hospitalization of an infant over time. In addition, most studies of NICU mothers include infants of varying gestational ages and illness severity without identifying these variables as potential predictors of maternal outcomes. In the current study, we examined gestational age of the infant, number of different medical diagnoses, and the infant's length of stay in the NICU in order to investigate whether these might contribute to the development of maternal mental health problems over time. In addition, we assessed mothers *and nurses* while the infant was still in the

NICU, and mothers again six months later in order to identify changes and patterns of reaction over time.

Speculations and anticipated findings

While the question of whether these factors impact maternal mental health remains open, we anticipated that more medical problems, and longer length of stay would be associated with higher levels of depression, anxiety, and posttraumatic stress in mothers of NICU infants. Given previous research focused on these variables, we also expected that more contact between mothers and infants in the hospital would buffer against the negative effects of both infant health problems and previous mental illness on the development of maternal psychopathology, both at baseline and six-month follow-up. Further, we expected that pessimism about the infant's potential for recovery (i.e., perceiving the infant's health condition as fixed and permanent) would buffer the effects of risk factors on maternal outcomes. Finally, we anticipated that a better (characterized as more positive, more helpful, more informative) mother-nurse relationship as reported by both the mother and by the nurse would result in fewer psychopathological symptoms at both time points.

Method

Participants

We recruited all mothers of moderate- to late-preterm infants from the Neonatal Intensive Care Unit of Morgan Stanley Children's Hospital, Columbia University Medical Center. Mothers were excluded from selection if their babies were born earlier than 32 weeks gestation, or later than 36 weeks and 6 days gestation. We recruited 91 mothers, 91 neonates, and 29 nurses of mothers in the NICU, for a total of 211 participants. Mothers were 40.7% Caucasian, 17.4% African American, 10.5% Asian, 2.3% American Indian/Alaskan Native, and 29.1% other;

38.9% of mothers were Hispanic. Of note, since the questionnaire asked about racial and ethnic groups separately, 80.1% of mothers who reported “other” for racial group identified as Hispanic, and 8.6% of mothers who reported “Caucasian” also identified as Hispanic. Anecdotally, there were also a large number of Hasidic Jewish mothers making up the “Caucasian” category. Mean age was 32.45 years ($SD = 6.78$), and mean years of education completed was 14.29 years ($SD = 4.30$).

Of the original 91 mothers, 76 participated in the six-month follow-up assessment, representing an 83.5% retention rate. Mothers who declined or were unreachable for six-month follow-up participation did not differ from mothers who did participate on any demographic variables or variables included in the study.

Procedure

All data was collected from the NICU of Morgan Stanley Children’s Hospital, Columbia University Medical Center (CUMC). It is important to note that the Columbia University Medical Center NICU is unique in that it draws high-risk and complex cases from Neonatal Intensive Care Units throughout the tristate area (e.g., Mt. Sinai Hospital, NYU Langone Medical Center, North Shore-LIJ Health System). Thus, infants hospitalized at CUMC tend to be of an earlier gestational age, more severely ill, and require more complex medical procedures than infants in other NICUs.

The current study assessed mothers at two different time points. A baseline assessment took place as soon as possible after the infant was admitted to the NICU, while the infant was still hospitalized. The average length of time between birth and baseline assessment was 34.78 days ($SD = 27.28$ days). The six-month assessment took place approximately six months after the initial assessment (M days = 195.05, $SD = 34.70$). NICU nurses were only assessed once,

while the infant was still hospitalized in the NICU. Nurses for 44 infant-mother pairs filled out questionnaires for the study. The Nursing Director of the NICU identified all mothers of moderate- to late-preterm infants, and the attending neonatologist requested verbal agreement from mothers to be contacted by a member of our research team. Once verbal agreement was obtained, the Principal Investigator or a trained Research Assistant contacted the mother in person in the NICU or by telephone or letter to describe the study and ask whether the mother was willing to participate. If the mother agreed, she was asked to fill out a consent form and a questionnaire packet while in the NICU, or sent these materials by mail to complete at home and return to our research team in a self-addressed, stamped envelope. Six months later, a member of our research team reached out to the mother by telephone to inform her that we were mailing a six-month follow-up packet for her to complete and mail back to us. Mothers either completed this packet and mailed it back to us, or answered questions during a phone interview.

The Principal Investigator (Jennifer Lotterman) or a Research Assistant trained as part of the research project obtained consent from mothers of neonates and NICU nurses. A member of the research team obtained signed informed consent from mothers as soon as possible after the attending neonatologist informed the potential participant about the research project, while the neonate was still in the NICU. After the mother consented to be a part of the research study, members of the research team contacted her nurse in the NICU in person to explain the study and obtain informed consent. Method of consent was a formal signature on a paper copy of the consent form. A member of the research team discussed the consent form with each potential study participant in person in the NICU if possible, or over the phone if the mother or nurse was not available to meet in person.

Measures

See appendices for mother baseline and six-month questionnaires and nurse questionnaire, including all measures.

Maternal optimism. The Life Orientation Test (LOT; Scheier & Carver, 1985) was used to measure optimism. This standardized and widely used measure of optimism consists of eight items plus four “filler” items intended to disguise the underlying purpose of the measure. Item-scale correlations are all moderate, indicating that each item is measuring the same construct, but not redundant with the others (α for the current sample = .80). This measure has demonstrated convergent and discriminant validity (Lai, 1997; Scheier & Carver, 1985; Terrill et al., 2002). Sample items include, “I always look on the bright side of things,” and “In uncertain times, I usually expect the best.” Ratings are given on a 5-point scale, including “*strongly agree*” (4); “*agree*” (3); “*neutral*” (2); “*disagree*” (1); and “*strongly disagree*” (0). Total score is obtained by summing the scores of each item.

Causal attributions. The Causal Dimensions Scale II (CDSII; McAuley, Duncan, & Russell, 1992) was used to measure causal attributions. This scale is standardized and widely used. It is a reliable and valid measure (Chang & Sue, 2003; McAuley, Duncan, & Russell, 1992), which permits respondents to provide open-ended causal attributions for outcomes, and then classify these attributions along causal dimensions of locus of causality, stability, and control (α for the current sample = .93 overall; α = .83 for locus of causality subscale; α = .87 for controllability subscale; α = .83 for stability subscale). **For the purposes of the current investigation, “stability” will be referred to as “pessimism about infant recovery” to more clearly describe the construct in the context of the NICU.** Ratings are given on a 9-point Likert scale, with sample items including, “*Is temporary*” (1) vs. “*Is permanent*” (9) and “*Reflects an aspect of the situation*” (1) vs. “*Reflects an aspect of yourself*” (9).

NICU experience. This measure was developed specifically for the unique context of the Neonatal Intensive Care Unit. Respondents were asked how often they engage in a variety of activities while in the NICU. Sample items include “I hold or touch my baby,” and “I catch up on work.” Ratings were given on a 5-point Likert scale from “*never*” (1) to “*nearly always*” (5). Nurses were also given this measure in order to compare nurse and mother responses and to help to validate maternal self-report regarding activities in the NICU.

Maternal relationships with NICU staff and other parents. A seven-item measure was designed to study maternal relationships with NICU staff and other parents in the NICU (α for the current sample = .79). Sample items include, “If you have spent time interacting with NICU staff, how would you characterize these experiences overall?” and “How supported have you felt by NICU staff?”

Nurse Questionnaire. Nurse impressions of mothers were assessed in order to compare these ratings with mothers’ ratings and gain additional information regarding mother-nurse relationships. Sample items include, “To the best of your knowledge, how many times per week does this mother visit the NICU?” and “In your opinion, how much does this mother understand when you explain things to her?” The NICU Experience measure was also administered to nurses for comparison purposes.

Coping style and flexibility. The Perceived Ability to Cope with Trauma Scale (PACT; Bonanno, Pat-Horenczyk, & Noll, 2011) is a standardized measure designed to study coping flexibility (α for the current sample = .87). Convergent, discriminant, and incremental validity have been demonstrated (Bonanno, Pat-Horenczyk, & Noll, 2011). Previous factor analysis indicated two subscales: Forward-focus (12 items, α = .83) and Trauma-focus (8 items, α = .73) (Bonanno, Pat-Horenczyk, & Noll, 2011; Burton et al., 2011). If there is a difference between the

two coping styles, those scores are reported separately. Typically, if no differences are detected between the two coping styles, a coping flexibility score is calculated by subtracting the difference score between the Trauma-focus and Forward-focus subscales (Forward – Trauma) from the sum of the subscales (Forward + Trauma), with higher scores reflecting a greater ability to use both coping strategies. Respondents were asked to indicate which behaviors and strategies they would be able to use following a potentially traumatic event if necessary. Sample items include, “Comfort other people,” “Spend time alone,” and “Reflect upon the meaning of an event.” Ratings are given on a 7-point Likert scale, from “*not true*” (1) to “*extremely true*” (7). The total score is obtained by summing responses to each item.

Infant health. The Infant Health Checklist was developed in conjunction with a Neonatologist on staff at the CUMC NICU for the specific context of being hospitalized in the NICU, and health development thereafter. The checklist asked mothers to mark which health problems her baby was currently experiencing (baseline), or had experienced in the past 6 months (asked at six-month follow-up). Sample items include “Bronchitis,” “Vision problems,” and “Cardiac issues.” It also asks mothers to list any medications their babies are currently taking. Total number of infant health problems, infant length of stay in the NICU, and gestational age were also obtained through NICU chart review. Total number of infant health problems reported by the mother was significantly correlated with total number of health diagnoses in the infant’s medical chart ($r = .37, p < .001$), indicating that maternal self-report was a valid metric.

Posttraumatic stress disorder (PTSD). The PTSD Checklist (PCL; Weathers et al., 1993) is a 17-item standardized, valid, self-report measure asking respondents to report level of distress associated with each reported PTSD symptom over the past month (α for the current sample = .93). It has shown high diagnostic accuracy (Forbes et al., 2001). The recommended cutoff

score for civilians on the PCL is 38 (National Center for PTSD, 2014). Sample items include, “Repeated disturbing memories, thoughts, or images of the stressful experience,” and “Avoiding thinking about or talking about the stressful experience or avoiding having feelings related to it.” Ratings are given on a 5-point scale, including “*not at all*” (1); “*a little bit*” (2); “*moderately*” (3); “*quite a bit*” (4); and “*extremely*” (5). The total score is obtained by summing the scores of each item.

Anxiety. The Generalized Anxiety Disorder-7 Item (GAD-7; Spitzer, Kroenke, Williams, & Lowe, 2006) is a standardized and widely used measure assessing the presence of symptoms of Generalized Anxiety Disorder (α for the current sample = .92). A score of 5 represents mild anxiety, 10 moderate anxiety, and 15 severe anxiety on the GAD-7 (Löwe et al., 2008), with a score of 10 or above generally accepted as a clinical cutoff (Spitzer, Kroenke, & Williams, 2006). This measure shows high construct validity (Lowe et al., 2008). Items include, “Feeling nervous, anxious, or on edge,” and “Trouble relaxing.” Ratings are given on a 4-point scale, including “*not at all*” (0); “*several days*” (1); “*more than half the days*” (2); and “*nearly every day*” (3). The total score is obtained by summing the scores of each individual item.

Depression. The Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) is a standardized 11-item scale that has shown adequate test-retest reliability and internal consistency across a wide range of subsamples (Roberts, Rhoades, & Vernon, 1990) and discriminates between depressed patients and controls (Boyd et al., 1982) (α for the current sample = .83). This measure demonstrates high validity (Andresen et al., 1994; Orme et al., 1986; Radloff, 1977). The clinical cutoff score for the 11-item CES-D is 8 (Kohout et al., 1993). Sample items include, “I felt depressed,” and “I could not get going.” Ratings are given on a 3-point scale, including “*hardly ever or never*” (1); “*some of the time*” (2); and “*much or most of*

the time” (3). Items 4 (“I was happy”) and 7 (“I enjoyed life”) are reverse-coded. The total score is obtained by summing the scores of each individual item.

Data Analytic Plan

Analyses at Wave 1 (while the infant is still in the NICU) were largely descriptive. We examined basic means and standard deviations on multiple measures, particularly focusing on our outcome measures (PTSD symptoms, anxiety, depression). As these measures are all standardized, we were able to compare the scores of mothers of moderate- to late-preterm infants in the NICU to norms and assess whether elevations existed in this unique group. We also looked at multiple correlations in order to get a sense of which variables were associated with better or poorer functioning, and which aspects of the NICU experience were related to functioning while the infant was still hospitalized. Finally, we examined the interactive associations between a number of variables and outcome measures based on prior research that identifies these variables as potential risk and/or protective factors.

Analyses at Wave 2 (approximately six months after the infant was discharged from the NICU) included linear regression analyses associated with PTSD, anxiety, and depression symptoms, while controlling for symptoms at Wave 1. We also investigated moderation effects using multiple hierarchical regression analysis. In each linear and hierarchical regression analysis, we reported the squared semipartial correlation (sr^2) for each variable in order to indicate the unique variance accounted for by that variable. To account for missing data at six-month follow-up, we used the Multiple Imputation Method (Schafer, 1999), a statistical technique for analyzing datasets in which multiple values are missing. This method involved imputing missing values 5 times, analyzing each of the resulting 5 complete data sets, and then integrating the 5 analysis results into a final, or “pooled,” result.

Results

Incidence of maternal psychopathology

Overall, we found elevations in depression, anxiety, and PTSD symptoms in mothers of moderate- to late-preterm infants *during the time of the infant's hospitalization and six months post-birth*. Despite our restricted range, it is clear that these mothers *did* evidence significant rates of psychopathological responses during hospitalization. Clinically relevant depression scores were found in 31.1% of NICU mothers at baseline and 21.1% of NICU mothers six months later, compared with 10-15% of mothers of healthy infants experiencing postpartum depression (Lefkowitz, Baxt, & Evans, 2010). Of the mothers who had clinically relevant depression scores at baseline, 42.9% had symptom levels at or above the clinical cutoff six months later. Only 5.8% of mothers had clinically relevant depression symptoms at six months, but not during hospitalization.

For anxiety, 24.7% of mothers had clinically relevant anxiety scores during hospitalization and 27.6% six months later. Given evidence that approximately 7.4%-8.7% of mothers of healthy infants experience clinically significant levels of postpartum anxiety (Matthey et al., 2003), NICU mothers showed comparatively increased rates of anxiety at both time points. Of the mothers who had clinically relevant anxiety scores at baseline, 40.1% had symptom levels at or above the clinical cutoff six months later. Approximately 17.1% of mothers had clinically relevant anxiety symptoms at six months, but not during hospitalization.

For PTSD symptoms, 15.4% of mothers in the current study had clinically significant levels at baseline and 15.8% at six-month follow-up, compared with 2.3%-6% of mothers of healthy infants evidencing clinically significant PTSD symptoms (Ross et al., 2006; Söderquist et al., 2004). Of the mothers who had clinically relevant PTSD scores at baseline, 28.6% had

clinically relevant symptom levels six months later. Approximately 10.5% of mothers had clinically relevant PTSD scores at six months, but not at baseline.

Overall, 33.7% of mothers at baseline and 38.2% of mothers at follow-up exhibited clinically significant psychopathological symptoms. At baseline, 10.1% of mothers had clinically relevant symptoms of only *one* psychological disorder, with 10.1% showing symptoms of *two*, and 13.5% evidencing symptoms of *all three*. At six months, 18.4% had symptoms of only *one* disorder, 13.2% of *two*, and 6.6% of *all three*. While PTSD, anxiety, and depression symptoms were strongly positively correlated at both time points, correlations were weaker by six months than they were at baseline, and each psychological disorder was differentially associated with risk and protective factors. At baseline, all three psychological disorders were approximately equally correlated with one another, with PTSD and anxiety slightly less strongly correlated (see Table 3). At six months, depression and PTSD were the least strongly correlated, and depression and anxiety most strongly correlated (see Table 9).

Validating maternal NICU experience self-report using nurse report

We assessed the frequency with which mothers engaged in a variety of activities while their infants were hospitalized in the NICU using the NICU Experience measure, which was developed for the specific context of mothers in the NICU. The purpose of this measure, which included items such as *I interact with my baby verbally; I have conversations with hospital staff; I spend time by myself*, was to investigate whether *the ways in which* mothers spend their time in the hospital might represent a risk or protective factor in the development of psychopathology. In order to validate maternal self-report, we administered the same measure to nurses, asking them to report on their observations of what mothers were doing in the NICU. Maternal responses for five out of the eight items were moderately significantly correlated with nurse-report (See Table

1). These included: *I interact with my baby verbally (e.g., speak, sing, make sounds); I hold or touch my baby; I have conversations with other parents on the unit; I ask questions to hospital staff (e.g., nurses, doctors, etc.); and I have conversations with hospital staff.* Maternal responses for three items were *not* significantly correlated with nurse-report. These included: *I attend the parent therapy group; I spend time by myself (e.g., reading, watching TV); and I catch up on work.* This is not surprising, given that the first five items are easily observable by nurses, while the last three are not. Therefore, we included maternal responses to items 1-5 on the NICU Experience measure in subsequent analyses.

Comparing mothers of moderate-preterm and late-preterm infants

We ran a series of independent-samples T-tests to investigate whether mothers of moderate-preterm infants (32-33^{6/7} weeks gestation) had higher levels of psychopathology than mothers of late-preterm infants (34-36^{6/7} weeks gestation) at baseline and six months later. We found no significant differences between the two groups in baseline PTSD symptoms ($p > .10$), anxiety symptoms ($p > .10$), or depression symptoms ($p > .10$), or six month post-birth PTSD symptoms ($p > .10$), anxiety symptoms ($p > .10$), or depression symptoms ($p > .05$). See Table 2 for means and standard deviations comparing mothers of moderate- and late-preterm infants on each outcome measure.

Potential risk and protective factors (Baseline)

Correlations among potential risk and protective factors as well as demographic and outcome variables are reported in Table 3. Self-reported previous psychiatric diagnosis was significantly positively associated with the presence of anxiety and depression in mothers immediately after an infant's hospitalization in the NICU. Of note, all reported previously diagnosed psychiatric disorders were mood or anxiety disorders (e.g., bipolar disorder,

depression, generalized anxiety disorder, posttraumatic stress disorder). Previous mental illness was also mildly correlated with PTSD symptoms. The total number of different infant health problems as reported by the mother was mildly correlated with anxiety, depression, and PTSD symptoms. Infant length of stay in the NICU was moderately correlated with total number of infant health problems reported by the mother and with maternal pessimism about the infant's potential for recovery, but was not associated with maternal psychopathology. Additionally, a forward-focused coping style was associated with lower levels of depression and anxiety symptoms, and a trauma-focused coping style was negatively correlated with mother-infant contact. Mother-infant contact in the NICU was mildly associated with PTSD, anxiety, and depression symptoms, though these correlations were not significant for depression and anxiety, and only approached significance for PTSD symptoms. Maternal pessimism about the infant's potential for recovery was significantly associated with yearly income and time from admission to the baseline assessment.

Mother-infant contact as a moderator of previous mental illness (baseline). We ran a series of three moderation analyses to examine the interactive effect of mother-infant contact in the NICU and presence of a previous mental illness on mental health outcomes (PTSD symptoms, depression, and anxiety; see Table 4). The interaction of previous mental illness and mother-infant contact was significantly associated with PTSD symptoms ($t = -2.10, p < .05$) with the models accounting for 14.5% of PTSD symptom variance. The interaction was graphed by plotting points one standard deviation above and below the means for both mother-infant contact and previous mental illness. This graph (Figure 1) shows that mothers not previously diagnosed with a mental illness had lower levels of PTSD symptoms while the infant was hospitalized in the NICU, but mother-infant contact was not associated with PTSD symptoms. For mothers who

had been previously diagnosed with a mental illness, lower mother-infant contact was associated with higher levels of PTSD symptoms at baseline.

The same procedures were repeated using anxiety and depression as outcome measures. The interaction between mother-infant contact and previous mental illness approached significance for anxiety ($t = -1.71, p = .09$) with trends in the same direction as reported above.

Mother-infant contact as a moderator of infant health problems (baseline). We ran an additional three moderation analyses to examine the interactive effect of mother-infant contact in the NICU and number of infant health problems on mental health outcomes (PTSD symptoms, depression, and anxiety; see Table 5). The interaction of total infant health problems and mother-infant contact was significantly associated with anxiety ($t = -2.62, p < .05$) with the models accounting for 11.97% of anxiety variance. The interaction was graphed by plotting points one standard deviation above and below the means for both mother-infant contact and number of infant health problems. This graph (Figure 2) shows that mothers of infants with fewer reported health problems at baseline had lower anxiety symptoms overall, but mother-infant contact was not associated with anxiety symptoms. For mothers of infants with more reported health problems at baseline, lower mother-infant contact was associated with higher levels of anxiety symptoms at baseline.

The same procedures were repeated using PTSD symptoms and depression as outcome measures, but the results were not significant.

Mother-infant contact as a moderator of coping style (baseline). We ran additional regressions to determine whether an interaction might exist between mother-infant contact in the NICU and a forward-focused coping style in predicting psychopathology at baseline (See Table 6). The interaction of forward-focused coping style and mother-infant contact in the NICU was

significantly associated with anxiety ($t = 2.31, p < .05$), with the model accounting for 13.1% of anxiety variance. A graph of this interaction (Figure 3) shows that mothers higher in forward-focused coping had lower anxiety levels, and mother-infant contact was not associated with anxiety. For mothers lower in forward-focused coping, more mother-infant contact in the NICU was associated with lower levels of anxiety.

Maternal optimism and pessimism about infant recovery as potential moderators.

We ran further regressions to determine whether maternal trait optimism and/or maternal pessimism about the infant's potential for recovery might moderate associations between the above factors (previous mental illness, infant health problems, coping style) and psychopathology. We did not find any significant results from these analyses.

Nurse report

Correlations between nurse ratings and baseline symptom levels are reported in Table 7. At baseline, a more positive overall rating of the mother-nurse interaction *by the nurse* was associated with lower PTSD symptoms and depression symptoms at baseline. Mothers who were rated by nurses as understanding more of what was explained to them in the NICU had lower anxiety and depression symptoms.

At six months post-birth, a series of multiple regressions examined whether nurse report while the infant was in the NICU predicted maternal psychopathology six months later (see Table 8). Nurse report of how much the mother understood what was explained to her in the NICU significantly predicted six-month maternal depression ($t = -3.92, p = .001$) and anxiety ($t = -2.34, p < .05$).

Maternal psychopathological outcomes at six months post-birth

A series of linear regression analyses were performed to investigate relations between maternal psychopathology at six-month follow-up (PTSD, anxiety, depression) and potential risk and protective factors, controlling for baseline symptom levels. At this time point, we also examined potential correlations between demographic variables and mental health outcomes (see Table 9). No significant differences in maternal depression, anxiety, or PTSD symptoms at six months were found based on age, race, years of education, income level, or length of time from birth to study participation. Thus, these variables were not included in subsequent analyses.

Maternal factors. Linear regression analysis showed that maternal reported previous mental illness diagnosis predicted maternal anxiety at six-month follow-up, controlling for maternal anxiety at baseline ($t = 2.15, p < .05$). The same analysis approached significance for depression at six months, controlling for depression at baseline ($t = 1.73, p = .09$).

Maternal optimism significantly predicted maternal PTSD at six months post-birth, controlling for baseline PTSD symptoms ($t = -2.06, p < .05$) and maternal anxiety at six months, controlling for baseline anxiety ($t = -2.07, p < .05$). Maternal optimism approached significance predicting depression at six months, controlling for baseline depression ($t = -1.64, p = .10$).

Hospital and infant health factors. Results of regression analysis indicated that the infant's length of stay in the NICU predicted maternal PTSD at six-month follow-up, controlling for baseline PTSD symptoms ($t = 2.71, p < .01$), anxiety at six months, controlling for baseline anxiety ($t = 2.32, p < .05$), and depression at six months, controlling for baseline depression ($t = 2.13, p < .05$). The total number of health problems reported by the mother at baseline also predicted maternal PTSD at six months post-birth, controlling for baseline PTSD symptoms ($t = 2.96, p < .01$), and anxiety at six months, controlling for baseline anxiety symptoms ($t = 2.05, p < .05$).

Mother-reported mother-infant contact while the baby was in the NICU also predicted maternal PTSD at six months, controlling for baseline PTSD symptoms ($t = -2.46, p < .05$).

Pessimism about the infant's recovery. The mother's pessimism about the infant's potential to recover approached significance in predicting PTSD at six months post-birth, controlling for baseline PTSD symptoms ($t = 1.84, p = .07$).

Moderators of maternal psychopathology at six months post-birth

Following the above linear regression analyses, we ran three different hierarchical regressions including potential predictive factors for each of our three outcome variables (PTSD, anxiety, depression) and controlling for baseline symptoms. In the first step of each hierarchical regression, we included potential *risk factors* (infant length of stay, previous mental illness, number of reported health problems) and potential *protective factors* (mother-infant contact, optimism, hope vs. pessimism about the infant's recovery) for that particular outcome variable (PTSD, anxiety, or depression). Variables that did not significantly predict the outcome variable of each model were not included (e.g., pessimism was not included for anxiety or depression). In the second step, we examined possible interactions between significant predictors of the outcome measure, assessing for interactions between protective factors and risk factors.

PTSD. For the model predicting PTSD at six months post-birth (see Table 10), we found that the interaction of infant length of stay in the NICU and pessimism about infant recovery significantly predicted PTSD at six months ($t = 3.53, p < .001$). This interaction was graphed by plotting points one standard deviation above and below the means for infant length of stay and pessimism (see Figure 4), and shows that mothers of infants with a shorter length of stay had lower PTSD symptoms at six months overall, but pessimism about infant recovery did not predict PTSD symptoms for these mothers. However, for mothers of infants with a longer length

of stay, the perception that the infant's condition was fixed and permanent predicted greater PTSD symptoms at six-month follow up.

Additionally, the interaction of total number of infant health problems reported by the mother at baseline and mother-infant contact in the NICU significantly predicted PTSD at six months ($t = 2.70, p < .01$). This interaction was graphed following the same procedures as above (see Figure 5), and the graph showed that for mothers of infants with *fewer* health problems, *more* mother-infant contact resulted in lower PTSD symptoms. However, for mothers of infants with *more* health problems, mother-infant contact did not predict PTSD symptoms at six months.

Anxiety. For the model predicting anxiety at six months post-birth (see Table 11), we found that the interaction of infant length of stay in the NICU and maternal optimism approached significance in predicting maternal anxiety symptoms at six months ($t = -.00, p = .09$). The interaction was graphed by plotting points one standard deviation above and below the means for infant length of stay and maternal optimism (see Figure 6), and shows that mothers of infants with a shorter length of stay had lower anxiety symptoms six months post-birth, but optimism did not predict anxiety symptoms for these mothers. However, for mothers of infants with a longer length of stay, higher optimism levels predicted lower anxiety levels at six-month follow-up.

Depression. For the model predicting depression at six months post-birth (see Table 12), we found that the interaction of infant length of stay in the NICU and maternal optimism approached significance in predicting maternal anxiety symptoms at six months ($t = .00, p = .10$). The interaction was graphed by plotting points one standard deviation above and below the means for infant length of stay and maternal optimism (see Figure 7), and shows that mothers of infants with a shorter length of stay had lower depression symptoms six months post-birth, but

optimism did not predict depression symptoms for these mothers. However, for mothers of infants with a longer length of stay, higher optimism levels predicted lower depression levels at six-month follow-up.

Verbal interaction with the infant as a protective factor.

Baseline analyses. In order to investigate whether *verbal* contact with the infant alone (e.g., speaking, singing, making sounds) may serve a similar protective function in cases where *physical* contact may not be possible, we re-ran the above analyses with *verbal contact* and *physical contact* as separate variables. For baseline PTSD symptoms, the interaction of verbal contact alone and previous mental illness approached significance in its association with PTSD symptoms ($t = -1.63$, $p = .10$), accounting for approximately 3% of PTSD symptom variance, with lower verbal contact with the infant associated with higher PTSD symptoms *for mothers who had been previously diagnosed with a mental illness*. The interaction of physical contact and previous mental illness also approached significance in its association with PTSD symptoms ($t = 1.85$, $p = .07$), accounting for approximately 4% of PTSD symptom variance. The above analyses investigating mother-infant interaction as a moderator of number of infant health problems and coping style at baseline were repeated examining infant *verbal* and *physical* interaction separately, but neither was a significant moderator of these risk factors.

Six-month analyses. We re-ran the above six-month analyses including verbal and physical interaction with the infant as separate variables, and found that the interaction of infant verbal interaction and *number of health problems at baseline* approached significance in predicting PTSD symptoms at six months ($t = 1.81$, $p = .07$), accounting for approximately 4% of six month PTSD variance, with trends in the same direction as reported above.

Discussion

Despite being presumably lower-risk than mothers of very preterm infants (Bastek et al., 2008; Engle, 2006; Fuchs & Gyamfi, 2008; Melamed et al., 2009), results of the current study clearly show that mothers of moderate- to late-preterm infants hospitalized in the NICU evidence rates of PTSD symptoms, anxiety, and depression that are markedly higher than mothers of healthy infants, both *during hospitalization* and *six months after the initial assessment*. Focusing on NICU infants of a restricted gestational age allowed us to assess rates of psychopathology in a specific subset of mothers, whom might have been expected to have low rates of psychological symptoms. While indeed rates of psychological symptoms were higher among these NICU mothers, the *majority* of mothers of infants hospitalized in the NICU *did not* experience symptoms of PTSD, anxiety, or depression at baseline or six-month follow-up. At baseline, 66.3% of mothers exhibited no clinically significant symptoms at all, with 61.8% exhibiting no symptoms six months later. Therefore, it is important to understand which factors contributed to the development or buffering of psychopathological responses in the subset of mothers who *were* symptomatic, and how these factors might guide the development of NICU programming for mothers. Given the findings from the current study, we can begin to form a clearer picture of NICU mothers who are most at risk of developing psychopathology, and who will most benefit from prevention or intervention programming.

Identifying mothers at risk

Previous mental illness. From the results of our study, it is clear that a previous psychiatric diagnosis (e.g., depression, anxiety, bipolar disorder, posttraumatic stress disorder) is a major immediate and long-term risk factor to consider when mothers have prematurely born infants who require NICU hospitalization. The stress of the infant's premature birth and

subsequent hospitalization may exacerbate previous psychiatric symptoms or instead make it more likely for the mother to develop different psychiatric symptoms layered on top of a previous disorder. These findings make sense in the context of previous research on preexisting mental illness as a risk factor for the development of additional psychiatric diagnoses following potentially traumatic events (e.g., Breslau et al., 1991; Matthey et al., 2003). While the presence of a previous psychiatric diagnosis is not a *therapeutically modifiable* risk factor, it is certainly worthwhile for the NICU team to carefully screen mothers whose infants are admitted to the unit for the presence of a psychiatric disorder in order to possibly enroll these mothers in targeted programming to reduce the risk of developing new psychiatric symptoms.

Infant health. The severity of the infant's health condition, resulting in a longer length of stay and more reported health problems during hospitalization, represents a major risk factor for the development of psychopathology *during the infant's hospitalization and six months post-birth*. Once again, while it is not possible to modify the severity of the infant's health condition, it is important for NICU staff to identify these mothers in order to flag them as high-risk and offer programming aimed at decreasing psychological symptoms.

Coping style. Mothers with lower levels of *forward-focusing coping* had significantly higher levels of psychopathology (PTSD, anxiety, and depression) while their infants were hospitalized in the NICU. This finding is fitting with recent research highlighting the importance of flexible use of coping strategy when faced with stressors or potentially traumatic events (e.g., Bonanno & Burton, 2013; Bonanno et al., 2004). Not only is the lack of forward-focused coping skills a *risk factor*, it is also a potentially therapeutically modifiable factor, which may be instrumental in helping mothers who are at greater risk of developing psychopathology during the infant's NICU stay.

Identifying protective factors

Equally as important as identifying mothers at risk for the development of psychopathology in the context of an infant's NICU hospitalization is identifying buffering or protective factors, especially variables that may be modifiable in order to assist mothers most at risk.

Mother-infant contact. Physical and/or verbal contact between the mother and infant played an important protective role at baseline, buffering the association between risk factors (previous mental illness, number of infant health problems, coping style) and psychopathological symptoms. Mothers who had been previously diagnosed with a mental illness, had babies with more health problems, or had fewer coping skills *who interacted with their infants more frequently* had levels of psychopathological symptoms that did not significantly differ from mothers with none of these risk factors. Taken together, it is clear that mother-infant contact in the NICU plays an important buffering role, diminishing the relation between risk factors and psychopathological symptoms during the time of hospitalization.

However, it is perhaps even more important to look at the impact of mother-infant contact over time on the development of psychopathological symptoms. At six months, mothers of infants with *fewer* health problems at baseline who interacted with their infants in the NICU had significantly lower levels of PTSD six months later, but this was not the case for mothers of infants with *more* health problems at baseline. Notably, this is the opposite of the function mother-infant contact served at baseline, protecting against the association between more health problems and psychopathology. This suggests that six months post-birth, mothers of infants who were less severely ill remained high in PTSD symptoms if they had less infant contact in the

NICU. Mother-infant contact in the NICU may have short-term benefits for mothers of sicker infants and long-term benefits for mothers of healthier infants.

For some mothers, physical interaction (e.g., holding, touching) with their infants is difficult or impossible due to medical condition or severity. For this reason, we re-ran analyses including mother-infant contact, this time examining *verbal contact* alone, and controlling for physical contact. Our findings suggest that verbal mother-infant contact plays a similar protective role, buffering the associations between *previous mental illness* and psychopathology at baseline, and also interacting with *number of infant health problems* to predict PTSD at six months. This is important information, especially concerning mothers previously diagnosed with a mental illness and/or whose infants are very sick and cannot be held or touched. Simply speaking, singing, or making sounds to their infant can diminish the association between previous and current psychopathology in this context, and the link between infant health and psychopathology over time.

Maternal optimism and hope/pessimism about infant recovery. For maternal psychopathology six months post-birth, optimism was an important protective mechanism, buffering against the association of infant length of stay in the NICU on the development of both maternal anxiety and depression. Additionally, maternal hope vs. pessimism about the infant's potential for recovery moderated the association of length of stay on the development of PTSD at six months. These factors suggest that hope, expectations, and beliefs are crucial in protecting mothers against the impact of risk factors related to infant health. These findings are fitting with previous research suggesting that some intervention programs in the NICU work by affecting maternal *beliefs* about the infant and recovery (e.g., The COPE Program; Melnyk et al., 2006). While trait optimism may not be therapeutically modifiable, providing realistic information

(when available) about the infant's potential for recovery and helping mothers to develop hope may be very important when infants are more severely ill or medically compromised.

Nurse impressions

Given that 81.3% of mothers said that they interacted with *nurses* more frequently than any other staff member (with 96.7% stating that nurses were among the staff members they interacted with most) it is highly important to address nurses' impressions of mother-nurse interactions in the NICU. Surprisingly, there has been little to no research investigating *both* mother and nurse impressions of mother-nurse interactions in any medical setting, especially the NICU. Our findings showed that specific nurse impressions of mothers were associated with maternal symptomatology both during hospitalization *and* six months post-birth. While a more positive nurse rating of the mother-nurse interaction was associated with lower PTSD and depression symptoms during hospitalization, it was the nurse rating of *how much mothers understood what was explained to them* that had both an immediate and long-term relation to symptoms. The perception by nurses that mothers understood *more* of what was explained to them was associated with lower anxiety and depression symptoms during hospitalization, *and* were associated with these symptoms six months later as well.

These findings suggest that mothers' comprehension of treatment procedures and explanations of infant care may be protective against the development of psychopathological symptoms, and that this effect carries through beyond the hospital stay. Therefore, it is important for mothers to receive information that they can comprehend, and for staff (especially nurses) to *help mothers understand* what is occurring in the NICU with their infant in order to protect against depression and anxiety symptoms over time.

Recommendations for NICU programming

The vast majority of programming aimed at buffering psychopathological reactions in mothers during the NICU hospitalization of an infant has not only been broadly applied to mothers with differing psychopathological reactions, but applied to mothers regardless of whether they are exhibiting symptoms *at all* (e.g., Lindsay et al., 1993; Preyde & Ardal, 2003). However, there is evidence that *not all* mothers of NICU infants require prevention or intervention programming (Carter, Mulder, Bartram, & Darlow, 2004), and tremendous amounts of time and money are spent on enrolling all parents, even those who may not be at risk. This study calls for programming with specific components aimed at mothers at risk for developing psychopathological symptoms during and/or following hospitalization.

Screening mothers at admission. At the time of the infant's admission to the Neonatal Intensive Care Unit, the mother should be screened for prior or current psychiatric diagnoses. Given the significant association between prior mood and anxiety disorders and psychopathological reactions in the current study, mothers who carry psychiatric diagnoses should be strongly encouraged to enroll in preventive programming. In addition, if possible on admission, the NICU team should flag mothers of infants in the moderate- to late-preterm gestational age range who are more severely ill (i.e., carry a greater number of medical diagnoses or will require a longer length of stay in the NICU). These mothers should also be encouraged to enroll in programming based on associations between number of health problems and psychopathological responses at baseline, and the association of symptoms six months later with both number of health problems and length of stay.

In addition to screening for prior psychiatric diagnoses and infant medical severity, implementing brief PTSD, anxiety, and depression screening tools in the NICU with all mothers would assist in targeting programming to mothers *who need it* rather than all mothers, saving

valuable time and monetary resources. Examples of such tools were used in the current study: the PTSD Checklist (PCL; Weathers et al., 1993); Generalized Anxiety Disorder-7 Item (GAD-7; Spitzer, Kroenke, Williams, & Lowe, 2006); and Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977).

Developing targeted NICU programming. The current study elucidates multiple therapeutically modifiable factors that moderate the impact of identified risk factors on the development of maternal psychopathology. These factors form three key elements to be included in preventive NICU programming aimed at mothers at risk: *parent education, enhancing coping skills, and mother-infant contact* (verbal and/or physical). Programming *specifically* aimed at mothers at risk, with sicker infants or previous psychiatric illness, which include these three components, are likely to have a highly beneficial effect on mothers who might otherwise develop serious mental health problems during/following the NICU hospitalization of an infant.

Providing parent education. Trait optimism was generally shown to be a protective factor, and positive expectations/hope specifically about the infant's potential for recovery was also shown to protect against the development of psychopathology for mothers at risk (e.g, with sicker babies). Additionally, nurse-report that the mother understood more of what was explained to her was associated with better outcomes for mothers immediately and long-term. Altogether, these results suggest that mothers at risk would benefit greatly from parent education programming aimed at helping mothers to form *realistic* positive expectations about infant recovery depending on the infant's diagnosis and prognosis. This may include designating specific times to meet with doctors to learn about the infant's condition, or even printed, case-specific information given to each mother to keep and review. In addition, it is important to

provide this information in the parent's language and at the parent's educational level in order to increase comprehension.

The March of Dimes Foundation implemented a family-centered care initiative in 2001, which involved a substantial parent education component (Cooper et al., 2007). Features of this initiative included a specialist designated to help families understand procedures and infant health condition; Parent Education Hours and Sibling Education Groups; and parent-to-parent support. Families who participated in these activities felt more knowledgeable about what to expect in terms of growth and development given their baby's specific medical condition (Cooper et al., 2007). While these findings were not linked to parental psychopathological symptoms, our results suggest that by way of increasing maternal knowledge and understanding, these types of activities are likely to be highly beneficial toward reducing PTSD, anxiety, and depression symptoms, especially for mothers most at risk.

Another program – Creating Opportunities for Parent Empowerment (COPE; Melnyk et al., 2006), mentioned above – also includes a significant parent education component as well as a behavioral component. This intervention involves providing parents with specific information on the appearance and behaviors of premature infants and how parents can participate in care, coupled with activities intended to help parents *use* the information provided. Parents in the COPE program had better mental health outcomes and reduced length of stay compared to parents who were not involved in the program (Melnyk et al., 2006).

While both of these programs are intended to include *all* parents of NICU infants rather than targeting the interventions specifically to mothers/parents most at risk, the parent education elements have been shown to be acceptable and helpful.

Enhancing coping skills. A forward-focused coping style was associated with reduced PTSD, anxiety, and depression symptoms during hospitalization, and buffered the association between lack of mother-infant contact and psychopathological symptoms. NICU preventive programming targeted toward mothers most at-risk should include a component specifically aimed at helping mothers to develop these coping skills as they apply to the infant's condition. Coping skills groups have shown effectiveness over and above support groups in hospital settings with various patient populations, including those with traumatic brain injury (Anson & Ponsford, 2006), cancer (Telch & Telch, 1986), and children undergoing surgery (Zastowny et al., 1986). While studies have not examined the utility of coping skills groups with NICU mothers/parents, our results provide evidence that such groups may be of assistance for mothers most at-risk toward developing more helpful coping styles and strategies.

Increasing mother-infant contact. Given the protective role that contact with the infant plays – both immediately and over time – it is crucial that mother-infant contact is a fundamental component of any NICU preventive or intervention program. Programs such as Kangaroo Care (Anderson, 1991; Feldman et al., 2002; Roller, 2005) focus on skin-to-skin mother-infant contact, which has been shown to enhance maternal attachment and confidence and result in less negative affect (Feldman et al., 2002). If it is medically possible, it is highly important for mothers to have the opportunity to hold and touch their infants.

However, for a subset of mothers with very sick infants, skin-to-skin contact or even gentle touching is not recommended, and might not be possible. Doctors frequently advise mothers of very fragile babies not to touch them at all. Additionally, these are the mothers who may be *most* at risk, with highly medically compromised infants who may require lengthy NICU stays. Our findings regarding *verbal infant interaction* are especially important for these mothers.

Simply interacting with the infant verbally – speaking, singing, or making sounds to the infant – buffered the relation between previous mental illness and PTSD symptoms during hospitalization. In addition, six months post-birth, mothers of infants with fewer health problems remained higher in PTSD symptoms if they had *not* interacted verbally with the infant in the NICU. While verbal infant contact did not serve the same protective function with mothers of sicker infants (more health problems, longer length of stay) as did a combination of verbal *and physical* interaction, mothers with current or previous mental health problems may benefit greatly from verbally bonding with their infant, especially if they cannot hold or touch the infant.

It is highly recommended that targeted NICU programming include *both* verbal and physical mother-infant contact if possible. This bonding may importantly protect against the negative impact of maternal psychiatric problems and more severe infant health problems. In addition, lack of mother-infant contact *compounded* the negative relation between poor coping skills and maternal mental health. Programming aimed at enhancing both of these components is likely to significantly improve maternal mental health, especially during hospitalization. Of note, no programs to our knowledge have included a specific *verbal contact* component in addition to maximizing physical contact.

A three-part preventive program model. In sum, a highly targeted preventive program model is recommended for use in Neonatal Intensive Care Units, composed of three distinct and complementary parts. Mothers should be screened at admission for current or prior psychiatric problems, and also flagged if their infants are severely ill or high-risk. These mothers should be encouraged to enroll in this three-part program, comprised of *infant health education, coping skills group, and mother-infant verbal and/or physical bonding time.*

Limitations and Future Directions

It is important to note several limitations of the current study. First, the data included in this study focused only on mothers who were able or willing to visit their infants in the NICU. Obstacles such as living far away from the NICU, cost associated with visiting, other children at home to care for, maternal health problems, lack of transportation, and no maternity leave time may deter certain mothers from visiting their infants in the NICU, and thus from participation in our study. It is important for future studies to contact these mothers to better understand why they cannot or do not visit, and how this may impact mental health functioning during and after hospitalization.

In addition, the current study focused only on *mothers* of NICU infants. While it is important to understand risk and protective factors specifically for mothers, it is also important to understand how *fathers* and *siblings* function during and after hospitalization, and how their mental health might be compromised in the context of this stressor. Future studies that focus on fathers and siblings would add valuable information to the current body of literature on family functioning surrounding infant hospitalization in the Neonatal Intensive Care Unit. This information would also be of assistance toward creating family-focused programming, inclusive of all family members, and helping to build family cohesion during and after hospitalization.

Another limitation of the current study was that the sample size was relatively small, and thus did not allow for larger, multivariate analysis to determine the most robust predictors of psychopathological responses over time. Research in the future should examine a larger sample of NICU mothers in order to conduct more in-depth longitudinal analyses of risk and protective factors.

Finally, future studies will need to pilot and test the efficacy of the proposed screening and programmatic components in order to assess feasibility, acceptability, and effectiveness with the target population. Such future research would be a huge step toward helping mothers most at risk of developing PTSD, anxiety, and depression symptoms stemming from their infant's hospitalization in the NICU.

Conclusions

Within the context of these limitations, the current study represents an important first step toward building *targeted, preventive* programming for high-risk NICU mothers, including careful screening procedures and a three-component model, including *education, skills-building, and mother-infant bonding*. We used a longitudinal design to identify major risk factors associated with increased psychopathological symptoms in mothers both *during* and *six months after* the infant's NICU hospitalization, including previous mental health problems, more severe infant medical problems, and a lack of forward-focused coping skills. We also used information from mothers *and nurses* to identify important protective factors that buffered the impact of these risk factors, including mother-infant contact (both verbal and physical), hope for the infant's recovery, understanding information about the infant's condition, and optimism. Using this information, we proposed a preventive program model that, if proven feasible and effective, may have enormous implications for caring for mothers in Neonatal Intensive Care Units throughout the country.

Table 1
Correlation Matrix for Mother-Report and Nurse-Report of NICU Experience (N = 44)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. MOM-INTERACT VERBALLY																
2. MOM-INTERACT PHYSICALLY	.42***															
3. MOM-CONVERSE WITH PARENTS	.32***	.14														
4. MOM-QUESTIONS TO STAFF	.42***	.39***	.11													
5. MOM-CONVERSE WITH STAFF	.49***	.45***	.14	.56***												
6. MOM-PARENT THERAPY GROUP	.15	.03	.32**	-.21*	.04											
7. MOM-TIME ALONE	.11	.11	.10	-.03	-.01	.29**										
8. MOM-CATCH UP ON WORK	.14	.05	.12	-.00	.06	.09	.30**									
9. NURSE-INTERACT VERBALLY	.32*	.22	.31*	.42**	.42**	-.10	-.16	.34*								
10. NURSE-INTERACT PHYSICALLY	.40*	.39**	.36*	.35*	.34*	-.05	-.04	.28	.87***							
11. NURSE-CONVERSE WITH PARENTS	.22	.35*	.48**	.31	.30	.08	-.01	.30	.34*	.44**						
12. NURSE-QUESTIONS TO STAFF	.28	.22	.26	.43**	.44**	-.02	-.09	.25	.51***	.42**	.55***					
13. NURSE-CONVERSE WITH STAFF	.23	.23	.22	.30	.39*	-.05	-.15	.38*	.62***	.57***	.48***	.78***				
14. NURSE-PARENT THERAPY GROUP	.23	.13	.33	.36	.29	.30	.32	.00	.29	.22	.37	.30	.14			
15. NURSE-TIME ALONE	.25	.23	.28	.23	.24	.03	.03	-.14	.15	.34	.33	.31	.15	.52*		
16. NURSE-CATCH UP ON WORK	.01	.14	.18	.06	.01	-.16	-.27	.09	-.13	-.14	.47**	.20	.11	.27	.27	
MEAN	4.56	4.79	2.68	4.63	4.41	1.56	2.08	1.44	4.36	4.51	3.19	4.09	4.27	1.81	2.09	1.79
STANDARD DEVIATION	.88	.61	1.33	.68	.87	1.08	1.27	.97	.81	.67	1.19	1.00	.84	.93	1.13	1.25

* $p \leq .10$ * $p < .05$. ** $p < .01$. *** $p < .001$
 Notes: Mom = Mother-report; Nurse = Nurse-report

Table 2

Means and Standard Deviations of Moderate- and Late-Preterm Mothers for Outcome Variables

VARIABLE	N	M	SD	T	P
PTSD (BSL)					
MODERATE	46	28.17	11.33	.96	.34
LATE	45	25.78	12.41		
ANXIETY (BSL)					
MODERATE	44	5.91	5.90	-.23	.82
LATE	45	6.20	5.95		
DEPRESSION (BSL)					
MODERATE	45	4.84	3.75	-.10	.92
LATE	45	4.93	4.51		
PTSD (6M)					
MODERATE	38	26.24	10.14	-.73	.47
LATE	38	28.03	11.17		
ANXIETY (6M)					
MODERATE	38	5.11	5.13	-.85	.40
LATE	38	6.13	5.38		
DEPRESSION (6M)					
MODERATE	38	14.71	3.81	-.64	.53
LATE	38	15.32	4.43		

Note. BSL = Baseline assessment (during hospitalization); 6M = six months post-birth;
 Cut score for PCL (PTSD): 38; Cut score for GAD-7 (Anxiety): 10; Cut score for CES-D
 (Depression): 8

Table 3
Correlation Matrix for Baseline Variables (N = 91)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. DEPRESSION SYMPTOMS															
2. ANXIETY SYMPTOMS	.78***														
3. PTSD SYMPTOMS	.77***	.70***													
4. PREVIOUS DIAGNOSIS	.24*	.29*	.17+												
5. AGE	.09	-.04	-.10	.02											
6. YEARS EDUCATION	.06	.14	-.01	.00	.17										
7. YEARLY INCOME	.02	.06	-.16	-.09	.25*	.22									
8. TIME-ADMIT TO BSL	.05	-.05	.11	-.15	.09	-.07	.01								
9. MOM-INFANT CONTACT	-.11	-.15	-.18	.01	-.05	.06	-.02	.11							
10. # HEALTH PROBLEMS	.19+	.17+	.14+	-.11	.00	.05	.23*	.01	.16						
11. FORWARD-FOCUS	-.23*	-.25*	-.17+	-.07	.01	.02	-.06	.05	-.06	.03					
12. TRAUMA-FOCUS	.09	.16	.06	.02	.06	.16	.03	-.15	-.27*	-.08	.29**				
13. PESSIMISM-INFANT RECOVERY	.07	.07	.04	-.12	.06	.17	.32**	.29**	.06	.17	-.09	-.02			
14. MATERNAL OPTIMISM	-.52***	-.49***	-.55***	-.37***	-.01	.00	.12	-.08	.08	-.14	.38***	.01	-.02		
15. LENGTH OF STAY	.07	.01	.08	.01	.00	.05	.00	.09	.13	.42***	-.06	-.15	.25*	-.06	
MEAN	4.89	6.06	26.99	1.0	32.45	14.29	111.99	34.77	9.35	1.36	63.67	38.71	8.52	21.68	33.25
STANDARD DEVIATION	4.13	5.90	11.87	.30	6.78	4.30	180.35	27.28	1.26	1.13	12.88	7.33	6.94	5.09	36.04

* $p < .10$ ** $p < .05$ *** $p < .01$ **** $p < .001$

Notes: Previous Diagnosis = Maternal previous mental illness diagnosis; Time-Admit to BSL = Time (in days) between admission to the NICU and baseline assessment; # health problems = Number of reported infant health problems by the mother at baseline; Pessimism-Infant Recovery = Mother's pessimism about the potential for the infant's recovery

Table 4Moderation of mother-infant contact on previous mental illness **at baseline** (N = 91)

Model and variable	B	SE	t	sr ²
Model 1	PTSD Symptoms ^a			
Previous Mental Illness	124.23*	55.73	2.23	.05
Mother-Infant Contact	-1.39	.99	-1.41	.02
PMI x M-I Contact	-12.45*	5.93	-2.10	.05
Model 2	Anxiety ^b			
Previous Mental Illness	52.19 [♦]	27.36	2.55	.04
Mother-Infant Contact	-.55	.49	-1.11	.01
PMI x M-I Contact	-4.97[♦]	2.91	-1.71	.03
Model 3	Depression ^c			
Previous Mental Illness	27.79	19.70	1.41	.02
Mother-Infant Contact	-.28	.36	-.78	.01
PMI x M-I Contact	-2.63	2.10	-1.72	.02

Note. PMI = Previous mental illness; M-I Contact = Mother-infant contact

[♦] $p \leq .10$ * $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

^a Model 1: $F(3, 85) = 3.57, p < .05; R^2 = .112$.

^b Model 2: $F(3, 83) = 4.06, p = .01; R^2 = .128$.

^c Model 3: $F(3, 84) = 2.34, p = .08; R^2 = .077$.

Table 5Moderation of mother-infant contact on infant health problems **at baseline** (N = 91)

Model and variable	B	SE	t	sr ²
Model 1	PTSD Symptoms ^a			
Infant Health Problems	9.48	11.88	.80	.01
Mother-Infant Contact	-1.34	1.34	-1.00	.01
IHP x M-I Contact	-.79	1.23	-.64	.00
Model 2	Anxiety ^b			
Infant Health Problems	15.80**	5.62	2.81	.08
Mother-Infant Contact	.09	.64	.14	.00
IHP x M-I Contact	-1.52**	.58	-2.62	.07
Model 3	Depression ^c			
Infant Health Problems	4.91	4.09	1.20	.02
Mother-Infant Contact	-.26	.46	-.57	.00
IHP x M-I Contact	-.42	.42	-1.00	.01

Note. IHP = Infant health problems; M-I Contact = Mother-infant contact

♦ $p \leq .10$ * $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

^a Model 1: $F(3, 82) = 1.69, p = .18; R^2 = .058$.

^b Model 2: $F(3, 81) = 4.33, p = .01; R^2 = .138$.

^c Model 3: $F(3, 82) = 2.20, p = .09; R^2 = .074$.

Table 6Moderation of mother-infant contact on coping style **at baseline** (N = 91)

Model and variable	B	SE	t	sr ²
Model 1	PTSD Symptoms ^a			
Forward-Focused Coping	-.66	.54	-1.23	.02
Mother-Infant Contact	-5.18	4.07	-1.28	.02
FF x M-I Contact	.05	.06	.93	.01
Model 2	Anxiety ^b			
Forward-Focused Coping	-.69 ^{**}	.25	-2.71	.08
Mother-Infant Contact	-4.91 ^{**}	1.92	-2.55	.07
FF x M-I Contact	.06[*]	.03	2.31	.06
Model 3	Depression ^c			
Forward-Focused Coping	-.33 [♦]	.19	-1.78	.04
Mother-Infant Contact	-2.26	1.41	-1.61	.03
FF x M-I Contact	.03	.02	1.42	.02

Note. FF = Forward-focused coping style; M-I Contact = Mother-infant contact

♦ $p \leq .10$ * $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

^a Model 1: $F(3, 81) = 1.91, p = .13; R^2 = .066$.

^b Model 2: $F(3, 80) = 4.03, p = .01; R^2 = .131$.

^c Model 3: $F(3, 81) = 2.39, p = .08; R^2 = .081$.

Table 7
Correlation Matrix for Nurse Ratings (N = 44)

	1	2	3	4	5	6	7
1. T1 PTSD SYMPTOMS							
2. T1 ANXIETY SYMPTOMS	.70 ^{***}						
3. T1 DEPRESSION SYMPTOMS	.77 ^{***}	.78 ^{***}					
4. NURSE RATING: NURSE-MOTHER INTERACTION QUALITY	-.32 [*]	-.22	-.36 [*]				
5. NURSE RATING: MOTHER UNDERSTANDS WHAT IS EXPLAINED TO HER BY NURSE	-.30	-.31 [*]	-.37 [*]	.31 [*]			
6. NURSE RATING: MOTHER ASKS TECHNICAL QUESTIONS	-.20	-.18	-.21	.22	.26		
7. NURSE RATING: MOTHER ASKS HOW TO CARE FOR HER BABY	-.25	-.20	-.27	.22	.34 [*]	.65 [*]	
MEAN	26.99	6.06	4.89	1.59	1.42	2.80	2.16
STANDARD DEVIATION	11.87	5.90	4.13	.58	.73	1.30	1.08

♦ $p \leq .10$ * $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

Note. Nurse Rating: Nurse-Mother Interaction Quality = nurse rating in response to question, “If you have spent time interacting with this mother, how would you characterize these experiences overall?”; Nurse Rating: Mother Understands what is Explained to her by Nurse = Nurse rating in response to question, “In your opinion, how much does this mother understand when you explain things to her?”; Nurse rating: mother asks technical questions = Nurse rating in response to question, “Does this mother ask technical questions (e.g., about the equipment, etc.)?”; Nurse rating – mother asks how to care for her baby = Nurse rating in response to question, “Does this mother ask about how to best care for her baby?”

Table 8

Nurse report and six-month mother psychopathology (N = 44)

Model and variable	B	SE	t	sr ²
Model 1	Six-month PTSD symptoms ^a			
Baseline PTSD	.18	.18	.95	.03
Mother visits per week	-.49	1.49	-.33	.00
Positive mother-nurse interaction	-2.13	4.10	-.52	.01
Mother-understands explanations	-4.47	3.31	-1.35	.05
Mother-technical questions	-.92	2.34	-.39	.00
Mother-asks how to care	-1.66	3.70	-.45	.01
Model 2	Six-month anxiety ^b			
Baseline anxiety	-.01	.18	-.05	.00
Mother visits per week	-.74	.74	-.23	.03
Positive mother-nurse interaction	-1.66	1.92	-.86	.02
Mother-understands explanations	-3.77*	1.61	-2.34	.15
Mother-technical questions	-.25	1.15	-.05	.00
Mother-asks how to care	-2.56	1.83	-1.40	.05
Model 3	Six-month depression ^c			
Baseline depression	.26	.17	1.49	.04
Mother visits per week	-.31	.47	-.67	.01
Positive mother-nurse interaction	-.70	1.24	-.57	.01
Mother-understands explanations	-4.04*	1.03	-3.92	.28
Mother-technical questions	-.60	.72	-.83	.01
Mother-asks how to care	-1.02	1.14	-.89	.01

Note. Mother-nurse interaction = nurse rating in response to question, “If you have spent time interacting with this mother, how would you characterize these experiences overall?”; Mother-understands explanations = Nurse rating in response to question, “In your opinion, how much does this mother understand when you explain things to her?”; Mother-technical questions = Nurse rating in response to question, “Does this mother ask technical questions (e.g., about the equipment, etc.)?”; Mother-asks how to care = Nurse rating in response to question, “Does this mother ask about how to best care for her baby?”

* $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

^a Model 1: $F(6, 27) = .89, p = .52; R^2 = .165$.

^b Model 2: $F(6, 26) = 1.63, p = .18; R^2 = .273$.

^c Model 3: $F(6, 27) = 4.71, p < .01; R^2 = .511$.

Table 9
Correlation Matrix for Six-Month Variables (N = 76)

	1	2	3	4	5	6	7	8	9	10
1. T2 DEPRESSION										
2. T2 ANXIETY	.76***									
3. T2 PTSD	.59***	.69***								
4. T1 DEPRESSION	.47***	.36***	.37***							
5. T1 ANXIETY	.40***	.35**	.33**	.78***						
6. T1 PTSD	.34**	.27*	.41***	.77***	.70***					
7. AGE	.17	.11	.21	.09	-.04	-.10				
8. YRS EDUCATION	-.05	.07	.07	.06	.14	-.01	.17			
9. YEARLY INCOME	-.14	-.14	-.02	.02	.06	-.16	.26*	.22		
10. TIME-ADMIT TO BSL	.06	-.12	-.08	.05	-.05	.11	.09	-.07	.01	
MEAN	15.01	5.62	27.13	4.89	6.06	26.99	32.45	14.29	111.99	34.77
STANDARD DEVIATION	4.11	5.25	10.63	4.13	5.90	11.87	6.78	4.30	180.35	27.28

♦ $p \leq .10$ * $p < .05$. ** $p < .01$. *** $p < .001$

Note. YRS Education = Years of education completed by the mother; Time-Admit to BSL = Time (in days) between admission to the NICU and baseline assessment

Table 10Moderators of risk factors associated with **PTSD at six months post-birth** (N = 76)

Model and variable	B	SE	t	sr ²
Step 1 ^a				
PTSD (Baseline)	.12	.09	1.29	.01
Optimism	-.43*	.22	-1.98	.03
Length of Stay (days)	.06*	.03	2.23	.04
Infant Health Problems	2.00*	.87	2.30	.04
Mother-Infant Contact	-2.67***	.76	-3.52	.10
Pessimism (Baseline)	.10	.14	.72	.00
Step 2 ^b				
PTSD (Baseline)	.24**	.09	2.77	.05
Optimism	-.43	.33	-1.31	.01
Length of Stay (days)	.42	.45	-.94	.01
Infant Health Problems	26.91**	9.20	-2.93	.06
Mother-Infant Contact	-4.69***	1.41	-3.34	.08
Pessimism (Baseline)	.42 [♦]	.24	-1.75	.02
LOS x Pessimism	.01***	.00	3.53	.08
LOS x Mother-Infant Contact	.03	.04	.72	.00
LOS x Optimism	.00	.00	.03	.00
IHP x Pessimism	.09	.11	.81	.00
IHP x Mother-Infant Contact	2.70**	.85	3.18	.07
IHP x Optimism	.09	.18	.55	.00

Note. LOS = Length of stay; Previous MI = Previous mental illness diagnosis; IHP = Infant health problems (total number reported by mother at baseline); Pessimism = Mother's pessimism about the potential for the infant's recovery

[♦] $p \leq .10$ * $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

^a Model: $F(7, 78) = 6.88, p < .001; R^2 = .381$.

^b Model: $F(13, 72) = 6.57, p < .001; R^2 = .542$.

Table 11Moderators of risk factors associated with **anxiety at six months post-birth** (N = 76)

Model and variable	B	SE	t	sr ²
Step 1				
Anxiety (Baseline)	.12	.09	1.23	.01
Previous Mental Illness	3.28 [♦]	1.72	1.91	.03
Optimism	-.18 [♦]	.11	-1.63	.03
Length of Stay (days)	.02 [♦]	.02	1.64	.03
Infant Health Problems	.74	.50	1.47	.02
Step 2				
Anxiety (Baseline)	.13	.09	1.37	.02
Previous Mental Illness	4.00	6.32	.63	.00
Optimism	-.21	.21	-1.00	.01
Length of Stay (days)	.10 [*]	.05	2.01	.04
Infant Health Problems	1.35	2.19	-.62	.00
Previous MI x Optimism	-.08	.35	-.24	.00
LOS x Optimism	-.00[♦]	.00	-1.62	.03
IHP x Optimism	.10	.10	.98	.01

Note. LOS = Length of stay; Previous MI = Previous mental illness diagnosis; IHP = Infant health problems (total number reported by mother at baseline)

[♦] $p \leq .10$ * $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

^a Model: $F(5, 82) = 6.23, p < .001; R^2 = .255$.

^b Model: $F(7, 80) = 4.62, p < .001; R^2 = .225$.

Table 12Moderators of risk factors associated with **depression at six months post-birth** (N = 76)

Model and variable	B	SE	t	sr ²
Step 1 ^a				
Depression (Baseline)	.29**	.10	2.82	.07
Previous Mental Illness	1.85	1.32	1.40	.02
Optimism	-.09	.09	-1.02	.01
Length of Stay (days)	.02*	.01	2.20	.04
Step 2 ^b				
Depression (Baseline)	.29**	.10	2.80	.07
Previous Mental Illness	2.32	4.79	.48	.00
Optimism	.00	.11	.00	.00
Length of Stay (days)	.09*	.04	2.10	.04
Previous MI x Optimism	-.04	.28	-.14	.00
LOS x Optimism	-.00[♦]	.00	-1.58	.03

Note. LOS = Length of stay; Previous MI = Previous mental illness diagnosis

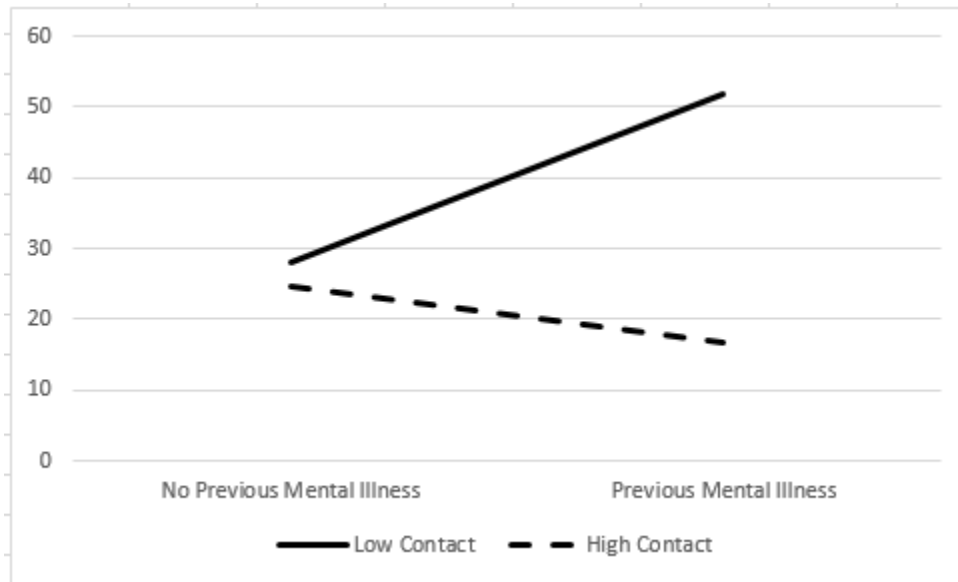
[♦] $p \leq .10$ * $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

^a Model: $F(4, 86) = 7.41, p < .001; R^2 = .256$.

^b Model: $F(6, 84) = 5.52, p < .001; R^2 = .231$.

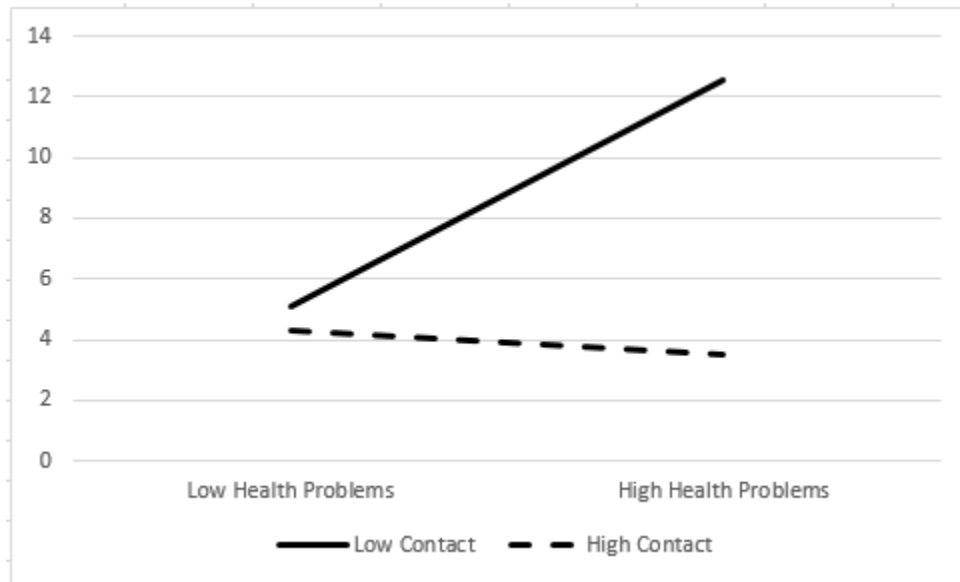
Figure 1

Baseline PTSD symptoms



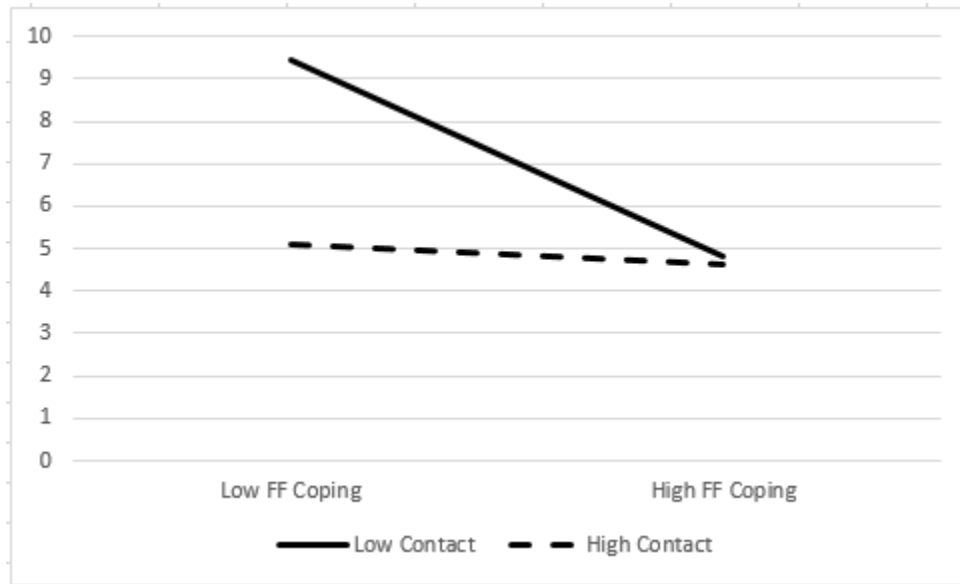
Note: Contact = Mother-infant contact; Previous Mental Illness = Mother previously diagnosed with a mental illness

Figure 2
Baseline anxiety



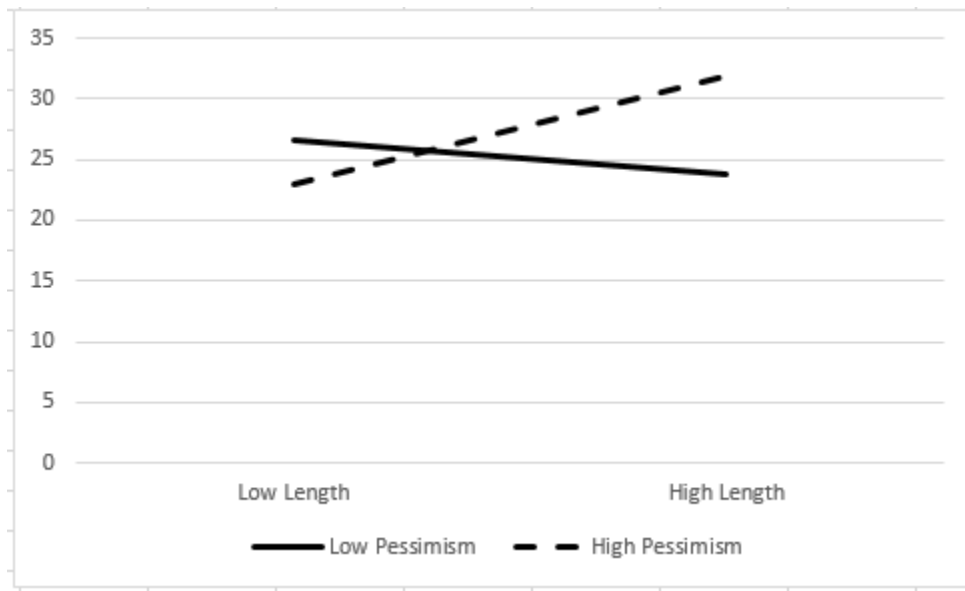
Note: Contact = Mother-infant contact; Health problems = Total number of infant health problems reported by mother at baseline

Figure 3
Baseline anxiety



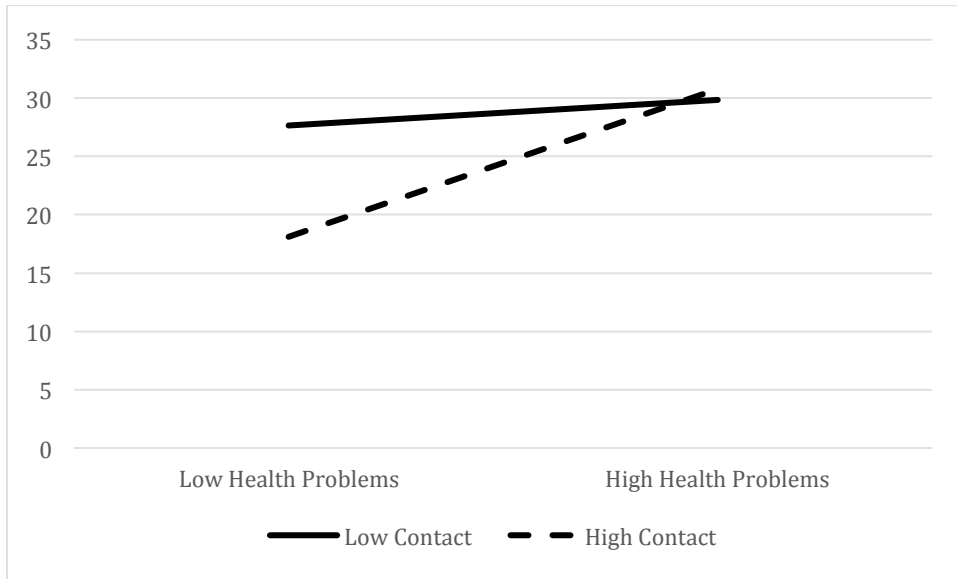
Note: Contact = Mother-infant contact; FF Coping = Forward-focused coping style

Figure 4
Six-month PTSD symptoms



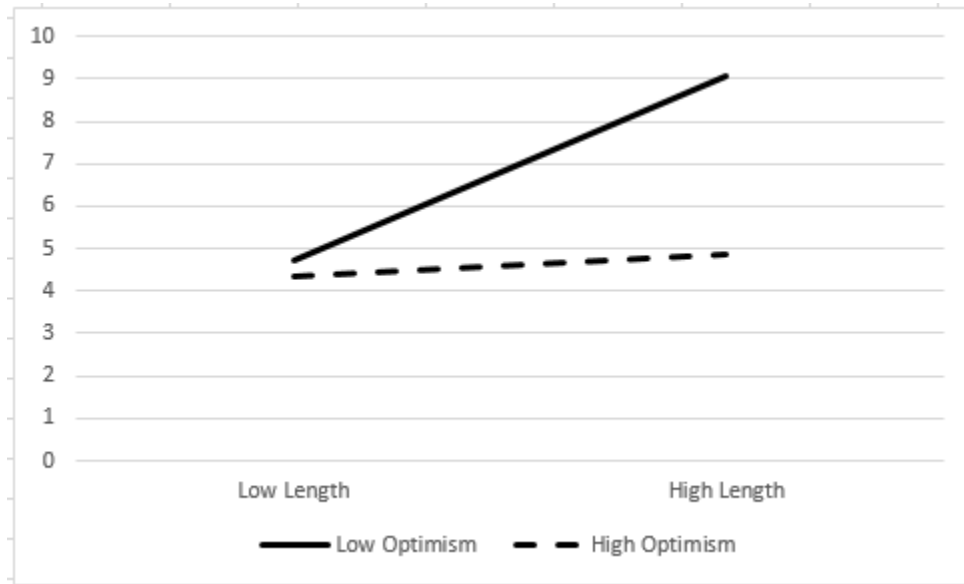
Note: Length = Infant length of stay in NICU; Pessimism = Mother's pessimism about the potential for the infant's recovery

Figure 5
Six-month PTSD symptoms



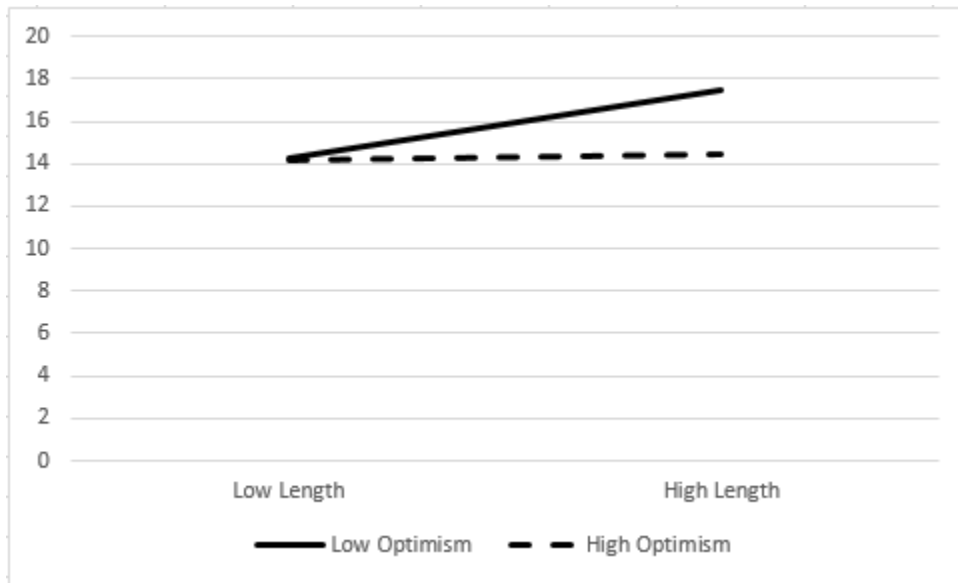
Note: Health problems = Total number of infant health problems reported by mother at baseline;
Contact = Mother-infant contact in the NICU

Figure 6
Six-month anxiety symptoms



Note: Length = Infant length of stay in NICU; Optimism = Maternal optimism

Figure 7
Six-month depression symptoms



Note: Length = Infant length of stay in NICU; Optimism = Maternal optimism

Figure Captions

Figure 1. Mother-infant contact as a moderator of the association between previous psychiatric diagnosis and maternal baseline PTSD symptoms.

Figure 2. Mother-infant contact as a moderator of the association between number of infant health problems and maternal baseline anxiety.

Figure 3. Mother-infant contact as a moderator of the association between forward-focused coping style and maternal baseline anxiety.

Figure 4. Mother's pessimism about the infant's recovery as a moderator of the association between infant length of stay and PTSD symptoms at six months post-birth.

Figure 5. Mother-infant contact in the NICU as a moderator of the association between number of infant health problems and PTSD symptoms at six months post-birth.

Figure 6. Maternal optimism as a moderator of the association between infant length of stay and anxiety symptoms at six months post-birth.

Figure 7. Maternal optimism as a moderator of the association between infant length of stay and depression symptoms at six months post-birth.

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APPENDIX 1: BASELINE MOTHER QUESTIONNAIRE

Participant # _____

Date Completed ____ / ____ / ____

**NICU Experience Study Questionnaire
(Mother Version)**

Instructions: The attached questionnaire will take approximately 25 minutes to complete. We recommend finding a block of time and a quiet place so that you can complete the questionnaire without undue distractions. It is best to finish the questionnaire in one sitting if possible, but you may complete it in more than one sitting if necessary.

Note: To ensure confidentiality of your responses, *please do not write your name anywhere on this booklet.*

DEMOGRAPHIC AND BACKGROUND INFORMATION

1. What is your age? _____ years

2. Gender _____ (1. F/2. M)

3. Do you have a religious affiliation? You may indicate more than one.

- 1. Christian _____
- 2. Jewish _____
- 3. Muslim _____
- 4. None _____
- 5. Other _____

4. What racial categories do you qualify as? You may indicate more than one.

- 1. American Indian/Alaskan Native _____
- 2. Asian _____
- 3. Native Hawaiian/Pacific Islander _____
- 4. Black/African American _____
- 5. Caucasian _____
- 6. Other _____

5. Do you qualify as Hispanic? _____ 1. Yes _____ 2. No

6. How many years of education have you completed? _____ Years

7. Are you currently employed?

- 1. Yes _____
- 2. No _____

8. If you are employed, approximately how many hours per week do you work? _____

9. How many children do you have (counting your child in the NICU)? _____

10. What are the ages of your *other* children? (not including your infant in the NICU)

11. What is the birth order of your infant currently in the NICU? (e.g., 1st, 2nd, 3rd)? _____

12. Have you ever had another infant hospitalized in the NICU?

- 1. Yes _____
- 2. No _____

If Yes, how many other children were hospitalized in the NICU? _____

13. What is your marital status?

- 1. Married _____
- 2. Separated _____
- 3. Divorced _____

- 4. Single _____
- 5. Living with partner _____

14. What is your current yearly family income? _____

15. What town or borough do you live in? _____

16. If you have visited the NICU, how long does it usually take you to get there? _____

17. If you have visited the NICU, what is your method of transportation?

- 1. Car (your drive yourself) _____
- 2. Car (someone takes you) _____
- 3. Bus _____
- 4. Train _____
- 5. Taxi _____
- 6. Other _____

18. If you have visited the NICU, approximately how much does the trip cost you? (including gas, tolls, public transportation costs, etc.) _____

19. Approximately how many times do you visit the NICU per week? _____

20. Approximately how long is your average visit to the NICU? _____

21. How many times has your infant's father visited the NICU? _____

22. Is your infant's father currently involved? (If YES, move on to question 21. If NO, skip to page 4.)

- 1. Yes _____
- 2. No _____

23. If your infant's father has visited the NICU, did he visit with you

- 1. All the time _____
- 2. Sometimes _____
- 3. Never _____

24. How important to you is your infant's father's involvement?

- 1. Very _____
- 2. Somewhat _____
- 3. Neutral _____
- 4. Unimportant _____

25. How emotionally supportive is your infant's father to you?

- 1. Very _____
- 2. Somewhat _____
- 3. Neutral _____
- 4. Not supportive _____

Health Survey

Please mark which health problems your infant is currently experiencing:

- | | | | | |
|------------------------------|-------|--------|-------|-------|
| 1. Bronchitis | _____ | 1. Yes | _____ | 2. No |
| 2. Pneumonia | _____ | 1. Yes | _____ | 2. No |
| 3. Other breathing problems | _____ | 1. Yes | _____ | 2. No |
| 4. Gastrointestinal problems | _____ | 1. Yes | _____ | 2. No |
| 5. Seizures | _____ | 1. Yes | _____ | 2. No |
| 6. Fever | _____ | 1. Yes | _____ | 2. No |
| 7. Virus | _____ | 1. Yes | _____ | 2. No |
| 8. Vision problems | _____ | 1. Yes | _____ | 2. No |
| 9. Hearing problems | _____ | 1. Yes | _____ | 2. No |
| 10. Cardiac issues | _____ | 1. Yes | _____ | 2. No |
| 11. Skin abnormalities | _____ | 1. Yes | _____ | 2. No |
| 12. Neurological problems | _____ | 1. Yes | _____ | 2. No |
| 13. Physical abnormalities | _____ | 1. Yes | _____ | 2. No |
| 14. Surgery | _____ | 1. Yes | _____ | 2. No |
| 15. Other | _____ | 1. Yes | _____ | 2. No |

If "Other" please briefly describe:

Medication

Please list any medications your baby is currently taking:

NICU Experience

Please indicate how often you engage in the following activities when you are in the NICU (if you have never visited the NICU, please skip to page 5).

	Never	Hardly ever	Sometimes	Most of the time	Nearly always
1. I interact with my baby verbally (e.g., speak, sing, make sounds)	1	2	3	4	5
2. I hold or touch my baby	1	2	3	4	5
3. I have conversations with other parents on the unit	1	2	3	4	5
4. I ask questions to hospital staff (e.g., nurses, doctors, etc.)	1	2	3	4	5
5. I have conversations with hospital staff	1	2	3	4	5
6. I attend the parent therapy group	1	2	3	4	5
7. I spend time by myself (e.g., reading, watching TV)	1	2	3	4	5
8. I catch up on work	1	2	3	4	5

9. If you have spent time interacting with NICU staff, how would you characterize these experiences overall? (Please circle one)

Very positive (1) Positive (2) Neutral (3) Negative (4) Very negative (5)

10. If you have spent time interacting with NICU staff, which staff members have you primarily spent time with?

Physicians (1) Nurses (2) Social Workers (3) Psychologists (4) Other (5)

If Other, please indicate: _____

11. How supportive have you felt the NICU staff has been?

Very supportive (1) Supportive (2) Neutral (3) Unsupportive (4) Very unsupportive (5)

12. How much has NICU staff helped you in preparing for discharge from the NICU?

Very much (1) Somewhat (2) Neutral (3) Not much (4) Not at all (5)

13. If you have spent time with other parents on the NICU, how would you characterize these experiences overall?

Very positive (1) Positive (2) Neutral (3) Negative (4) Very negative (5)

14. If you have spent time with other parents on the NICU, how helpful have these experiences been?

Very helpful (1) Helpful (2) Neutral (3) Unhelpful (4) Detrimental (5)

CDSII

Please briefly write what you believe to be the *reasons or causes* of your infant's hospitalization in the NICU.

Think about the reason or reasons you have written above. The items below concern your impressions or opinions of this cause or these causes of your outcome. Circle one number for each of the following scales.

Is the cause(s) something that:

1. Reflects an aspect of the situation	1	2	3	4	5	6	7	8	9	Reflects an aspect of yourself
2. Is uncontrollable by you or other people	1	2	3	4	5	6	7	8	9	Is controllable by you or other people
3. Is temporary	1	2	3	4	5	6	7	8	9	Is permanent
4. Is unintended by you or other people	1	2	3	4	5	6	7	8	9	Is intended by you or other people
5. Is outside of you	1	2	3	4	5	6	7	8	9	Is inside of you
6. Is variable over time	1	2	3	4	5	6	7	8	9	Is stable over time
7. Is about others	1	2	3	4	5	6	7	8	9	Is about you
8. Is changeable	1	2	3	4	5	6	7	8	9	Is unchanging
9. No one is responsible for	1	2	3	4	5	6	7	8	9	Someone is responsible for

PCL

Below is a list of problems and complains that people sometimes have in response to stressful life experiences (in this case, your child's birth and hospitalization). Please read each one carefully, then **circle** one of the numbers to the right to indicate how much you have been **bothered** by the problem **in the past month**.

BOTHERED BY:	Not at all	A little bit	Moderately	Quite a bit	Extremely
1. Repeated disturbing memories, thoughts, or images of the stressful experience?	1	2	3	4	5
2. Repeated, disturbing dreams of the stressful experience?	1	2	3	4	5
3. Suddenly acting or feeling as if the stressful experience were happening again (as if you were reliving it)?	1	2	3	4	5
4. Feeling very upset when something reminded you of the stressful experience?	1	2	3	4	5
5. Having physical reactions (e.g., heart pounding, trouble breathing, or sweating) when something reminded you of the stressful experience?	1	2	3	4	5
6. Avoiding thinking about or talking about the stressful experience or avoiding having feelings related to it?	1	2	3	4	5
7. Avoiding activities or situations because they remind you of the stressful experience?	1	2	3	4	5
8. Trouble remembering important parts of the stressful experience?	1	2	3	4	5
9. Loss of interest in activities that you used to enjoy?	1	2	3	4	5
10. Feeling distant or cut off from other people?	1	2	3	4	5
11. Feeling emotionally numb or being unable to have loving feelings for those close to you?	1	2	3	4	5
12. Feeling as if your future will somehow be cut short?	1	2	3	4	5
13. Trouble falling or staying asleep?	1	2	3	4	5
14. Feeling irritable or having angry outbursts?	1	2	3	4	5
15. Having difficulty concentrating?	1	2	3	4	5
16. Being "super alert" or watchful or on guard?	1	2	3	4	5
17. Feeling jumpy or easily startled?	1	2	3	4	5

PIS

Please rate how accurate the following statements apply to you for the past month.

If I needed help, I could count on people in my life who **would** help me (without receiving financial compensation) with:

	Definitely True	Probably True	Probably False	Definitely False
1. Household chores	1	2	3	4
2. Transportation	1	2	3	4
3. Shopping/Errands	1	2	3	4
4. Caring for others (children, parents, pets)	1	2	3	4
5. Financial Support	1	2	3	4
6. Paperwork/Information (legal documents, taxes, etc.)	1	2	3	4

ISEL-E

Please rate how accurately the following statements apply to you for the past month.

	Definitely True	Probably True	Probably False	Definitely False
1. There is no one that I feel comfortable talking to about intimate personal problems.	1	2	3	4
2. I feel that there is no one I can share my most private worries and fears with.	1	2	3	4
3. I feel a strong emotional bond with at least one other person.	1	2	3	4
4. I have close relationships that provide me with a sense of emotional security and well-being.	1	2	3	4
5. I lack a feeling of intimacy with another person.	1	2	3	4

GHQ

We want to know how your health has been in general over the last few weeks. Please read the questions below and each of the four possible answers. Circle the response that best applies to you. Thank you for answering all the questions.

Have you recently:

1. been able to concentrate on what you're doing?

- 0. better than usual
- 1. same as usual
- 2. less than usual
- 3. much less than usual

2. lost much sleep over worry?

- 0. not at all
- 1. no more than usual
- 2. rather more than usual
- 3. much more than usual

3. felt that you are playing a useful part in things?

- 0. more so than usual
- 1. same as usual
- 2. less so than usual
- 3. much less than usual

4. felt capable of making decisions about things?

- 0. more so than usual
- 1. same as usual
- 2. less so than usual
- 3. much less than usual

5. felt constantly under strain?

- 0. not at all
- 1. no more than usual
- 2. rather more than usual
- 3. much more than usual

6. felt you couldn't overcome your difficulties?

- 0. not at all
- 1. no more than usual
- 2. rather more than usual
- 3. much more than usual

7. been able to enjoy your normal day to day activities?

- 0. more so than usual
- 1. same as usual
- 2. less so than usual
- 3. much less than usual

8. been able to face up to your problems?

- 0. more so than usual
- 1. same as usual
- 2. less so than usual
- 3. much less than usual

9. been feeling unhappy or depressed?

- 0. not at all
- 1. no more than usual
- 2. rather more than usual
- 3. much more than usual

10. been losing confidence in yourself?

- 0. not at all
- 1. no more than usual
- 2. rather more than usual
- 3. much more than usual

11. been thinking of yourself as a worthless person?

- 0. not at all
- 1. no more than usual
- 2. rather more than usual
- 3. much more than usual

12. been feeling reasonably happy, all things considered?

- 0. not at all
- 1. no more than usual
- 2. rather more than usual
- 3. much more than usual

GAD-7

Over the last 2 weeks, how often have you been bothered by the following problems?

	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

CES-D

Please indicate how often you have felt this way during the past 2 weeks.

	Hardly ever or never	Some of the time	Much or most of the time
1. I did not feel like eating; my appetite was poor.	1	2	3
2. I felt everything was an effort.	1	2	3
3. My sleep was restless.	1	2	3
4. I was happy.	1	2	3
5. I felt lonely.	1	2	3
6. People were unfriendly.	1	2	3
7. I enjoyed life.	1	2	3
8. I felt sad.	1	2	3
9. I felt that people disliked me.	1	2	3
10. I could not get "going."	1	2	3
11. I felt depressed.	1	2	3

PACT

Sometimes we must contend with difficult and upsetting events. Unfortunately, sometimes we are confronted with events that might be traumatic and disruptive to the course of our lives. Examples of such events include the death or injury of someone close to us, a natural disaster, a serious accident or illness, sexual and physical assault, and terrorist attack. Below you will find a list of different kinds of behaviors and strategies that people sometimes use in the weeks following potentially traumatic events. This questionnaire asks which of these behaviors and strategies you might be **able** to use.

Please rate the extent that you would **be able to** do each of these behaviors following a potentially traumatic event **if you needed to.**

	Not true					Extremely true	
1. Keep my schedule and activities as constant as possible	1	2	3	4	5	6	7
2. Comfort other people.	1	2	3	4	5	6	7
3. Look for a silver lining.	1	2	3	4	5	6	7
4. Stay focused on my current goals and plans.	1	2	3	4	5	6	7
5. Find activities to help me keep the event off my mind.	1	2	3	4	5	6	7

	<div style="display: flex; justify-content: space-between;"> Not true Extremely true </div>						
6. Let myself fully experience some of the painful emotions linked with the event.	1	2	3	4	5	6	7
7. Spend time alone.	1	2	3	4	5	6	7
8. I would be able to laugh.	1	2	3	4	5	6	7
9. Try to lessen the experience of painful emotions.	1	2	3	4	5	6	7
10. Reduce my normal social obligations.	1	2	3	4	5	6	7
11. Alter my daily routine.	1	2	3	4	5	6	7
12. Reflect upon the meaning of the event.	1	2	3	4	5	6	7
13. Distract myself to keep from thinking about the event.	1	2	3	4	5	6	7
14. Face the grim reality head-on.	1	2	3	4	5	6	7
15. Enjoy something that I would normally find funny or amusing.	1	2	3	4	5	6	7
16. Focus my attention on or care for the needs of other people.	1	2	3	4	5	6	7
17. Remind myself that things will get better.	1	2	3	4	5	6	7
18. Keep myself serious and calm.	1	2	3	4	5	6	7
19. Remember the details of the event.	1	2	3	4	5	6	7
20. Pay attention to the distressing feelings that result from the event.	1	2	3	4	5	6	7

LOT

Please indicate the extent to which you agree with the following items. Try to be as accurate and honest as you can, and try not to let your answers to one question influence your answers to other questions. There are no correct or incorrect answers.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. In uncertain times, I usually expect the best.	4	3	2	1	0
2. It's easy for me to relax.	4	3	2	1	0
3. If something can go wrong for me, it will.	4	3	2	1	0
4. I always look on the bright side of things.	4	3	2	1	0
5. I'm always optimistic about my future.	4	3	2	1	0
6. I enjoy my friends a lot.	4	3	2	1	0
7. It's important to me to keep busy.	4	3	2	1	0
8. I hardly ever expect things to go my way.	4	3	2	1	0
9. Things never work out the way I want them to.	4	3	2	1	0
10. I don't get upset too easily.	4	3	2	1	0
11. I'm a believer in the idea that "every cloud has a silver lining."	4	3	2	1	0
12. I rarely count on good things happening to me.	4	3	2	1	0

Please answer the following questions if you are currently married or in a relationship.

DAS-4

Most persons have disagreements in their relationships. Please indicate below the approximate extent of agreements or disagreements had between you and your spouse/partner for each item on the following list.

0 = All the time 1 = Most of the time 2 = More often than not 3 = Occasionally 4 = Rarely 5 = Never

1) How often did you discuss or consider divorce, separation, or terminating your relationship?	0	1	2	3	4	5
2) In general, how often did you think that things between you and your partner were going well?	0	1	2	3	4	5
3) Did you confide in your partner?	0	1	2	3	4	5

4) The dots on the following line represent different degrees of happiness in your relationship. The point, "happy," represents the degree of happiness of most relationships. Please circle the dot that best describes the degree of happiness, all things considered, of your relationship.

0	1	2	3	4	5	6
•	•	•	•	•	•	•
Extremely unhappy	Fairly unhappy	A little unhappy	Happy	Very happy	Extremely happy	Perfect

APPENDIX 2: SIX MONTH MOTHER QUESTIONNAIRE

Participant # _____

Date Completed ____ / ____ / ____

**NICU Experience Study Questionnaire
(Mother Version)**

Instructions: The attached questionnaire will take approximately 25 minutes to complete. We recommend finding a block of time and a quiet place so that you can complete the questionnaire without undue distractions. It is best to finish the questionnaire in one sitting if possible, but you may complete it in more than one sitting if necessary.

Note: To ensure confidentiality of your responses, *please do not write your name anywhere on this booklet.*

DEMOGRAPHIC AND BACKGROUND INFORMATION

1. What is your age? _____ years

2. Gender _____ (1. F/2. M)

3. Do you have a religious affiliation? You may indicate more than one.

- 1. Christian _____
- 2. Jewish _____
- 3. Muslim _____
- 4. None _____
- 5. Other _____

4. What racial categories do you qualify as? You may indicate more than one.

- 1. American Indian/Alaskan Native _____
- 2. Asian _____
- 3. Native Hawaiian/Pacific Islander _____
- 4. Black/African American _____
- 5. Caucasian _____
- 6. Other _____

5. Do you qualify as Hispanic? _____ 1. Yes _____ 2. No

6. How many years of education have you completed? _____ Years

7. Are you currently employed?

- 1. Yes _____
- 2. No _____

8. If you are employed, approximately how many hours per week do you work? _____

9. How many children do you have? _____

10. What are the ages of your *other* children? (not including your baby who was in the NICU)

11. What is the birth order of your baby who was hospitalized in the NICU? (e.g., 1st, 2nd, 3rd)? _____

12. What is your marital status?

- 1. Married _____
- 2. Separated _____
- 3. Divorced _____
- 4. Single _____
- 5. Living with partner _____

13. What is your current yearly family income? _____

14. What town or borough do you live in? _____

15. Is your baby's father currently involved? (If YES, move on to question 16. If NO, skip to question 18.)

- 1. Yes _____
- 2. No _____

16. How important to you is your baby's father's involvement?

- 1. Very _____
- 2. Somewhat _____
- 3. Neutral _____
- 4. Unimportant _____

17. How emotionally supportive is your baby's father to you?

- 1. Very _____
- 2. Somewhat _____
- 3. Neutral _____
- 4. Not supportive _____

18. In general, how would you rate your baby's health?

- 1. Very good _____
- 2. Good _____
- 3. OK _____
- 4. Poor _____
- 5. Very poor _____

19. How would you rate your baby's health compared to the average baby of the same age and gender?

- 1. Much better than average _____
- 2. Better than average _____
- 3. Average _____
- 4. Worse than average _____
- 5. Much worse than average _____

Health Survey

Please mark which health problems your infant is currently experiencing:

- | | | | | |
|------------------------------|-------|--------|-------|-------|
| 1. Bronchitis | _____ | 1. Yes | _____ | 2. No |
| 2. Pneumonia | _____ | 1. Yes | _____ | 2. No |
| 3. Other breathing problems | _____ | 1. Yes | _____ | 2. No |
| 4. Gastrointestinal problems | _____ | 1. Yes | _____ | 2. No |
| 5. Seizures | _____ | 1. Yes | _____ | 2. No |
| 6. Fever | _____ | 1. Yes | _____ | 2. No |
| 7. Virus | _____ | 1. Yes | _____ | 2. No |
| 8. Vision problems | _____ | 1. Yes | _____ | 2. No |
| 9. Hearing problems | _____ | 1. Yes | _____ | 2. No |
| 10. Cardiac issues | _____ | 1. Yes | _____ | 2. No |
| 11. Skin abnormalities | _____ | 1. Yes | _____ | 2. No |
| 12. Neurological problems | _____ | 1. Yes | _____ | 2. No |
| 13. Physical abnormalities | _____ | 1. Yes | _____ | 2. No |
| 14. Surgery | _____ | 1. Yes | _____ | 2. No |
| 15. Other | _____ | 1. Yes | _____ | 2. No |

If "Other" please briefly describe:

Medication

Please list any medications your baby is currently taking:

CDSII

Please briefly write what you believe to be the *reasons or causes* of your baby's hospitalization in the NICU.

Think about the reason or reasons you have written above. The items below concern your impressions or opinions of this cause or these causes of your outcome. Circle one number for each of the following scales.

Is the cause(s) something that:

1. Reflects an aspect of the situation	1	2	3	4	5	6	7	8	9	Reflects an aspect of yourself
2. Is uncontrollable by you or other people	1	2	3	4	5	6	7	8	9	Is controllable by you or other people
3. Is temporary	1	2	3	4	5	6	7	8	9	Is permanent
4. Is unintended by you or other people	1	2	3	4	5	6	7	8	9	Is intended by you or other people
5. Is outside of you	1	2	3	4	5	6	7	8	9	Is inside of you
6. Is variable over time	1	2	3	4	5	6	7	8	9	Is stable over time
7. Is about others	1	2	3	4	5	6	7	8	9	Is about you
8. Is changeable	1	2	3	4	5	6	7	8	9	Is unchanging
9. No one is responsible for	1	2	3	4	5	6	7	8	9	Someone is responsible for

PCL

Below is a list of problems and complains that people sometimes have in response to stressful life experiences (in this case, your child's birth and hospitalization). Please read each one carefully, then **circle** one of the numbers to the right to indicate how much you have been **bothered** by the problem **in the past month**.

BOTHERED BY:	Not at all	A little bit	Moderately	Quite a bit	Extremely
1. Repeated disturbing memories, thoughts, or images of the stressful experience?	1	2	3	4	5
2. Repeated, disturbing dreams of the stressful experience?	1	2	3	4	5
3. Suddenly acting or feeling as if the stressful experience were happening again (as if you were reliving it)?	1	2	3	4	5
4. Feeling very upset when something reminded you of the stressful experience?	1	2	3	4	5
5. Having physical reactions (e.g., heart pounding, trouble breathing, or sweating) when something reminded you of the stressful experience?	1	2	3	4	5
6. Avoiding thinking about or talking about the stressful experience or avoiding having feelings related to it?	1	2	3	4	5
7. Avoiding activities or situations because they remind you of the stressful experience?	1	2	3	4	5
8. Trouble remembering important parts of the stressful experience?	1	2	3	4	5
9. Loss of interest in activities that you used to enjoy?	1	2	3	4	5
10. Feeling distant or cut off from other people?	1	2	3	4	5
11. Feeling emotionally numb or being unable to have loving feelings for those close to you?	1	2	3	4	5
12. Feeling as if your future will somehow be cut short?	1	2	3	4	5
13. Trouble falling or staying asleep?	1	2	3	4	5
14. Feeling irritable or having angry outbursts?	1	2	3	4	5
15. Having difficulty concentrating?	1	2	3	4	5
16. Being "super alert" or watchful or on guard?	1	2	3	4	5
17. Feeling jumpy or easily startled?	1	2	3	4	5

PIS

Please rate how accurate the following statements apply to you for the past month.

If I needed help, I could count on people in my life who ***would*** help me (without receiving financial compensation) with:

	Definitely True	Probably True	Probably False	Definitely False
1. Household chores	1	2	3	4
2. Transportation	1	2	3	4
3. Shopping/Errands	1	2	3	4
4. Caring for others (children, parents, pets)	1	2	3	4
5. Financial Support	1	2	3	4
6. Paperwork/Information (legal documents, taxes, etc.)	1	2	3	4

ISEL-E

Please rate how accurately the following statements apply to you for the past month.

	Definitely True	Probably True	Probably False	Definitely False
1. There is no one that I feel comfortable talking to about intimate personal problems.	1	2	3	4
2. I feel that there is no one I can share my most private worries and fears with.	1	2	3	4
3. I feel a strong emotional bond with at least one other person.	1	2	3	4
4. I have close relationships that provide me with a sense of emotional security and well-being.	1	2	3	4
5. I lack a feeling of intimacy with another person.	1	2	3	4

GHQ

We want to know how your health has been in general over the last few weeks. Please read the questions below and each of the four possible answers. Circle the response that best applies to you. Thank you for answering all the questions.

Have you recently:

1. been able to concentrate on what you're doing?

- 0. better than usual
- 1. same as usual
- 2. less than usual
- 3. much less than usual

2. lost much sleep over worry?

- 0. not at all
- 1. no more than usual
- 2. rather more than usual
- 3. much more than usual

3. felt that you are playing a useful part in things?

- 0. more so than usual
- 1. same as usual
- 2. less so than usual
- 3. much less than usual

4. felt capable of making decisions about things?

- 0. more so than usual
- 1. same as usual
- 2. less so than usual
- 3. much less than usual

5. felt constantly under strain?

- 0. not at all
- 1. no more than usual
- 2. rather more than usual
- 3. much more than usual

6. felt you couldn't overcome your difficulties?

- 0. not at all
- 1. no more than usual
- 2. rather more than usual
- 3. much more than usual

7. been able to enjoy your normal day to day activities?

- 0. more so than usual
- 1. same as usual
- 2. less so than usual
- 3. much less than usual

8. been able to face up to your problems?

- 0. more so than usual
- 1. same as usual
- 2. less so than usual
- 3. much less than usual

9. been feeling unhappy or depressed?

- 0. not at all
- 1. no more than usual
- 2. rather more than usual
- 3. much more than usual

10. been losing confidence in yourself?

- 0. not at all
- 1. no more than usual
- 2. rather more than usual
- 3. much more than usual

11. been thinking of yourself as a worthless person?

- 0. not at all
- 1. no more than usual
- 2. rather more than usual
- 3. much more than usual

12. been feeling reasonably happy, all things considered?

- 0. not at all
- 1. no more than usual
- 2. rather more than usual
- 3. much more than usual

GAD-7

Over the last 2 weeks, how often have you been bothered by the following problems?

	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

CES-D

Please indicate how often you have felt this way during the past 2 weeks.

	Hardly ever or never	Some of the time	Much or most of the time
1. I did not feel like eating; my appetite was poor.	1	2	3
2. I felt everything was an effort.	1	2	3
3. My sleep was restless.	1	2	3
4. I was happy.	1	2	3
5. I felt lonely.	1	2	3
6. People were unfriendly.	1	2	3
7. I enjoyed life.	1	2	3
8. I felt sad.	1	2	3
9. I felt that people disliked me.	1	2	3
10. I could not get "going."	1	2	3
11. I felt depressed.	1	2	3

PACT

Sometimes we must contend with difficult and upsetting events. Unfortunately, sometimes we are confronted with events that might be traumatic and disruptive to the course of our lives. Examples of such events include the death or injury of someone close to us, a natural disaster, a serious accident or illness, sexual and physical assault, and terrorist attack. Below you will find a list of different kinds of behaviors and strategies that people sometimes use in the weeks following potentially traumatic events. This questionnaire asks which of these behaviors and strategies you might be **able** to use.

Please rate the extent that you would **be able to** do each of these behaviors following a potentially traumatic event **if you needed to.**

	Not true					Extremely true	
1. Keep my schedule and activities as constant as possible	1	2	3	4	5	6	7
2. Comfort other people.	1	2	3	4	5	6	7
3. Look for a silver lining.	1	2	3	4	5	6	7
4. Stay focused on my current goals and plans.	1	2	3	4	5	6	7
5. Find activities to help me keep the event off my mind.	1	2	3	4	5	6	7

	<div style="display: flex; justify-content: space-between;"> Not true Extremely true </div>						
6. Let myself fully experience some of the painful emotions linked with the event.	1	2	3	4	5	6	7
7. Spend time alone.	1	2	3	4	5	6	7
8. I would be able to laugh.	1	2	3	4	5	6	7
9. Try to lessen the experience of painful emotions.	1	2	3	4	5	6	7
10. Reduce my normal social obligations.	1	2	3	4	5	6	7
11. Alter my daily routine.	1	2	3	4	5	6	7
12. Reflect upon the meaning of the event.	1	2	3	4	5	6	7
13. Distract myself to keep from thinking about the event.	1	2	3	4	5	6	7
14. Face the grim reality head-on.	1	2	3	4	5	6	7
15. Enjoy something that I would normally find funny or amusing.	1	2	3	4	5	6	7
16. Focus my attention on or care for the needs of other people.	1	2	3	4	5	6	7
17. Remind myself that things will get better.	1	2	3	4	5	6	7
18. Keep myself serious and calm.	1	2	3	4	5	6	7
19. Remember the details of the event.	1	2	3	4	5	6	7
20. Pay attention to the distressing feelings that result from the event.	1	2	3	4	5	6	7

LOT

Please indicate the extent to which you agree with the following items. Try to be as accurate and honest as you can, and try not to let your answers to one question influence your answers to other questions. There are no correct or incorrect answers.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. In uncertain times, I usually expect the best.	4	3	2	1	0
2. It's easy for me to relax.	4	3	2	1	0
3. If something can go wrong for me, it will.	4	3	2	1	0
4. I always look on the bright side of things.	4	3	2	1	0
5. I'm always optimistic about my future.	4	3	2	1	0
6. I enjoy my friends a lot.	4	3	2	1	0
7. It's important to me to keep busy.	4	3	2	1	0
8. I hardly ever expect things to go my way.	4	3	2	1	0
9. Things never work out the way I want them to.	4	3	2	1	0
10. I don't get upset too easily.	4	3	2	1	0
11. I'm a believer in the idea that "every cloud has a silver lining."	4	3	2	1	0
12. I rarely count on good things happening to me.	4	3	2	1	0

Please answer the following questions if you are currently married or in a relationship.

DAS-4

Most persons have disagreements in their relationships. Please indicate below the approximate extent of agreements or disagreements had between you and your spouse/partner for each item on the following list.

0 = All the time 1 = Most of the time 2 = More often than not 3 = Occasionally 4 = Rarely 5 = Never

1) How often did you discuss or consider divorce, separation, or terminating your relationship?	0	1	2	3	4	5
2) In general, how often did you think that things between you and your partner were going well?	0	1	2	3	4	5
3) Did you confide in your partner?	0	1	2	3	4	5

4) The dots on the following line represent different degrees of happiness in your relationship. The point, "happy," represents the degree of happiness of most relationships. Please circle the dot that best describes the degree of happiness, all things considered, of your relationship.

0	1	2	3	4	5	6
·	·	·	·	·	·	·
Extremely unhappy	Fairly unhappy	A little unhappy	Happy	Very happy	Extremely happy	Perfect

APPENDIX 3: NURSE QUESTIONNAIRE

Participant Name: _____

**NICU Experience Study Questionnaire
(Nurse Version)**

Instructions: The attached questionnaire will take approximately 5-10 minutes to complete. When you are finished, PLEASE REMOVE THE TOP PAGE AND RETURN ONLY THE BOTTOM PAGE TO THE RESEARCHER.

Note: To ensure confidentiality of your responses, please do not write your name anywhere on this booklet.

Participant # _____

Date Completed ____ / ____ / ____

1. To the best of your knowledge, how many times per week does this mother visit the NICU? _____

2. To the best of your knowledge, how many times in total has this mother visited the NICU? _____

3. To the best of your knowledge, how many times in total has the father visited the NICU? _____

4. If you have spent time interacting with this mother, how would you characterize these experiences overall?

(Please circle one)

Very positive (1) Positive (2) Neutral (3) Negative (4) Very negative (5)

5. In your opinion, how much does this mother understand when you explain things to her?

A lot (1) A little (2) Some (3) Not much (4) Almost nothing (5)

6. Does this mother ask technical questions (e.g., about the equipment, etc.)?

Very often (1) Often (2) Sometimes (3) Seldom (4) Never (5)

7. Does this mother ask about how to best care for her baby?

Very often (1) Often (2) Sometimes (3) Seldom (4) Never (5)

8. To your knowledge, please indicate how often this mother has engaged in the following activities while in the NICU (if she has never visited the NICU, please skip this question).

	Never	Hardly ever	Sometimes	Most of the time	Nearly always
1. She interacts with her baby verbally (e.g., speak, sing, make sounds)	1	2	3	4	5
2. She holds or touches her baby	1	2	3	4	5
3. She has conversations with other parents on the unit	1	2	3	4	5
4. She asks questions to hospital staff (e.g., nurses, doctors, etc.)	1	2	3	4	5
5. She has conversations with hospital staff	1	2	3	4	5
6. She attends the parent therapy group	1	2	3	4	5
7. She spends time by herself (e.g., reading, watching TV)	1	2	3	4	5
8. She catches up on work	1	2	3	4	5