

THE PENNSYLVANIA STATE UNIVERSITY
SCHREYER HONORS COLLEGE

DEPARTMENT OF PSYCHOLOGY

POSTPARTUM DEPRESSION AND POST-TRAUMATIC STRESS SYMPTOMS IN THE
NICU: Prevalence and Contributing Factors

GRETCHEN PERHAMUS
Spring 2016

A thesis
submitted in partial fulfillment
of the requirements
for baccalaureate degrees
in Psychology and Sociology
with honors in Psychology

Reviewed and approved* by the following:

Dr. Ginger Moore
Associate Professor of Psychology
Thesis Supervisor

Dr. Jeff Love
Senior Lecturer in Psychology
Honors Advisor

* Signatures are on file in the Schreyer Honors College.

ABSTRACT

This study aimed to identify factors related to symptoms of Postpartum Depression (PPD) and Post-Traumatic Stress Disorder (PTSD) in mothers whose infants were admitted to the Neonatal Intensive Care Unit (NICU), with an emphasis on the role of breastfeeding in the NICU context. Mothers ($N=22$) were assessed for symptoms of PPD and PTSD, life stress, and feeding practices at 1, 2, 4, and 5-24 months postpartum using questionnaires. Retrospective data concerning PPD and PTSD symptoms during the first trimester were assessed with phone interviews. Clinical levels of PPD and PTSD were high and strongly related within time points. Life stress was more strongly associated with PPD than with PTSD symptoms. Contrary to predictions, feeding method was largely not associated with PPD or PTSD symptomology. Qualitative data concerning feeding challenges highlighted four common themes: presence or absence of hospital support, lack of control over the situation, feelings of incompetence or failure as a mother, and logistical difficulties. Mentioning a lack of hospital support for feeding or emotional challenges was associated with more symptoms of both conditions, suggesting the importance of hospital support for healthy coping in this population.

TABLE OF CONTENTS

LIST OF TABLES	iii
ACKNOWLEDGEMENTS.....	iv
INTRODUCTION.....	1
<i>Postpartum Depression in the NICU</i>	<i>1</i>
<i>Post-Traumatic Stress Disorder in the NICU</i>	<i>3</i>
<i>Role of Breastfeeding.....</i>	<i>6</i>
<i>Conclusion</i>	<i>9</i>
<i>Participants.....</i>	<i>11</i>
<i>Procedure.....</i>	<i>12</i>
<i>Measures.....</i>	<i>14</i>
RESULTS.....	18
<i>Postpartum Depression Symptomology</i>	<i>18</i>
<i>Post-Traumatic Stress Disorder Symptomology,</i>	<i>19</i>
<i>Correlating and Distinguishing Factors.....</i>	<i>19</i>
<i>Qualitative Data.....</i>	<i>23</i>
DISCUSSION	26
<i>Results and Implications</i>	<i>26</i>
<i>Limitations</i>	<i>30</i>
<i>Conclusions.....</i>	<i>32</i>
TABLES.....	34
References	37
ACADEMIC VITA	41

LIST OF TABLES

<i>Table 1: Descriptive Statistics of PPD and PTSD symptoms and Percentages at Clinical Levels</i>	.34
<i>Table 2: Correlations between PPD and PTSD Symptoms</i>	34
<i>Table 3: Chi-Square Statistics between Clinical PPD and PTSD Levels</i>	35
<i>Table 4: Correlations between Maternal Stress/Social Support, PPD, and PTSD Symptoms</i>	35
<i>Table 5: Correlations between Feeding Method, PPD, and PTSD symptoms</i>	36

ACKNOWLEDGEMENTS

I would like first to thank Dr. Ginger Moore and Kelsey Quigley, who have worked tirelessly with me throughout this process. Thank you for pushing me along the way and being positive voices in my ears as unexpected challenges arose. This project would not have been possible without your support.

Next, I would like to thank Geisinger Medical Center and St. Luke's University Health Network, both of which took the time to work with me in recruitment efforts and were invested in the success of this study. I would also like to thank the Penn State's College of Liberal Arts and the Erickson Discovery Grant program, both of which provided funding for this research.

Finally, I would like to offer my utmost gratitude to the mothers who agreed to participate in this study and share their experiences with me. I was repeatedly touched by the openness and bravery exhibited by all I spoke with. Thank you for contributing to this research and telling me your stories.

INTRODUCTION

Postpartum Depression (PPD) and Post-Traumatic Stress Disorder (PTSD) have been shown to have negative consequences for mothers and infants, including long-term mental health problems, poorer-quality attachment relationships, and an overall diminished quality of family life (Dennis & Dowswell, 2013; Kendall-Tackett, 2014). PPD and PTSD symptom levels and prevalence rates are significantly higher in mothers whose infants are in the Neonatal Intensive Care Unit (NICU), with some studies showing rates over double those found in the general population (Bicking & Moore, 2012; Lefkowitz, Baxt, & Evans, 2010; Feeley et al. 2011). However, few studies have used prospective methods beginning right after birth; instead research has relied on retrospective reports to examine psychiatric symptoms and relevant risk factors. These methods raise questions regarding the accuracy and comprehensiveness of data collected. In addition, much less is known about PTSD than about PPD during the postpartum period, and no studies have examined differentiating factors between these two conditions within this population. Finally, studies concerning these disorders specifically targeting mothers with infants in the NICU are limited in number.

Postpartum Depression in the NICU

Postpartum depression, or depression after childbirth, is a widespread and potentially devastating condition. Diagnostic criteria and symptomology are the same as those seen in depression occurring at any time, but the intense and rapid changes, both physical and socioemotional, make depression during the postpartum period of particular interest to researchers. Symptoms range in severity, but typically include standard difficulties associated with depression, with the addition of a disinterest in and/or thoughts of harming the new baby

(Dennis & Dowswell, 2013). The severity and duration of symptoms vary widely, from mild baby blues, which generally last less than two weeks, to severe postpartum psychosis, which is very rare and extreme. Common symptoms include dysphoria, sleep disturbances, changes in appetite, guilt, confusion, disinterest in the baby, and thoughts of harming oneself and/or the child; if left untreated these symptoms can develop into severe clinical depression (Dennis & Dowswell, 2013).

The effects of postpartum depression may extend beyond the mother to the infant. Some depressed mothers interact differently with their infants when compared to their non-depressed counterparts. For example, depressed mothers have been found to use less infant-directed speech, have less synchrony in their interactions with their infants, spend less time touching their infants and do so in a proportionally more negative manner (Field, 2010). They also perform fewer enrichment activities such as reading, playing games, and singing songs (Field, 2010). As the child ages, depressed mothers discipline less consistently and tend to use less positive reinforcement (Dennis & Dowswell, 2013). The risk of the use of harsh punishment, such as spanking, hitting, or slapping, is increased with depressed mothers (Field, 2010).

Reported prevalence rates of postpartum depression vary widely depending on the time and type of screening used. However, a recent Cochrane Review found a 19.2% prevalence rate of postpartum depression within the first 12 weeks following birth, with a 7.1% period prevalence of major depression (Dennis & Dowswell, 2013). Studies on the prevalence of PPD in the NICU repeatedly show consistently higher rates in this population, with studies finding 28% to 70% meeting clinical cutoffs (Bickings & Moore, 2012; Tahirkheli et al., 2014). Vigod et al. (2010) found mothers of premature infants to be 40% more likely to develop PPD than mothers outside of the NICU. Lefkowitz et al. (2010) found that 39% of NICU mothers met

criteria for clinical PPD 30 days after their infants' admission, and another 16.9% showing subclinical symptoms.

The exact etiology of postpartum depression, as with all depression, remains unclear, and there is much conflicting evidence about risk factors, especially in the NICU population (Tahirkheli et al., 2014). While there may be biological factors that contribute to PPD, these are beyond the scope of the current study. The most common psychosocial correlates with symptomology include the perception of hospital staff support, marital status, and the extent of parental role alteration (Tahirkheli et al., 2014). A perceived lack of social support and social isolation are often strongly associated with increased depression symptoms (Dennis, 2013; Tahirkheli et al., 2014). However, some studies have found these factors to have less of an effect in NICU mothers, instead finding a perceived lack of support from hospital personnel and an alteration of the parental role to be linked to higher symptomology (Tahirkheli et al., 2014). Additionally, while a history of psychopathology (especially of anxiety or depression) is commonly considered a risk factor for developing depression after birth (Dennis, 2013), this has not been replicated in NICU mothers (Tahirkheli et al., 2014).

This study expects to replicate these findings concerning high rates of PPD in this population. It also aimed to clarify the roles of social support, support from hospital personnel, history of depression, and other debated factors in both the development and course of depression symptomology in NICU mothers.

Post-Traumatic Stress Disorder in the NICU

When births are traumatic, symptoms warranting a diagnosis of PTSD can arise over time or immediately after the birth of the child. As described by Kendall-Tackett (2014) the diagnostic criteria for PTSD following a traumatic birth are not differentiated from that of

general PTSD. People with PTSD experience intrusion symptoms, such as recurrent, involuntary, and intrusive memories that can manifest in the form of flashbacks or nightmares. The mother may avoid people, places, and other activities that remind her of the birth (Kendall-Tackett, 2014). This can include the partner, the baby, and the hospital. Mothers may also have negative changes in cognitions and mood, including a lack of memory of an important aspect of the event; persistent or exaggerated negative expectations about themselves, others, or the world; feelings of detachment or estrangement; and diminished interest and participation in significant activities (Kendall-Tackett, 2014). Finally, mothers may exhibit changes in arousal and activity, such as hyper-vigilance, reckless or destructive behavior, and an increase in anger, irritability, or aggression (Kendall-Tackett, 2014). In order to be considered PTSD, these symptoms must persist for at least one month; before that point, a diagnosis of Acute Stress Disorder (ASD) is used (American Psychiatric Association, 2013). All of these behaviors can have large implications for the wellbeing of the mother, child, and family unit. It can limit mother-infant attachment formation, can prevent the mother from attending necessary medical appointments for herself and the child, and can cause marital conflict (Kendall-Tackett, 2014).

To receive a diagnosis of PTSD, a mother must be exposed to a traumatic event, defined as death or threatened death, injury or threatened injury, or actual or threatened sexual violation (Kendall-Tackett, 2014). In the research literature, two pathways for the development of postpartum PTSD have been identified: those who identify the experience of birth itself as traumatic and develop PTSD related to that event, and those who identify previous traumatic events (e.g. sexual abuse or physical assault) that are retriggered by the birth (Grekin & O'Hara, 2014). Those in the first group often experienced unexpected interventions during delivery, felt a loss of control, or felt uninformed about the labor and delivery process (Grekin & O'Hara, 2014).

This group may be especially present in the NICU population, as many births resulting in NICU admission are filled with unexpected challenges and extreme situations.

While prevalence estimates of postpartum PTSD, as with PPD, vary widely depending on the time and type of assessment, most studies of community samples find between 1% and 5% of mothers meeting criteria for PTSD due to childbirth (Grekin & O'Hara, 2014). This rises slightly (between 2% and 9%) when looking at period prevalence of PTSD during the postpartum period, not limiting to childbirth as the triggering event (Grekin & O'Hara, 2014). A large study of non-NICU mothers ($N = 1,573$) found that 9% of all mothers met full diagnostic criteria, with another 18% showing subclinical symptoms (Kendall-Tackett, 2014). Another prospective study found lower rates ranging from 3.6% at 4-6 weeks postpartum to 6.3% at 12 weeks (Kendall-Tackett, 2014). Similarly, Grekin and O'Hara (2014), through an extensive quantitative meta-analysis, found 3.1% of a community sample met criteria for PTSD.

Studies on NICU mothers have shown rates over double those in the general population. For instance, Lefkowitz and colleagues (2010) conducted a longitudinal study identifying rates of trauma symptoms in mothers and fathers of NICU infants at two time points. They found 34.9% of mothers and 24.4% of fathers met Acute Stress Disorder criteria upon their infant's admission to the NICU. Thirty or more days later, 15% of mothers and 8% of fathers met PTSD criteria (Lefkowitz et al., 2010). Another study found similar rates 6 months after discharge from the NICU. Feeley et al. (2011) administered the Perinatal PTSD Questionnaire (PPQ) 6 months after mothers were discharged from the NICU. They found that 23.8% of mothers scored at or above clinical levels of PTSD.

There is also evidence that these rates persist over time. Researchers (Ahlund, Clarke, Hill, & Thalange, 2009) mailed mothers the Impact of Event Scale (IES-R), a validated 22-item

self-report measure, two to three years postpartum. They found that 17% of mothers of very low birth weight infants ($N = 24$) met full diagnostic criteria 2-3 years postpartum, compared to 0% of control mothers ($N = 22$) (Ahlund et al., 2009).

As with depression, correlates for postpartum PTSD may vary somewhat depending on the risk status (i.e., having a history of psychiatric conditions or fragile infant) of the mother. Postpartum depressive symptomology and history of trauma are highly related to PTSD symptomology regardless of risk status, and seem to act independently of time since delivery, parity, or age (Grekin & O'Hara, 2014). As with PPD, social support in the postpartum period is largely associated with PTSD symptoms, but the effect sizes tend to be smaller in relation to PTSD (Grekin & O'Hara, 2014) than PPD. In at-risk mothers, maternal complications in childbirth and infant complications following childbirth are also both strongly positively associated with PTSD symptomology, while these are not significantly associated with PTSD in community samples during the postpartum period (Grekin & O'Hara, 2014). Specifically for NICU mothers, risk factors include lower infant birth weight, more pregnancy and birth complications, and longer hospitalizations (Feeley et al. 2011). Demographic factors, such as education, parity, income, and race tend not to be predictive of PTSD symptoms, regardless of risk status (Feeley et al., 2011; Grekin & O'Hara, 2014).

Role of Breastfeeding

Breastfeeding is generally viewed in a favorable light, and is associated with positive outcomes for mother and child (Kendall-Tackett, Cong & Hale, 2011). However, few studies have looked at its beneficial effects for the mother's mental health during the postpartum period.

Instead, much of the research on the relationship between PPD and PTSD and breastfeeding examines the negative effects of the disorders on breastfeeding outcomes. For example, mothers with these conditions are less likely to breastfeed, show an earlier cessation of breastfeeding, and may have a delay in lactogenesis II (the onset of full milk supply) (Field, 2010; Kendall-Tackett, 2014; Kendall-Tackett, Cong & Hale, 2011).

Some studies have found a positive effect of breastfeeding for the prevention of development of PPD. Kendall-Tackett et al. (2011) used data from a large data set to examine the effect of feeding method on mothers' reports of depressed or saddened mood, anhedonia, and overall depression (Kendall-Tackett et al., 2011). These were assessed with the Patient Health Questionnaire (PHQ-2), a 2-item self-report measure of how often a mother has experienced common symptoms of depression (Kendall-Tackett et al., 2011). Feeding method was operationalized as breastfeeding only, formula only, or mixed. They found that breastfeeding mothers showed lower PHQ-2 scores and were less likely to report depressed mood or anhedonia than either mixed-feeding or formula-only (Kendall-Tackett et al., 2011).

Similarly, McCoy et al. (2006) found those mothers who were breastfeeding exhibited significantly lower occurrence of PPD than those feeding by formula only. Not breastfeeding combined with a history of depression drastically increased risk for PPD. Additionally, a failed attempt or early cessation of breastfeeding was associated with higher scores on depression screening questionnaires, while breastfeeding was associated with lower scores and later peaking incidence of PPD (McCoy et al., 2006).

However, the mother's intent to breastfeed during pregnancy and history of depression may mediate the effects of breastfeeding on PPD (Borra, Iacovou & Sevilla, 2014; McCoy et al., 2006). A large study ($N = 14,000$) measured intent to breastfeed during pregnancy, when

initiation of breastfeeding occurred, breastfeeding status at 1, 2, and 4 weeks after initiation, and whether or not the mother exclusively breastfed the infant. The authors found that the effect of breastfeeding differed by maternal mental health and whether mothers intended to breastfeed. For mothers who intended to breastfeed during pregnancy, doing so decreased risk of PPD, while formula feeding or pumping increased risk (Borra et al., 2014). In addition, smaller effects were seen in mothers who had been depressed prior to birth (Borra et al., 2014), suggesting that history of depression has a stronger relation to PPD than feeding methods.

Fewer studies have examined the effects of breastfeeding on the risk of developing PTSD, and those in existence are largely qualitative and inconclusive. Kendall-Tackett (2014) suggested two possible relationships between breastfeeding and PTSD, based on a review of interviews with mothers. Breastfeeding could exacerbate trauma symptoms associated with a traumatic birth, as it can make the mother uncomfortable due to the desire to avoid the infant, and can trigger flashbacks due to the similarity between breastfeeding positions and how babies are laid on a mother directly after birth (Kendall-Tackett, 2014). Alternatively, breastfeeding could be a healing process, as it allows mothers an opportunity to bond with the infant, a way to overcome the traumatic birth experience, and a method of proving success as a mother (Kendall-Tackett, 2014).

There are no studies, to this researcher's knowledge, directly examining the effects of breastfeeding in the NICU. However, this may be an especially important factor in this population, due to the struggles facing NICU mothers surrounding parental role alteration and lack of control over the infant's care. Findings showing the strong relationship between Acute Stress Disorder symptoms and a perceived inability to care for the infant would support this prediction (Cleveland, 2008). Systematic reviews of the literature identified needs for contact

with the infant, needs to be involved with the infant's care, and fear of loss of the parental role to be among the chief concerns of NICU mothers (Aagaard & Hall, 2008; Cleveland, 2008).

Breastfeeding, or pumping to provide breast milk for the child, may be one way mothers can provide for their newborns and help mitigate these concerns, especially as it is something only they, and not medical personnel, can do to help. While Cleveland (2008) found that NICU mothers did find providing breast milk to be a desirable form of contact, there is no quantitative data to follow up on these claims. Additionally, a qualitative study examining interviews with 62 non-NICU mothers of Swiss nationality found that most found breastfeeding to be a negative experience, commonly citing physical pain, perceived judgment by others due to difficulties, and feelings of failure as a mother (Razurel et al., 2011). This conflicting information shows the need for a clear, specifically directed quantitative study to investigate this relationship and what these mothers' experiences entail.

Conclusion

PPD and PTSD after childbirth both may have negative effects on maternal and child wellbeing. Rates of both of these conditions are higher in parents with infants admitted to the NICU, making this population especially important to study when evaluating protective factors. This study aims to provide further insight into factors relating to the development and persistence of PPD and PTSD in NICU mothers, especially in areas facing a lack of prospective research or inconsistent findings. The use of multiple assessments and prospective measures beginning shortly after birth may provide data more accurate and reliable than those of previous retrospective studies. In addition, the study was the first to specifically investigate the role of

breastfeeding in the development of PPD and PTSD in the context of the NICU. Finally, the inclusion of qualitative data about mothers' challenges and supports throughout this experience will help to form a more complete picture of these conditions and open the door for the development of effective interventions in NICUs.

METHODS

Participants

Participants ($N = 25$) were recruited by posting a flyer detailing the requirements of the study and the researcher's contact information in hospitals' NICU waiting rooms and on social media pages dedicated to NICU mothers. Mothers were excluded if they had not given birth to an infant who had spent at least one week in a NICU within the past 2 years, were under 18 years old, or did not have a valid mailing address or email address. All recruitment materials, procedures, and measures were approved by appropriate IRB boards before any recruitment activities began.

In all aspects except for race, the final sample was fairly diverse. Total family income ranged widely, from less than \$15,000 ($n=3$; 12%) to greater than \$150,000 ($n=1$; 4%), with a mean of approximately \$60,000. Education levels also varied widely, with 5 mothers (20%) reaching a GED or high school diploma, 5 (20%) some college or an associates degree, 5 (20%) a Bachelor's degree, and 7 (28%) a post-graduate degree. The majority of mothers were white ($n=17$; 68%), with 2 black (8%), 1 Asian (4%), and 2 other race (8%) respondents. Participants varied in age from 19 to 42 years, with an average age of 28.95 years ($SD = 6.42$). For most, this was the first child ($n=12$; 54.5%), but parity ranged up to 4 children ($n=1$; 4%). The length of NICU stay of the infant also varied, from 8 to 243 days ($M = 54.11$, $SD = 55.06$). This is mirrored in the range of infant birth weights from 1.03lbs to 10.13lbs ($M = 3.72$; $SD = 2.22$).

Procedure

The study used a combined longitudinal within-subjects repeated measures design and cross-sectional design. Mothers could join the study at any time, and were sorted either into one of two cohorts: those who gave birth within the past 4 months ($n=13$), and those who had given birth between 4 months and 2 years ago ($n=12$). The initial study targeted only the first cohort, but was expanded due to recruitment issues. The split between participants was considered to differentiate largely between mothers who were currently experiencing life in the NICU and the immediate aftermath, and those whose infants were likely home from the NICU but still adjusting to life with a new baby.

All participants completed an initial phone interview to confirm eligibility, obtain verbal consent, and to gather information on the time since birth in order to sort the participant into the appropriate cohort. At this time, participants were asked whether they preferred to complete questionnaires by telephone ($n=4$) or by mail ($n=21$). A total of three mothers never returned questionnaires after recruitment, leaving a final sample of 22 participants.

Cohort 1: Less than 4 months since birth

During the initial phone intake, those who indicated they had given birth within the past 4 months ($n=13$) also completed retrospective measures about depressive and PTSD symptoms during the first trimester of pregnancy. Mothers were asked to think back to the first trimester of their pregnancies and were given some guiding questions to do so (e.g. “*What season was it?*” “*What was an average day like for you?*”). They were then asked to answer questions in ways that most reflected how they felt at that time in relation to depressive and PTSD symptoms. This type of retrospective interview has been found to be a valid and reliable way to assess past symptoms of psychopathology (Caspi et al., 1996). Mothers in this group then answered

questionnaires regarding PPD and PTSD symptomology, feeding practices, and maternal stress at one month ($n=8$), two months ($n=8$), and four months ($n=11$) after birth. As mothers could join the study at any time, they completed questionnaires beginning at the closest time point after the phone intake. At each time, mothers were instructed to complete all questionnaires and return them to the researcher within 10 days of receiving them in order to maintain integrity of the timing being used. Upon the return of each questionnaire packet, mothers received compensation of \$15 in the form of a gift card, as well as a bonus \$15 if they completed all three time points.

Cohort 2: Five to 24 months since birth

All mothers who indicated during the initial phone interview that their infant had been born between four and 24 months prior were sorted into a second cohort ($n=12$). These mothers completed one set of questionnaires which assessed current PPD and PTSD symptoms, past and current feeding practices, demographics, and maternal stress. The packet also included retrospective versions of the PPD and PTSD scales targeting symptoms at 1 month after birth. Mothers were asked to think back to the first month after their child was born and were given some guiding questions to do so (*e.g.* “*What season was it?*” “*What was an average day like for you?*”). They were then asked to answer questions in ways that most reflected how they felt at that time. Mothers were instructed to complete the questionnaires at their earliest convenience. Upon the return of each questionnaire packet, mothers received a nominal award of \$15 in the form of a gift card.

Measures

Postpartum Depression Measure

Postpartum Depression was measured using the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden & Sagovsky, 1987), a widely-used screening instrument validated for use in this population and shown to be sensitive to changes in depression over time (Borra et al., 2014). The questionnaire is a 10-item self-report measure, with each item containing four scaled answer choices indicating differing levels of severity or duration of depressive symptoms. Scores on each item can range from 0 to 3, leaving total range of aggregate scores of 0 to 30. When all questions are used, a cutoff of 13 and higher is suggested to indicate probable major depression in postnatal populations (Matthey et al., 2006). Question #10, which asks about thoughts of self-harm, was excluded from questionnaires used in this study, as it added a level of ethical concern when working with participants who are not seen in person and are participating via telephone or social media. With this in mind, total aggregate scores can range from 0 to 27, and the clinical cutoff was adjusted to a score of 12 or higher for this study.

Post-Traumatic Stress Disorder Measures

To assess PTSD symptoms, two measures were used depending on the time point. To retrospectively assess first trimester PTSD scores, the PTSD Checklist – Civilian Version (PCL-C; Weathers et al., 1993) was used. This questionnaire is made up of 17 items directly relating to DSM-IV criteria for PTSD and designed to be applied generally to any traumatic event. It has been shown to be consistent, reliable, and valid through multiple studies (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996). Mothers were asked to rank symptoms on a 1 to 5 scale

regarding how much they were bothered by them during the first trimester of their pregnancy. Scores can range from 17 to 85, with a clinical cutoff of 44 (Weathers et al., 1993). However, it is important to note this overall symptomology cutoff does not explicitly address diagnostic criteria of meeting re-experiencing, avoidance, and arousal symptoms. Rather, this study was interested in overall severity of symptoms, thus the aggregate score was more appropriate.

At all other time points after childbirth, PTSD symptomology was assessed using the Modified Perinatal PTSD Questionnaire (PPQ; Callahan, Boria & Hynan, 2006), a self-report questionnaire specifically designed for use in obstetric settings. It contains 14 items asking mothers about symptoms of PTSD specifically related to childbirth. The original version of the scale uses dichotomous answer choices, while the modified version uses a five-level Likert scale. This modified version showed improved internal consistency over the original version, and acceptable convergent and divergent validity with other standardized PTSD questionnaires (Callahan et al., 2006). Total possible scores range from 0 to 56, with a score of 19 or higher indicating clinical levels of symptoms (Callahan et al., 2006).

Demographic and Feeding Information

Demographic and feeding information were gathered using questionnaires designed by the researchers based on prior research experience. Mothers were asked about their income, educational attainment, age, race, parity, and working status. Concerning the birth experience, they were asked the method of birth (e.g. natural, emergency cesarean section, planned cesarean section, etc.), infant's birth weight, what complications led to the the NICU hospitalization, the length of the hospitalization, and whether the mother or baby had experienced any further health difficulties since the birth. Mothers were also asked whether or not they had ever been diagnosed with depression or anxiety.

Questions concerning feeding methods made up the second half of the demographic questionnaire. Mothers were asked to write-in the percentage of their infants' feeding that consisted of: breastfeeding directly from the breast, pumping and feeding bottled breast milk, formula feeding, and other feeding (e.g., I.V. nutrients) at each time point. Those in the second cohort completing questionnaires also indicated percentage feeding solid foods, as this cohort included mothers with infants between 5 and 24 months. Mothers were also asked how they had originally planned to feed (breastfeeding, pumping, formula, or other), what factors impacted their decisions about how they ultimately chose to feed, who regularly fed the baby, and whether they tended to feed on a schedule or routine. Finally, mothers were asked to tell about any feedings challenges they had faced, and what had been especially challenging or supportive for them in that process.

Maternal Stress/Social Support Measure

Potential correlates of maternal stress and social support were assessed using the Parenting Stress Inventory, 3rd edition (PSI; Abidin, 1983). This is a 120-item self-report measure containing six child subscales (Distractibility/Hyperactivity, Reinforces Parent, Demandingness, Mood, and Acceptability) and seven parent and situational subscales (Competence, Attachment, Isolation, Health, Role Restriction, Depression, and Spouse), as well as total subscale scores, an overall life stress score, and a stressful life event scale. The questionnaire has been validated for use with parents whose children are as young as one month old, and has been shown to have good reliability (Abidin, 1983).

All mothers completed the entire questionnaire, but this study focused on the subscales of perceived competence, isolation, role restriction (feeling restricted to the maternal role rather

than other social or professional roles), spouse relations, total maternal stress, and overall stress, as these are most related to the concepts of maternal stress and social support.

RESULTS

Postpartum Depression Symptomology

Due to the recruitment procedure used, the number of participants with data available varied by time point: 14 mothers had PPD data available at the first trimester, 15 at one month, 8 at two months, 9 at four months, and 9 at post-four months.

EPDS scores between time points were uncorrelated. Depressive symptoms were average in this population, although there were large ranges in symptom scores at each time point (Table 1). Paired samples t-tests showed no significant differences in levels of depressive symptoms between time points, with the exception of a significant decrease from 1 month to post-four months ($t[7] = 2.77, p < .05$).

Although mean levels of depressive symptoms were moderate, the percentage of mothers reaching levels above clinical cutoffs ($EPDS \geq 12$) at each time point suggested several mothers were at risk for clinical depression (Table 1). Nearly half of mothers (47.8%, $n = 11$) were at or above this cutoff at least once, with a range from 12.1% at two months to 53.3% one month after birth. Reaching clinical levels at one month was unrelated to reaching them at two months ($\chi^2(1, n = 6) = 6.00, p = .17$), four months ($\chi^2(1, n = 5) = 5.00, p = .20$), or post-four months ($\chi^2(1, n = 8) = .89, p = 1.00$). The relationship between two and four months was incalculable, as there were no women with data available at both time points reaching clinical levels.

Post-Traumatic Stress Disorder Symptomology,

Similar results were seen for PTSD symptomology. Again, the number of participants with valid PTSD data varied by time point, with 13 at the first trimester, 13 at one month, 7 at two months, 11 at four months, and 9 at post-four months. Correlations showed PTSD symptoms at one month and post-four months to be significantly positively correlated ($r[8] = .76, p < .05$), but no other correlations between time points were significant. Means indicated average symptomology at most time points, with large variability throughout (Table 1). As with PPD, mean scores were higher at one month and post-four months than at two months. Paired-samples t-tests found no significant differences in mean symptom levels between any time points.

Percentages of participants meeting clinical levels for PTSD ($PCL-C \geq 44, PPQ \geq 19$) were computed to provide more insight into conditions facing these mothers (Table 1). As with PPD, nearly half of mothers (45.5%, $n=10$) in the sample met general cutoffs indicating clinically significant levels of PTSD at least once, with percentages ranging from 14.3% at two months to 46.2% at one month. Reaching clinical levels at one month was unrelated to meeting clinical levels at four months ($\chi^2(1, n = 3) = 3.00, p = .33$) and post-four months ($\chi^2(1, n = 8) = 1.60, p = .46$). Relationships between one and two months and between two and four months could not be calculated due to a lack of variability.

Correlating and Distinguishing Factors

Demographics, PPD, and PTSD

When examining external factors' relations to PPD and PTSD symptoms, demographics were first analyzed. A total of 40.9% ($n = 9$) mothers reported ever being diagnosed with

depression or anxiety. One-way ANOVAs were conducted to see the effect of ever being diagnosed with depression or anxiety on PPD and PTSD symptom levels at each time point. The only significant relationship was with PPD symptoms during the first trimester ($F(1,11) = 5.42, p < .05$). Correlations showed higher education attainment was associated with lower PTSD symptoms prior to birth only ($r[13] = -.57, p < .05$), and never with PPD. Higher infant birth weight was associated with higher PTSD symptoms only at two months ($r[7] = .97, p < .001$), and was not associated with PPD symptoms. Age, marital status, income, parity, birth method, and length of NICU stay were not associated with symptoms of either disorder. Due to the lack of associations between demographic factors and PPD and PTSD symptoms, these factors were not included in further analyses.

Relationship between PPD and PTSD Symptoms

Postpartum Depression and PTSD symptomology were strongly related to each other within, but not between, time points (Table 2). Retrospective EPDS and PCL-C scores of symptoms during the first trimester were unrelated as would be expected as these represent symptoms prior to the triggering birth event. However, the two conditions were strongly correlated at one month, four months, and post-four months, with higher PPD symptoms linked to higher PTSD symptoms. No significant relationships were found in symptom levels of conditions between time points.

The same is seen when chi-square tests of association were conducted regarding mothers reaching clinical levels of the conditions (Table 3). Again, first-trimester levels were not related. However, reaching a clinical level in either PPD or PTSD was significantly associated with also reaching clinical levels in the other disorder at one month and post-four months, and marginally significant at four months. No significant relationships were found between time points.

Maternal Stress/Social Support, PPD, and PTSD

A major interest of this study was to examine the roles of maternal stress and social support in the development and persistence of both PPD and PTSD. Only three valid PSI scales were available at the one-month time point, limiting analysis to the two-, four-, and post-four-month time points. All correlations are within time points (e.g., 4-month PSI data correlated with 4-month EPDS scores), as there were not sufficient available data across times points. Higher scores on all PSI measures indicate greater presence of negative traits (less perceived competence, greater isolation, greater role restriction, worse spousal relations, more maternal stress, and more overall stress).

Overall, maternal stress and social support were insignificantly or inconsistently correlated with PPD and PTSD symptoms (Table 4). No significant correlations emerged between any social support or stress measures and PPD or PTSD at two months. Less perceived competence, total maternal stress, and overall stress (which includes child-related stress) was related to higher levels of PPD symptoms at both four months and post-four months. Role restriction was related to PPD at four months only, while spouse relations and isolation were related only at post-four months. PTSD was less associated with maternal stress and social support, as significant relationships were found only at four months. Less perceived competence, more isolation, feelings of role restriction, total maternal stress, and overall stress were related to more PTSD symptoms at this time, while spouse relations were never significant.

Breastfeeding, PPD, and PTSD

Another main aim of this study was to examine relationships between breastfeeding, PPD, and PTSD within the context of the NICU. Before birth, 86.4% ($n=19$) of mothers planned to feed their children with breast milk, either by nursing or feeding pumped milk. Nearly this

many successfully used feeding by breastfeeding or pumping for at least one time point (81.8%, $n=18$). During the first month after birth, 71.4% ($n=10$) fed their children by breastfeeding or pumping. However, this fell drastically at two months, with 42.9% ($n=3$) breastfeeding or pumping at this time. This held relatively stable at four months (27.3%, $n=3$) and post-four months (33.3%, $n=3$). As with other measures, these differences were statistically insignificant.

Relationships of feeding method as a dichotomous variable (breastfeeding or not) with PPD and PTSD were not significant when analyzed with paired t-tests or ANOVAs. Therefore, the relationships were examined with correlations between the percentage of time infants were fed by breastfeeding, pumping, formula, or other feeding (e.g. I.V. nutrients), and PPD and PTSD symptomology at each time point. Correlations with PPD symptoms are presented in Table 5. The only significant relationship between feeding method and PPD was between EPDS score at one month and formula feeding at one month, with more formula feeding associated with lower EPDS scores.

More correlations emerged relating to PTSD symptoms, all concerning symptomology at two months (Table 5). Higher PPQ scores at two months were related to more breastfeeding at two and four months, and more pumping at four months. The opposite was seen with formula feeding, with more formula feeding at four months associated with lower two-month PPQ scores. However, the absolute relationships seen here, as well as difficulties with earlier analyses at this time point due to a lack of variability, require these results be interpreted with caution.

Qualitative Data

To add depth to understanding the feeding experiences of these mothers, qualitative data about supports and challenges were gathered at each time point. The prompt was the last question on the demographics/feeding questionnaire, and was worded as follows:

What has figuring out feeding been like for you, now and since your baby's birth? Have you faced any emotional challenges? Logistical? How have you coped with those? Also feel free to tell us anything you would like about your feeding experience.

Mothers' responses were analyzed and four major themes identified by noting common content topics: importance of hospital support, lack of control, feelings of incompetence or failure, and logistical issues. Responses were coded as either having a statement matching a theme category or not, with one response potentially containing sentences or comments related to more than one category. For example, the sentence "I really wish the hospital had helped prepare me better to give my daughter her medications once we returned home, because once we got there everything felt completely out of control" would prompt a response being coded positive both for 'importance of hospital support' and 'lack of control'.

The first category, 'importance of hospital support' was mentioned by ten mothers. It included all references to the need for hospital support during any point of the birth, NICU, or homecoming experience. This category was then broken down into 'presence of hospital support' and 'absence of hospital support'. The first includes all mentions of a positive experience relating to hospital support, including feeding support, emotional support, and support with the transition from hospital to home. This was mentioned by three mothers. 'Absence of hospital support' included exactly the opposite – mentions of inadequate feeding

support or pressure to feed a certain way, a lack of appropriate emotional support, or lack of support during the homecoming experience. This was mentioned by seven mothers.

A perceived lack of control was mentioned by eight mothers. This included feelings of chaos, lack of ability to change the course of events, and being overpowered by others (such as hospital personnel). Feelings of failure or incompetence related to feeding included feelings of ineptitude at motherhood or womanhood, due to difficulties feeding using a certain method or figuring out a feeding schedule that would work for everyone. Six mothers described these feelings. Finally, seven mothers mentioned logistical issues related to feeding, such as having to figure out a pumping/nursing schedule around work demands.

Qualitative Concerns, PPD, and PTSD

In order to test the relationships between these qualitative themes and PPD and PTSD symptoms, t-tests were conducted to compare mean EPDS and PPQ scores between those who did and did not mention each qualitative category. The same was done for percentages of mothers reaching clinical symptoms. The 'importance of hospital support' category was analyzed only in terms of its sub-categories, as they represented contradictory experiences, and would therefore have confused results when combined. Noting a presence of hospital support was not significantly related to PPD or PTSD symptomology at any time point (t 's range from $-.19$ to 1.41 , all p 's $>.10$). The relationship to reaching clinical cutoffs could not be conducted due to the small number of people endorsing this theme, as well as small sample sizes at each time point. Absence of hospital support showed a much larger effect. No mothers who endorsed this theme had data available at two months, and therefore analyses were only run for first trimester, one month, four months, and post-four months. No significant relationship arose during the first trimester. Noting a lack of hospital support was related to higher PPD and PTSD symptoms at

one month ($t_{EPDS}[13] = -3.31, p < .01; t_{PPQ}[11] = -4.43, p < .001$) and four months ($t_{EPDS}[9] = -2.27, p < .05; t_{PPQ}[9] = -2.80, p < .05$), but not at post-four months ($t_{EPDS}[7] = .26, p < .30; t_{PPQ}[7] = .16, p < .17$). Mothers who mentioned a lack of hospital support were also more likely to be above clinical cutoffs for PPD and PTSD at one month ($t_{PPD}[13] = -3.18, p < .01; t_{PTSD}[11] = -5.44, p < .001$) and four months ($t_{PPD}[9] = -2.39, p < .05; t_{PTSD}[9] = -2.39, p < .05$).

Mothers who mentioned a lack of control tended to have higher EPDS and PPQ scores than those who did not, but none of these differences were significant (t 's range from -2.14 to .62, all p 's $> .06$). However, these mothers were more likely to reach clinical levels of PTSD at one month ($t[11] = -2.43, p < .05$), but not at any other time point (t 's range from -1.51 to .60, all p 's $> .15$). Feelings of failure or incompetence related to feeding produced no visible trends in symptomology, and likewise there were no statistically significant differences in mean EPDS or PPQ scores, or reaching clinical levels of PPD or PTSD, at any time. The same was true for mentioning logistical issues.

DISCUSSION

Results and Implications

This study adds to the literature showing NICU mothers to be an especially at-risk population for both Postpartum Depression and Postpartum PTSD (Lefkowitz et al., 2010; Feeley et al., 2011). Rates of both disorders were high in this sample, with 47.8% of mothers at or above clinical cutoffs for PPD at least once, and 45.5% at or above clinical cutoffs for PTSD at least once. These are much higher than the average 15-20% for PPD and 1-5% for PTSD seen in the general population (Dennis & Dowswell, 2013; Grekin & O'Hara, 2014).

Changes in both PPD and PTSD symptomology across time points were largely insignificant, and tended to fluctuate widely. PPD symptom levels were never correlated between time points, and rose and fell throughout the study. Symptoms of PPD appeared to be highest at one month-postpartum and decreased significantly by four months after birth, as they often do in the non-NICU population. However, by four months postpartum, about 22% of the women in this study still showed clinical levels of depressive symptoms, which is higher than the rates typically seen in the postpartum population (Dennis & Dowswell, 2013). Similarly, there were no significant differences in PTSD symptomology between time points, and symptoms were generally unstable, with only one significant correlation between symptomology at one month and four months. These findings were unexpected, and could have been driven by small sample sizes available between time points. However, they could also suggest that in this population, PPD and PTSD symptomology is less stable and more event-driven than in the non-NICU postpartum population. Mothers whose infants are in the NICU face uncertainty regarding infant outcomes, and must face many transitions (e.g. coming off ventilation, switching from I.V.

feeding to bottle feeding, coming home from the NICU), all of which present new challenges and stresses. Adjusting to these changes and the extended time before a routine can be established could drive this inconsistency in symptomology over time, and should be examined in future studies.

This study also found strong correlations between PPD and PTSD symptomology after the birth of the baby. Retrospective measures during the first trimester did not show this relationship, suggesting the birth and NICU hospitalization experience could be a driving force behind both conditions. The relationship between depressive symptoms and PTSD symptomology has been well-documented in previous research (Feeley et al., 2011; Grekin & O'Hara, 2014). It is possible that PPD and PTSD exhibit a cause-and-effect relationship, with depressive symptoms and disinterest in the baby arising from trauma-related symptoms. It could also be the case that the questionnaires used in this study are inadequate for distinguishing between the two types of symptoms. This study shows the importance of screening for both conditions in this population, especially when one is known to be occurring, as the presence of either PPD or PTSD may place mothers at even higher risk for developing the other.

Social support and maternal stress were found to be inconsistently correlated with PPD and PTSD symptomology at the various time points. Perceived incompetence and total maternal stress were related to PPD scores at both four months and post-four months. Greater role restriction was associated with higher levels of PPD symptoms only at four months, while isolation, spouse relations, and overall stress were related only post-four months. PTSD scores were unrelated to all measures of stress and social support at all times except at four months, when less perceived competence, more isolation, total maternal stress, and overall stress were associated with more PTSD symptoms. The finding that social-support factors were significant

only at later time points (four months and post-four months), suggests that they may only come into play in later times in this population, after the infant's health is more stable and he or she has come home from the hospital, while during earlier times other aspects, such as hospital environments, may be more important. This is consistent with previous research suggesting that social support is less influential in NICU mothers than in the general population (Tahirkheli et al., 2014). Additionally, the fact that these measures were more likely to be associated with PPD symptoms than with PTSD symptoms suggests a potential distinguishing factor between the two conditions, with the persistence of PPD being more influenced by the environment after birth than PTSD.

A major goal of this study was to provide insight into the relationship between breastfeeding, PPD, and PTSD in the context of the NICU. Feeding by breast milk, either through nursing or pumping, was a popular choice within our sample, with 81.8% feeding in this way during at least one-time point. This was only slightly lower than the 86.4% who planned to use one of these feeding methods. However, this percentage fell sharply over the first few months, at a rate sharper than that seen in the general population (Center for Disease Control, 2015). This suggests it could be especially difficult to maintain breastfeeding over time for NICU mothers, possibly due to logistical or health issues found more commonly in this population.

Breastfeeding or pumping was found to be unrelated to PPD symptoms at all time points. However, more formula feeding at one month was associated with lower PPD symptoms at this time. This relationship is contrary to past research in the general population (Borra et al., 2014; McCoy et al., 2006; Kendall-Tackett et al., 2011), which has often shown breastfeeding to be associated with lower depressive symptoms after birth. Although this finding may be due to

methodological factors in the current this study, it is possible that within the NICU context, choosing to formula feed removes the stress of establishing milk supply and feeding with a fragile infant, especially during this first month. It is also possible that the effect of formula feeding at this time is driven by a lack of extreme fragility that would require more feeding by I.V. nutrients, and less by formula feeding, although this argument is not supported by the lack of a significant finding for 'other' feeding at any time point.

Results for PTSD symptomology also seem to support a protective effect of formula feeding and an exacerbating effect of breastfeeding or pumping. Breastfeeding and pumping were significantly related to more symptoms and more cases at clinical levels at two and four months after birth. Meanwhile, formula feeding was linked to lower symptoms and fewer cases at clinical levels at these times. These results seem to support a theory whereby nursing or pumping (and difficulties associated with these methods) could exacerbate PTSD symptoms (see Kendall-Tackett [2014] for qualitative data supporting this theory). However, this study did not investigate the roles of attempting and failing to breastfeed or intent to breastfeed, both of which may mediate these effects (Borra et al., 2014). As this was the first study to investigate the relationship between breastfeeding and postpartum PTSD symptoms quantitatively, in general as well as in the NICU context, more research is needed before any true conclusions can be drawn.

Qualitative responses related to feeding supports and challenges show more insight into these feeding results. Mothers commonly cited the importance of hospital support, feelings of lack of control or chaos, feelings of failure or incompetence, and logistical issues in their descriptions of feeding experiences. While all of these issues certainly impact mothers during the postpartum period and should be addressed by health care professionals, a perceived lack of hospital support seems to be especially impactful in this population. Mothers who mentioned a

lack of hospital support also reported experiencing significantly more symptoms of both PPD and PTSD, and were statistically more likely to reach clinical levels of both conditions at one month and four months after birth. These results were not apparent during a retrospective first-trimester measure and the effects attenuated post-four months. This suggests this perceived lack of support may have elevated symptoms during earlier times when dealings with hospital staff were most frequent, and not that higher symptoms caused mothers to be more critical of available hospital support.

Limitations

While this study makes significant contributions in a field often understudied and filled with inconsistent results, it does have several shortcomings which must be acknowledged. First, while the use of prospective measures beginning soon after birth is a strength of this study missing from many other studies in the area, the combination of retrospective and prospective methods, especially at one month after birth, could cause some accuracy concerns. Mothers reporting retrospectively may not accurately report symptoms, and using both prospective and retrospective data within the same analysis, especially at the one-month time point where both types were used, may less accurately describe symptom levels than using only prospective data would have done. Additionally, the use of self-report measures to assess symptomology and cutoff scores to indicate clinical levels of both conditions can not provide information on mothers truly meeting diagnostic criteria, as clinical interviews are able to do. However, validated, standard questionnaires were used in an attempt to combat this issue, and this study was focused on levels of distress rather than diagnoses. Furthermore, PTSD symptoms were always considered in terms of overall symptomology, rather than in terms of meeting the proper numbers of symptoms from each cluster of symptoms (avoidance, re-experiencing, hyperarousal,

and negative changes in cognitions/mood) as required for a clinical diagnosis of PTSD.

However, mothers did endorse clinical levels of symptoms, indicating a high level of distress.

The largest limitation of this study was the small sample size, both overall and between time points. While the overall sample size is similar to that seen in other studies of this population, the split between time points, as well as the allowance of mothers to join the study at any time within the scope of the study, greatly decreased the amount of concurrent data available for analysis. This prevented many statistical tests from being conclusive, and requires that all results be interpreted with caution.

The reasons for this small sample size were many. One was simply due to the many demands already being placed on these mothers during this time, which makes it less likely they would volunteer to participate in a study. Another was due to difficulty in securing cooperation to recruit participants from hospitals. Hospitals and researchers have different goals and many institutions may be unable or unwilling to accommodate the needs of researchers. This was a particular problem for the current study, as the recruitment plan had to be re-worked multiple times to face these challenges. The original plan was to work directly within the hospital, meeting with mothers personally in the NICU setting, or having hospital staff pass on information about the study directly to participants. However, recruitment with flyers posted in NICU waiting rooms was eventually decided upon in order to address hospitals' concerns. This method was not highly effective with this population, leading to recruitment through support-group social media sites as an additional source. This proved to be very effective, with most participants from this study contacting the researcher after seeing information on a social media sites. However, this type of convenience sample may not be generalizable to the NICU population as a whole.

Conclusions

While these limitations are significant, this study still found theoretically consistent results in many areas. It affirms that NICU mothers are at risk for developing both PPD and PTSD, and should be screened for these disorders. Additionally, the presence of one of these disorders may place mothers at increased risk for the other, and therefore a high score when screening for one condition (such as the EPDS at a well-baby visit, as many practitioners routinely perform) should trigger assessment for the other.

Additionally, PPD and PTSD in NICU mothers may have different contributing factors than in the general population, as social isolation, social stress, and other common correlates were largely insignificant, or inconsistently significant, in this study. Future research should examine why this may be the case, and whether, as suggested by this study, social support and maternal stress only come into play at later times, when infants have returned home from the NICU.

This study suggests that feeding with formula is associated with lower PPD and PTSD symptoms, while breastfeeding or pumping is associated with higher PTSD symptoms in this population. This may be because eliminating breastfeeding reduces stress and uncertainty, which could be especially important to this population. As this was the first study to quantitatively examine the relationship of feeding methods with these disorders, more quantitative research is needed in this area to decide whether these findings are due to small sample sizes, or whether breastfeeding adds additional stress in this population, causing results opposite from those in the general population.

Finally, qualitative results showed that NICU mothers may be at increased risk for both PPD and PTSD when they feel insufficiently supported by the hospital, especially relating to

feeding. This highlights the need for hospitals to take a personalized approach to care, in order to address the individual needs of their patients.

TABLES

Table 1: Descriptive Statistics of PPD and PTSD symptoms and Percentages at Clinical Levels

		<i>1st Trimester</i>	<i>1 month</i>	<i>2 months</i>	<i>4 months</i>	<i>Post-4 Months</i>	<i>Overall*</i>
PPD Symptoms	<i>N</i>	14	15	8	11	9	23
	<i>M (SD)</i>	7.85 (4.33)	12.67 (6.85)	5.50 (4.14)	9.91 (5.80)	8.89 (5.97)	9.98 (4.79)
	<i>Min-Max</i>	2-16	2-25	0-12	3-19	1-21	0-25
	<i>% Clinical (n)</i>	21.4% (3)	53.3% (8)	12.5% (1)	36.4% (4)	22.2% (2)	47.8% (11)
PTSD Symptoms	<i>N</i>	13	13	7	11	9	22
	<i>M (SD)</i>	33.08 (14.33)	16.69 (12.31)	8.86 (8.65)	13.63 (11.50)	14.44 (9.18)	14.89 (10.58)
	<i>Min-Max</i>	19 -63	1 - 39	4 - 28	3 - 39	0 - 34	0 - 39
	<i>% Clinical (n)</i>	15.4% (2)	46.2% (6)	14.3% (1)	36.4% (4)	22.2% (2)	45.5% (10)

*PTSD Overall scores calculated using PPQ scores (postpartum) only

Table 2: Correlations between PPD and PTSD Symptoms

	<i>PTSD 1st Trimester</i>	<i>PTSD 1 mo.</i>	<i>PTSD 2 mos.</i>	<i>PTSD 4 mos.</i>	<i>PTSD post-4 mos.</i>
<i>PPD 1st Trimester (n)</i>	.47 (13)	.55 (5)	-.05 (7)	.24 (11)	-. (0)
<i>PPD 1 month (n)</i>	.57 (7)	.84*** (13)	-.41 (5)	.87 (5)	.59 (8)
<i>PPD 2 months (n)</i>	.52 (7)	.84 (4)	.39 (7)	.37 (6)	-. (0)
<i>PPD 4 months (n)</i>	.21 (11)	.72 (3)	-.19 (6)	.81** (11)	-. (0)
<i>PPD Post-4 months (n)</i>	-. (0)	.57(8)	-. (0)	-. (0)	.93*** (9)
	- incalculable	* $p < .05$	** $p < .01$	*** $p < .001$	

Table 3: Chi-Square Statistics between Clinical PPD and PTSD Levels

	<i>Clinical PTSD 1st Trimester</i>	<i>Clinical PTSD 1 mo.</i>	<i>Clinical PTSD 2 mos.</i>	<i>Clinical PTSD 4 mos.</i>	<i>Clinical PTSD post- 4 mos.</i>
<i>Clinical PPD 1st Trimester (n)</i>	.97 (13)	- (5)	.19 (7)	.02 (11)	- (0)
<i>Clinical PPD 1 month (n)</i>	- (7)	6.96* (13)	- (5)	5.00 (5)	.89 (8)
<i>Clinical PPD 2 months (n)</i>	- (7)	4.00 (4)	- (7)	- (6)	- (0)
<i>Clinical PPD 4 months (n)</i>	.20 (11)	3.00 (3)	- (6)	4.06+ (11)	- (0)
<i>Clinical PPD Post- 4 months (n)</i>	- (0)	1.60 (8)	- (0)	- (0)	9.00* (9)

df = 1 † $p < .10$ * $p < .05$

Note: exact two-sided probability statistic used due to low sample sizes

Table 4: Correlations between Maternal Stress/Social Support, PPD, and PTSD Symptoms

		Competence	Isolation	Role Restriction	Spouse Relations	Maternal Stress	Overall Stress
2 months	PPD (n=7)	.48	.73	-.07	-.18	.46	.45
	PTSD (n=7)	.17	-.25	-.57	.58	-.45	-.59
4 months	PPD (n=9)	.79*	.51	.79*	.63	.88**	.86**
	PTSD (n=9)	.69*	.69*	.78*	.65	.88**	.85**
Post-4 Months	PPD (n=7)	.91**	.85*	.75	.79*	.84*	.82*
	PTSD (n=7)	.79	.72	.69	.61	.68	.69

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

Table 5: Correlations between Feeding Method, PPD, and PTSD symptoms

		1 month			2 months			4 months			Post-4 months		
		Nurse	Pump	Formula	Nurse	Pump	Formula	Nurse	Pump	Formula	Nurse	Pump	Formula
1 month	EPDS	-.13	.14	-.58*	.05	.75	-.58	-	-	-	.23	-.59	.18
	PPQ	-.03	.08	-.26	-.16	.96	-.65	-	-	-	-.03	-.61	.37
2 months	EPDS	-.20	.14	-.06	.21	-.16	-.04	.41	.41	-.41	-	-	-
	PPQ	-.03	-.27	.23	.81*	-.09	-.48	.98***	.98***	-.98***	-	-	-
4 months	EPDS	.93	-.48	.31	-.12	-.50	.43	-.22	-.05	.17	-	-	-
	PPQ	.37	-.69	.63	.47	-.60	.08	-.12	.21	-.09	-	-	-
Post-4 months	EPDS	.40	-.53	.11	-	-	-	-	-	-	.10	-.50	.43
	PPQ	.25	-.54	-.03	-	-	-	-	-	-	-.04	-.59	.52

- in calculable * $p < .05$ ** $p < .01$ *** $p < .001$

References

- Aagaard, H., & Hall, E. O. (2008). Mothers' Experiences of Having a Preterm Infant in the Neonatal Care Unit: A Meta-Synthesis. *Journal of Pediatric Nursing, 23*(3).
- Abidin, R. R. (1983). Parenting Stress Index. Charlottesville, VA: Pediatric Psychology Press.
- Åhlund, S., Clarke, P., Hill, J., & Thalange, N. (2009). Post-Traumatic Stress Symptoms in Mothers of Very Low Birth Weight Infants 2–3 years Post-Partum. *Archives of Women's Mental Health, 12*(4), 261- 264.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.
- Bickings, C., & Moore, G. A. (2012). Perinatal maternal depression in the Neonatal Intensive Care Unit: The role of the neonatal nurse. *Neonatal Network, 31*, 295-304.
- Blanchard, E. B., Jones-Alexander, J., Buckley, T. C., & Forneris, C. A. (1996). Psychometric properties of the PTSD Checklist (PCL). *Behaviour Research and Therapy, 34*, 669–673.
- Callahan, J., Borja, S., & Hynan, M. (2006). Modification of The Perinatal PTSD Questionnaire To Enhance Clinical Utility. *Journal of Perinatology, 26*, 533-539.
- Caspi, A., Moffitt, T., Thornton, A., Freedman, D., Amell, J., Harrington, H., . . . Silva, P. (1996). The Life History Calendar: A Research and Clinical Assessment Method for Collecting Retrospective Event History Data. *International Journal of Methods in Psychiatric Research, 6*, 101-114.

Center for Disease Control and Prevention. *Infant Feeding Practices Study II and its Year Six*

Follow Up: Results. Retrieved April 06, 2016, from

<http://www.cdc.gov/breastfeeding/data/ifps/results.htm#ch3>

Cleveland, L. M. (2008). Parenting in the Neonatal Intensive Care Unit. *Journal of Obstetric, Gynecologic & Neonatal Nursing*, 37(6), 666-691.

Cox, J.L., Holden, J.M., and Sagovsky, R. (1987). Detection of Postnatal Depression:

Development of the 10-item Edinburgh Postnatal Depression Scale. *British Journal of Psychiatry* 150, 782-78.

Dennis, C.L., Dowswell T. (2013). Psychosocial and psychological interventions for preventing postpartum depression. *Cochrane Database of Systematic Reviews* 2013, Issue 2. Art.

No.: CD001134. DOI:10.1002/14651858.CD001134.pub3.

Feeley, N., Zelkowitz, P., Cormier, C., Charbonneau, L., Lacroix, A., & Papageorgio, A. (2011).

Posttraumatic Stress Among Mothers of Very Low Birthweight Infants At 6 Months After Discharge From The Neonatal Intensive Care Unit. *Applied Nursing Research*, 24(2), 114-7.

Field, T. (2010). Postpartum depression effects on early interactions, parenting, and safety

practices: A review. *Infant Behavioral Development* 33(1), 1.

<http://dx.doi.org/10.1016/j.infbeh.2009.10.005>

Grekin, R., & O'Hara, M. (2014). Prevalence and risk factors of postpartum posttraumatic stress disorder: A meta-analysis. *Clinical Psychology Review*, 34, 389-401.

Kendall-Tackett, K. (2014). Childbirth-Related Posttraumatic Stress Disorder Symptoms and Impact on Breastfeeding. *Clinical Lactation*, 5(2).

- Kendall-Tackett, K., Cong, Z., & Hale, T. W. (2011). The Effect of Feeding Method on Sleep Duration, Maternal Well-being, and Postpartum Depression. *Clinical Lactation*, 2(2), 22-26.
- Lefkowitz, D., Baxt, C., & Evans, J. (2010). Prevalence and Correlates of Posttraumatic Stress and Postpartum Depression in Parents of Infants in the Neonatal Intensive Care Unit (NICU). *Journal of Clinical Psychology in Medical Settings*, 17(3), 230-237.
- Matthey, S. (2001). Calculating clinically significant change in postnatal depression studies using the Edinburgh Postnatal Depression Scale. *Journal of Affective Disorders*, 78(3), 269-272.
- McCoy, S., Beal, J.M., Shipman, S.B., Payton, M.E., & Watson, G.H. (2006). Risk factors for postpartum depression: A retrospective investigation at 4-weeks postnatal and a review of the literature. *JAOA*, 106(4).
- Razurel, C., Bruchon-Schweitzer, M., Dupanloup, A., Irion, O., & Epiney, M. (2011). Stressful events, social support and coping strategies of primiparous women during the postpartum period: A qualitative study. *Midwifery*, 27(2), 237-242.
- Tahirkheli, N., Cherry, A., Tackett, A., Mccaffree, M. A., & Gillaspay, S. (2014). Postpartum depression on the neonatal intensive care unit: Current perspectives. *International Journal of Women's Health IJWH*, 6, 975-987.
- Vigod, S., Villegas, L., Dennis, C., & Ross, L. (2010). Prevalence and risk factors for postpartum depression among women with preterm and low-birth-weight infants: A systematic review. *BJOG: An International Journal of Obstetrics & Gynaecology*, 117(5), 540-550.

Weathers, F.W., Litz, B.T., Herman, D.S., Huska, J.A. & Keane, T.M. (1993) The PTSD

Checklist (PCL): Reliability, validity, and diagnostic utility. Paper presented at the 9th Annual Conference of the ISTSS, San Antonio.

ACADEMIC VITA

Gretchen Perhamus

EDUCATION

The Pennsylvania State University
Schreyer Honors College

Anticipated Graduation: May 2016

Bachelor of Arts: **Psychology** (with honors) Bachelor of Arts: **Sociology**

Minors: **French, Music Performance**

Université Paul Valéry, Montpellier, France

January 2015 – May 2015

RESEARCH EXPERIENCE

Honors Thesis – NICU Experience Study

January 2015 – Present

Mentor: Dr. Ginger Moore *Collaborator:* Kelsey Quigley

Designed and conducted a study investigating contributors to PTSD and Postpartum Depression in mothers whose infants were admitted to a NICU

Duties included background research, obtaining IRB approval, locating recruitment sites, working with human subjects through phone interviews and data collection, and storing and analyzing data.

Parent-Infant Interaction Lab

September 2013 – December 2014

Coded videos in Interact depicting a teaching task with adoptive parents and children at age 27 months

Transcribed interviews with expecting mothers conducted during the third trimester

Coded videos in Interact depicting a Still Face Paradigm between mother and child during the postpartum period

Research Scholar at Lehigh Valley Health Network

June 2014 – July 2014

Created a plan-of-action for developing an updated model of care for Postpartum Depression for the hospital network

PRACTICUM EXPERIENCE

Friendship Group Coach, Child Study Center
University Park, PA

October 2015 – March 2016

Implemented a social skills intervention aimed at improving the abilities of elementary-age children to make and maintain friendships

PRESENTATIONS

Perhamus, G., Quigley, K., Moore, G.A. (2016). *Postpartum Depression and PTSD in the NICU: Prevalence and Contributing Factors*. Poster presented at Pennsylvania State University Undergraduate Research Exhibition, University Park, PA.

Perhamus, G., (2014, July, 25) *Improving Care for Postpartum Depression*. Poster presented at LVHN Research Scholar Program Poster Session, Lehigh Valley Health Network, Allentown, PA.

VOLUNTEER EXPERIENCE

English Teacher at École Saint Jean-Baptiste **February 2015 – April 2015**
Montpellier, France

Taught elementary-age French children basic English at a private school located in Montpellier, France

Counselor at STEAM Camp, Lafayette College **August 2014**

Led a group of children entering 5th grade during a weeklong day camp. Responsibilities included maintaining order within the group, bringing the group to modules throughout the day, and teaching and reinforcing material learned at the camp.

AWARDS and SCHOLARSHIPS

Child Study Center Undergraduate Student Spotlight **February 2016**

Erickson Summer Discovery Grant **Summer 2015**

Competitive monetary award to support the NICU Experience Study. Includes an invitation to present at the Undergraduate Research Conference in Spring 2016.

Dean's Chair Scholarship **Spring 2015**

Paterno Fellows Program **Inducted Spring 2014**

An honors program offered through Penn State University's College of Liberal Arts requiring extra experiences such as participation in an internship, study abroad, foreign language experience, and community service in addition to standard Schreyer Honors College requirements.

Dean's List **Each semester: Fall 2012 - Present**